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Master Thesis Financial Economics

Tournament Incentive, Risk Taking and CEO turnover

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Abstract

In this study, we examine a so far less studied compensation element—the dispersion of compensation among senior managers as tournament incentive—and its influence on firm risk and how it can influence CEO turnover. We measure the tournament incentive by the fraction of total top five executives' compensation that is captured by the CEO. I discover that a higher CPS provides strong tournament incentive to senior ranking managers below CEO to increase firm risk. We also investigate how the tournament incentive of senior managers affect the corporate policies. We discover that CPS increases the firm R&D intensity and firm leverage while decreases the CAPEX intensity. We assume that the tournament incentive can also increase the senior executive who wins in the tournament test to get a higher chance to get CEO position. However, the results reject my hypothesis. We conclude that the higher tournament inventive provide the senior manager with more aggressive risk-taking incentive to affect firm risk and policies, however, they eventually cannot challenge the CEO power because even when the senior managers excel at good performance, CEO remain the position because the board of directors and shareholders attribute the company' s performance to the CEO's contribution.

Key word: tournament inventive, CPS, firm risk, CEO turnover CEO entrenchment

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1.Introduction

Executive compensation has been a critical subject in economics and business research. Prior research associated with executive compensation mainly focused on the perspective from CEO because of the critical role of CEO in shaping corporate policies. The past 20 years witness a dramatic increase in CEO compensation scheme, not only in terms of its absolute value, but also the relative value compared with other employees and senior executives (Kaplan, 2008)-which dwarfed the importance of senior executive beneath the rank of Chief executive officer (CEO). An increasing proportion of literature shifts attention to investigate the compensation scheme of other senior manager in firm performance, mainly based on the tournament theory. The tournament theory stipulates that a considerable pay dispersion between the CEO and other senior managers provides strong incentives to particularly satisfied senior managers, consequently result in higher efforts from them and improved corporate performance (KW Lee, 2005, Aggarwal and Samwick,2003). The importance of senior managers or the top management team is partly because the executive with the highest and significant outcome will get promotion from his/her position the board of directors and CEOs cannot discern whether it was because of the executive's outstanding performance or the higher project risk resulted in the higher output.

Risk-taking behavior is prominent for corporations to obtain long-term competitive advantage in the market. In terms of CEOs, they have already possessed the highest pay and authority within firm hierarchy, thus they do not have much incentive to make risky projects other than the senior managers. The existing of a highly-paid CEO is likely to induce other lower-ranking executives with promotion-like tournament incentives. (Kini and Williams, 2012) A growing body of tournament literature documents that higher tournament incentives serve as an effective mechanism to generate greater risk-taking behavior for corporations, to increase his/her chance of winning the tournament (see Bronars, 1987; Brown, Harlow, and Starks, 1996) to get promoted to the position of CEO and receive the promotion prize. Because the outcomes of senior managers are unable to be distinguished from their real ability, their performance will only be judged by the company's performance.

Although widely view support the opinion that other executives below the rank of CEO are in align of the interest of CEO, however, several studies have confirmed that with the executive rank rises in the hierarchy, executive compensation increases accordingly. (e.g. Murphy (1985), Leonard (1990), and Gibbs (1995)). Thus, relative compensation will be an important factor to affect top team power competition. That means, CEOs will face the risk of power contests from

other executives and these potential risks are one of the important factors influencing CEO turnover. (Shen et al.,2010) Therefore, we would expect that with the higher tournament incentive, senior manager will have more probability of promotion to the CEO position. The large executive pay of CEOs, serving as a tournament prize, has more probability to attract managerial and ambitious executives as competitors to participate in the tournament in order to get the chance of promotion. (see Bronars, 1987; Brown, Harlow, and Starks, 1996).

Goel and thakor(2008) theoretically hypothesize that by implementing a larger tournament incentive, senior managers will take greater risk-taking behavior in order to increase their chance of promotion to the rank of CEO position. The particular prediction in their thesis is that if the incentive for promotion increases, the risk of the enterprise will also increase. Therefore, in the first part of our analysis, we mainly follow the paper of Kini and Williams (2012) to examine the importance of risk-taking incentive of senior executives, however, their study does not give empirical analysis on to which extent does this inventive affect the senior managers status. Therefore, we also attempt to investigate CEO turnover and to find how power competition between the CEO and other senior executives of the firm impact the change of CEO turnover.

Therefore, our research question will be set into two parts. The first part we attempt to investigate on *how "the tournament incentive for senior executives will affect firm risk and corporate policy?"* and for the second part, we *test "will the tournament incentive induce senior executives to increase the probability CEO turnover?"*

Early compensation studies primarily focused on the different component and level of compensation packages, and their stock option volatility and sensitivity to firm performance (Jensen and Murphy 1990; Yermack1995). However, when personal output is difficult to be detected, tournament theory proposes that, it is efficient to pay individuals based on organizational hierarchy ranking. Just like simulating the prize scheme set up in the sports tournament, higher positions can lead to higher compensation. Thus, we measure the tournament incentive by the percentage of total compensation of the top five executives that is captured by the CEO (Bebchuk et. al.,2011). This indicator well reflects the relative compensation level between the CEO and the other members of the top management team.

In this study we examine a sample of 19,231 frim-year observations with 3,958 CEOs for 2,023 US companies spanning the period between 2001-2016 and we find that the tournament

incentive measure by lagged CPS is positively associated with stock return volatility, which is supported by Kini et al., (2011) as they use the pay gap as tournament incentive between the CEO total pay with the mean compensation of other number of executives. Additionally, we document that tournament incentive has a positive effect on firm investment policy and financing policy (measured by R&D intensity and Book leverage, respectively) while it has a negative relationship with capital-expenditure intensity. Overall, results of this study show that the tournament incentive of the top management team is positively correlated with firm risk and corporate policies.

Further, our results contradict our prediction that there is a positive impact from tournament theory perspective. We discover that the impact of CPS on CEO turnover is negative. The underlying reason is that with a higher tournament incentive, the senior managers have more tendency to challenge the CEO's position within the firm while even compelling the CEO to leave his position because of the bad firm performance. The senior managers might implement extreme risky projects or non-profitable projects to do bad for the firm performance while the board of directors and shareholders cannot discern whether these projects are adopted due to senior managers' ability or their risky behavior. Therefore, when the CEO approves of these extreme risky projects and when they turn non-profitable, not only the CEO's decisions will be doubted, but also this will put the manager in a bad performance. So even though top senior managers manage to deteriorate the performance of the CEO, it comes to a cost to this senior manager. Meanwhile, their actions benefit other managers through increasing their probability to the CEO position. Therefore, in order to make the individual performance recognized, senior managers will collectively excel at their own divisions and accordingly enhance their power among the management team. However, even with a higher tournament incentive, this senior manager still cannot challenge the CEO position because the performance improvement of the whole firm will be considered as the CEO's credit, based on their authority and status. Another reason that senior executives are less likely to challenge these powerful CEOs is might because CEOs receiving more compensation, have more power and have more discretion relative to other executives over corporate policies based on the CEO entrenchment perspective.

This study contributes to the managerial compensation under tournament theory research on several dimensions. Primarily, it provides comprehensive and updated empirical evidence that tournament incentive is positively associated with firm risk and corporate policy. Additionally, we do not focus on the absolute level of CEO pay as a great boy of previous literature, but we focus on the relative value which represents tournament prize by measuring CPS. Therefore,

our study thus contributes to previous literature by shifting our attention from the CEOs to the executive-team compensation. Further, because little literature focuses on how the CEO compensation affects CEO turnover from the perspective from tournament incentive or from the managerial power theory. Thus, our study also extends the literature by filling this gap through directly investigating the CEO compensation effects on CEO turnover.

The rest of our paper is organized as follows. Section 2 discusses literature review regarding tournament incentive and presents our hypotheses. Section 3 demonstrates our methodology and data collection procedure, while Section 4 presents our empirical results. Section 5 reports our robustness tests and section 6 displays our conclusion and limitations.

2.Literature Review and Hypothesis

2.1 Tournament incentive

The tournament theory has received much attention in the academic literature, partly because it provides explanations for the skewness of corporate compensation structure, namely at a high level of CEO compensation compared with other executives and workers (Bognanno ,2001). In the same way, Hayward and Hambrick (1997) state that larger pay gap between the CEO and the next highest executive level within the top management team ranges is huge and usually ranges from 30% to 50%. This huge inequality pays during the top management team, Kim and Mauborgne (1996) propose that, leads to the focus on procedural justice, which may induce the promotion incentive between executives, which influences the top management team's cohesion and also competitive awareness and consequently contributes to firm performance. While Baker, Jensen and Murphy (1998) states that since the CEO is at the top place of the corporate hierarchy, which means they have no room for promotion within the firm, and leaves only performance-based compensation as the only incentive.

According to Lazear and Rosen (1981), other non-CEO executives of the company are the participants of the competition for promotion. Winners will obtain promotion with a higher compensation compared with competitors. This theory put forwards three basic augments: firstly, managers' compensation level depends on the level of his/her position. Secondly, the managers promotion is based on his/her performance ranking relative to the absolute performance level. Thirdly, the pay gap caused by the promotion will motivate the lower-ranking executives to put more effort and increase the probability of higher replacement.
In the business research, Main et al. (1993) investigate 200 US firms during the early of 1980s and discover that when one promoted within the corporate hierarchy, executive pay dispersion

increases significantly, which indicates that the higher compensation based on rank-ordering motivates participants to obtain higher goals, and that the dispersion in top compensation increases with the number of participants. Edmans and Gabaix(2011) also support the tournament theory and posit that compared with other top executives, the CEO's high compensation is an incentive set up by the company intentionally, to help improve the company's performance. The winners will be promoted by the promotion and get higher social status. The competition mechanism of the tournament can achieve resource allocation efficiency similar to the marginal mechanism.

2.2 Tournament incentive, firm risk and firm policy

Wright, P. et al., (2007) perceive the risk-taking distribution from firm strategy into upside and downside potential variance. They discover that risk-averse executives are likely to adopt less risky strategy to guarantee their under-diversified human capital and well-being within their firms. While with the implementation with a higher compensation scheme, from where they define a higher proportion of managerial salaries to ownership incentives, will attract more risk-seeking candidate into management team, which subsequently increase frim risk and reduce the probability of low outcome variance corporate strategy.

Under the pressure of competition, with the presence of information asymmetry, board members and shareholders within firms cannot judge whether the firm outcomes derived because of the executives' efforts, their capabilities, or risk-bearing levels of executives. Goel and Thakor (2008) state that choosing a policy or project that leads to high performance means that executives need to take on higher risks. But at this time, if executives still bear the same level of risk, then there is no big difference in their performance. In order to increase their chances of promotion, executives will have to take greater risks than in the absence of tournament.

Based on the research of Kini and Williams, (2012), the managerial incentives increase the firm risk by increasing firm different policies. More and more empirical studies are analyzing the impact of the incentives of chief executive officers (CEOs) on corporate policy, still a little literature analyzes the effect of non-CEO executives on corporate policies. For example, Coles, Daniel, and Naveen (2006) find that the pay-performance sensitivity(delta) of all senior executives and high sensitivity of executive s' wealth to stock volatility (vega) also affect firm investment and debt policies. Specifically, Jiang, Petroni, and Wang (2010) propose that CFOs, one of the senior executives plays a important role in financial reporting because of the

importance of CFOs influence. And they find that the CFOs equity-based incentives dominate over the incentive of CEO upon the financial reporting. Geiger and North (2006) confirms that they discover a decline of discretionary accruals surrounding the appointment of CFOs which are independent form the influence of CEOs. Chava and Purnanandam (2010) emphasis the importance of CFOs incentives regarding financing risk, i.e. short-term debt. Firms whose CFOs have higher vega (the risk-taking incentive) implement higher short-term debt while they do not find an important role for CEOs incentives in terms of financing policy. In terms of accruals management, which proxy for a volatility decreasing accounting decision, CFOs with higher risk-taking incentive enforce higher accruals managements.

Kini.et al., (2011) performance in a sample of 100 UK firms in 1997 and discover that senior executives are likely to have greater risk-taking motivation in firms with a higher CEO's compensation. They measure tournament incentives as the pay gap between the CEO and senior managers at the next highest level during the period from 1994 to 2009, they find intra-organizational pay gap is significantly affect the firm risk. What's more, they discover that higher tournament incentives lead to higher R&D intensity, firm focus, and leverage, but lower capital expenditures intensity. Overall, they do find that tournament incentive among the top management team shape the corporate risk-taking behavior.

In summary the above discussion leads to the following hypotheses:
H1: Tournament incentive(CPS)will have a positive effect on firm risk (stock return volatility)
H2: Tournament incentive(CPS)will have a positive effect on firm policy.

2.3 CEO power, tournament theory associated with CEO turnover

Several studies have shown that executive compensation within a firm rises with the level of executive rank in the hierarchy (e.g. Murphy (1985), Leonard (1990), Baker, Gibbs and Holmstrom (1994)). Therefore, relative compensation can be an important predictor of the future CEO.

Previous research demonstrates several perspectives about the management competition at the top of the firm. One perspective is based on managerial power theory. As Bebchuk et al., (2012) discover the agency problem partly attributed to less CEO turnover, the reason behind is that with CEO entrenchment, powerful CEO will harness his/her authority to remain the CEO position, which make the CEO position less likely to be replaced by internal candidates even

when the firm performance become worse, as they have more discretion to capture the board management, reflecting the CEO power. Powerful CEOs can blame the bad performance on the other executives to protect themselves when firm performance (Boeker, 1992). Further, CEOs could select an organizational structure that protest them from being replaced by other competitors, according to Novaes and Zingales (1995), such as high ownership, or invesing in firm-specific assets, therefore, it is challenging for shareholder to take the place of them. Thus, under the managerial power theory, the higher CEO compensation will contribute to less CEO turnover based on the CEO entrenchment problem.

However, under tournament theory, Milgrom and Roberts, 1992 state that a tournament incentive can have ambiguous effect to senior executives other than the CEO. To some extent, a tournament prize can provide incentives for those executives whose ranking is lower than CEO to increase their chances of succeeding the CEO. On the other hand, a tournament prize could incur heavy deadweight costs by, for example, causing executives to envy for the CEO position while lead to less cooperation, and even seek to undermine, their competitors. These benefits and costs may vary from company to company.

According to Bloom and Michel's paper (2002), they document that a tournament-incentive compensation scheme increases the turnover of lower-level managers, however, this evidence might not provide empirical evidence on senior executives. The higher CEOs compensation induce envy and contest among low ranking managers, because lower-ranking managers struggle to remain lower social position and relatively less compensation compared with upper level managers. However, compared with lower-ranking managers who are less likely to win the top prize, senior executives with more competitive advantage are more aggressive within the contests. Thus, they also challenge the position of the CEOs as they attempt to replace their position when they are un-satisfied with their compensation and recognize that they are under-compared with the performance of CEO, therefore, they have incentives to initiate a tournament competition challenging the CEO and attempts to obtain the top pay (Zald and Berger, 1978).

However, when these executives strive to improve their performance and make them look good to the board of directors, contentious executives can deliberately implement organizational damage and make the CEO look bad. Lazear (1989) state that setting a tournament incentive induces organizational competition among the top management team, for example, senior executives below the rank of CEO may deliberately take actions to adversely affect the

performance of other competitors in order to improve their own opportunity of winning the top prize during the tournament.

Lazear and Rosen (1981) also point out that a tournament incentive is often used when it is difficult for boards and shareholders to monitor individual performance, executives even will take action in political sabotage while these actions are difficult to be dectected and penalized (Lazear, 1989). To increase their chance of winning, as stated by Zald and Berger (1978), executives can deliberately conceal important information away the CEO and try to influence other executives, shareholders and board of directors, without CEO's awareness, attempting to decline the CEO's reputation while raise their own.

Based on the above information, if CEO pay is set as the highest award recommended by tournament theory, we expect it to provide incentives for managerial and ambitious executives to compete in the tournament to win the CEO position, to increase the likelihood of a power contest against the CEO, and have a positive impact on CEO turnover.
H3. Tournament incentive(CPS) increase the likelihood of CEO turnover.

3. Research design

I explain what sample this research uses and how the data is collected and merged. I elaborate on the variable definitions and discuss the summary statistics. In the methodology part, I will discuss the relevant methodology and formulate the statistical tests that will be used to test the hypotheses.

3.1 Data collection

The sample of this thesis consists of 3999 CEOs in the United States from January 2001 to December 2016 among 19, 231 firm-year observations. The time horizon used for this research is over 2001 to 2016. We are interest in how the executive compensation changes after the 20th century, thus we start from 2001 and as 2016 is the latest year for which almost all required data was available. My main database is the ExecuComp, from where I collect all top 5-executive compensation and CEO characteristics. One thing need to be notice is that if any firm reported number of executives in the database with fewer than five executives, then those firms are excluded in order to ensure that CPS remains comparable from firms to frims. (Bebchuk, Cremers and Peyer ,2011). The related firm characteristics and fundamental data came from the Compustat database. Further, we obtain specific stock data information from the Center for Research in Security Prices (CRSP) files.

We excluded those financial firms and utilities from our sample, which is a standard approach in the corporate finance research due to their different structures and heavy regulatory principles. Firms with standard industrial classification codes (SIC) between 4900–4999 and 6000–6999 are excluded respectively. We eventually merge these different databases mainly based on the cusip number, company Id number (gvkey) and the fiscal year. After the merging process, our dataset consisted of *19231* firm-year observations for *1176* S&P firms in 55 different industries (based on two-digit SIC codes). Nevertheless, some variables are missing on several observations. Thus, the sample size varies per analysis in the empirical results section, especially when it included different dependent variables.

3.2 Variable measurement

3.2.1 Independent variable —CPS (tournament incentive)

For this thesis, we define CPS as tournament incentive, also the promotion-based incentive. It measures the proportion of the compensation of the top 5 executives that goes to CEO (the 5 top executives are selected by the executives' salary & bonus rank). This variable reflects the firm senior executives' tournament incentives as it captures the ratio in senior executives pay relative to the CEO pay.

Total compensation (TDC1) is used and consists of executives' salary, bonus, all other compensation, all other annual compensation, restricted stock granted, option granted Black Scholes value and long-term incentive plan payouts from ExecuComp database.

3.2.2 Dependent variable—Firm risk and firm policies

In this paper, we first test the above prediction that managerial risk-taking behavior within firms increases with tournament incentive. We use Return volatility, the annualized standard deviation of daily stock returns at year t to proxy for firm risk. Additionally, we investigate in whether tournament inventive will have an influence on firm investment policy and financing policy. We define R&D intensity as R&D expenditures divided by total assets (Compustat data items XRD/AT) and CAPEX intensity as capital expenditures divided by total assets (Compustat data items [CAPX-SPPE]/AT). Book leverage is defined as the book value of the long-term debt plus the long-term debt in current liabilities, divided by the total asset. ([$LTDT + LTDCL$]/ AT). LTDT stands for the book value of the long-term debt and LTDCL is the long-term debt in current liabilities. Book leverage proxies for the financing policy of the firm, considering investments. Top management team often tend to finance investments with debt when they assume the firm is undervalued by the market, whereas they prefer equity when the market overvalues the firm's stock (Narayanan, 1988). Higher leverage ratios relate to more

risk, however the optimal financing structure, which implies less risk, is a mix of debt, equity and cash (Jensen & Meckling, 1976).

3.2.3 Control variables

To make sure that the observed effect in the statistical analysis is infect attributable to the dependent variable, I also include a variety of control variables based on prior literature, specifically CEO characteristics and firm characteristics.

We include CEO characteristics to control the managerial power influence. Two of the most important CEO specific characteristics are the age and tenure of CEOs. CEOs with longer tenure are paid more in general because of their profession knowledge and their experience that has been built up over the years (Alves et al., 2016). Moreover, Hill and Phan (1991) argue that longer tenure is associated with increased managerial power. As such, these executives would be able to use their power to positively influence their compensation (Hill & Phan, 1991). Others expect that there is more management entrenchment with respect to these executives. As a consequence, they would be more risk-averse (Berger, Ofek, & Yermack, 1997). CEO age in turn, is measured straightforward by the number of years. CEO tenure is the number of years since the CEO was promoted to his/her position.

As CEO duality and CEO ownership proxy for CEO power, we control these two variables to control the CEO discretion and their managerial power on setting CEO compensation, which will also consequently decrease the firm risk as CEOs are regarded as risk-aversion. I also add CEO outsider: Baker et al. (1994) study the internal promotion against external hiring CEOs and he report that external hiring candidate occurs at all levels among the top management team but much less so at upper levels. Based on Chan (1996) study, he considers tournaments in which candidates outside the firm participate, which reduces the probability of winning for internal competitors in the tournament. CEO outsider measured as the CEO was joining in the firm for less than one year before becoming CEO.

In terms of firm characteristics, we define ln[Assets] as firm size and measured by the natural logarithm of total book assets (Compustat data item AT), Tobin's Q is defined as the market value of assets divided by the book value of assets (Compustat data items ([AT +CSHO*PRCC -CEQ -TXDB]/AT). ROA is defined as net income divided by total assets (Compustat data items NI/AT).

Considering that the magnitude of maximum and minimum variables value is exceptionally high, although they are not frequent they can influence the analysis excessively. Therefore, the data is winsorized at the 1% and 99% levels by resetting all extreme negative/positive data at the 1st/99th percentile value. This is considered a preferred approach to handle outliers. Further analysis is reported under assumption that the winsorized distribution characterized the native distribution. Following the winsorizing the standard deviation and kurtosis are lower which is expected result because winsorizing creates thinner tails.

3.3 Methodology

After reviewing prior literature on executive compensation and risk taking, it is obvious that methodological considerations are very important. In order to account for both time and cross-sectional effects, it is common to apply panel data.

Our investigation is divided in to three sections. First, we investigate the effect of tournament inventive on the frim risk. Secondly, we want to investigate whether tournament incentive affects corporate policies, like R&D intensity, capital expenditures intensity, and firm leverage. For each measure of firm risk/policy, we estimate the following equation using an OLS regression approach:

$$\text{Frim risk}_{i,t} = \beta_0 + \beta_1 \text{CPS}_{i,t-1} + \beta_2 \text{CEO age}_{i,t} + \beta_3 \text{CEO tenure}_{i,t} + \beta_4 \text{CEO ownership}_{i,t} + \beta_5 \text{CEO outsider}_{i,t} + \beta_6 \text{Tobin's Q}_{i,t} + \beta_7 \text{ROA}_{i,t} + \beta_8 \text{Ln(Assets)}_{i,t} + \beta_9 \text{Sales growth}_{i,t} + \text{Year dummies} + \varepsilon_t$$

$$\text{Corporate policy}_{i,t} = \beta_0 + \beta_1 \text{CPS}_{i,t-1} + \beta_2 \text{CEO age}_{i,t} + \beta_3 \text{CEO tenure}_{i,t} + \beta_4 \text{CEO ownership}_{i,t} + \beta_5 \text{CEO outsider}_{i,t} + \beta_6 \text{Tobin's Q}_{i,t} + \beta_7 \text{ROA}_{i,t} + \beta_8 \text{Ln(Assets)}_{i,t} + \beta_9 \text{Sales growth}_{i,t} + \text{Year dummies} + \varepsilon_t$$

However, performing Ordinary Least Squares (OLS) regression in the presence of endogeneity would has severe consequences for the estimates. In the manifestation of endogeneity, the OLS regression model can generate bias and inconsistent parameter estimates (Cole et al., 2006). Therefore, the hypotheses tests can be seriously misleading under OLS regressions. According to Kini et al.,(2011), our lagged main independent variable cannot effectively eliminate the endogeneity problem.

Therefore, our empirical analysis addresses this issue by employing 2sls regression approach by using lagged values of industry-mean CPS and number of vice president among the top 5 executives as instruments. Under the 2sls regression, the first stage of the 2SLS regresses

CPS on variables that are expected to influence this dependent variable, and have no expected relation with firm risk/policies, in order to obtain a fitted value of the compensation measure.

While in the second stage, the fitted value of CPS is employed as explanatory variable with other control variables to test the effect on firm risk and firm policies. Thus, we estimate the following 2SLS regression equations:

$$\text{Frim risk}_{i,t} = \beta_0 + \beta_1 \text{ predicted CPS}_{i,t-1} + \beta_2 \text{ CEO age}_{i,t} + \beta_3 \text{ CEO tenure}_{i,t} + \beta_4 \text{ CEO ownership}_{i,t} + \beta_5 \text{ CEO outsider}_{i,t} + \beta_6 \text{ Tobin's Q}_{i,t} + \beta_7 \text{ ROA}_{i,t} + \beta_8 \text{ Ln(Assets)}_{i,t} + \beta_9 \text{ Sales growth}_{i,t} + \text{Year dummies} + \varepsilon_t$$

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For the 2SLS model, particular tests for our models are also performed. To check the validity of our instruments, firstly, we require the coefficient for these two instruments to be statistically significant, which means that the instruments are individually relevant. Secondly, we do the weak instrument test to check whether instruments are weak and we also run under-identification test: test whether instruments are irrelevant. They are often referred to analyze if the instrumental variable is correlated strongly enough with the endogenous variable, with Staiger and Stock's (1997) rule of thumb: reject that your instruments are weak if first stage F-statistic is larger than 10, for the instrumental variables to satisfy its first condition for validity. Because Weak instruments can produce biased IV estimators and hypothesis tests with large size distortions (Stock and Yogo, 2005). Observing the significance between the instrumental variable and the endogenous variable in the first stage prove that the endogenous variable with instruments are jointly relevant.

Further, we run the Sargan-Hansen test to test the validity of over-identifying restrictions. this test is utilized when more than 1 instrumental variables are used. The test analyses if instrumental variables are exogenous enough to the error term. The null hypothesis is that the instruments are valid instruments (i.e., uncorrelated with the error term in the second stage) and that the excluded instruments are correctly excluded from the estimation second-stage regression. A rejection would cast doubt on the validity of the instruments. We report the results of these tests along with the instruments we use in the first-stage regressions in the bottom panel of the estimated 2SLS regressions in the tables that follow.

Finally, we check the Durbin and the Hausman-Wu endogeneity test for each relationship (not shown in this thesis). The null hypothesis in these tests is that the variable under consideration

(CPS) can be treated as exogenous. Overall, we find that the test statistic is highly significant for each equation, then we reject the null hypothesis of exogenous， and we must treat CPS variable as endogenous (not shown).

In terms of all regressions, we control for firm or industry and year fixed effects in all the regression specifications. The firm fixed effects is used to control for unobserved firm characteristics. Year fixed effect are incorporated to capture the influence of aggregate time series variation and the industry fixed effects are involved to capture the amount of managerial discretion that is related to the type of industry.

3.4 Descriptive Statistics

Table 1: Descriptive statistics

This table gives the number of observations, means, standard deviations, minimum observations, maximum observations of the variables included in this study. The reported numbers concern the full sample of CEO years. Our industry instruments are based on two-digit SIC codes. All variables are winsorized at 1% and 99%

Variable	Observations	Mean	Std.	Min	Max
CPS	19,231	0.3931823	0.1182726	0.0374192	0.7228374
Return volatility	19,210	0.0268993	0.0133761	0.0094888	0.0797647
R&D	12,771	0.0509801	0.0647727	0	0.3501843
Book leverage	19,171	0.2207184	0.1913898	0	0.8716127
CAPEX	13,788	0.0449912	0.0466123	-0.0067002	0.2624243
age	18,830	55.66189	7.065962	40	75
ownership	19,231	16.38187	40.8439	0	288.424
CEO tenure	19,038	9.323214	7.387072	0	36
CEO outsider	19,231	0.1638482	0.3701472	0	1
duality	19,231	0.2412507	0.427853	0	1
Tobin's q	17,852	1.962782	1.171286	0.7035675	7.197396
ROA	19,224	0.0355937	0.1161121	-0.5613841	0.2861596
In [asset]	19,229	7.478034	1.575379	4.294028	11.63278
industry-mean CPS	19,231	0.4007312	0.0326806	0.3196334	0.5340528
number of VPs	19,573	3.080315	1.371958	0	6

The descriptive statistics are presented in Table 1. The statistics are computed based on a panel data set of 19,231 firm-year observations that represent 3,999 different CEOs and 2023 firms between 2001 and 2016. Not all companies have 16 observation years because CPS had to be deleted due to missing values. The average CPS is 0.393 which means that 39.3% proportion of the total compensation of the top 5 executives goes to the CEO. The firm risk measure of stock return volatility has a mean of 0.0268993, which means that the average tournament incentive would motivate senior managers to implement projects that generate more than

2.6899% increase in firm value for each percent of additional risk. For the measurement of firm policy, R&D has a measure of 0.0509801 and its manimum is around 0.286.

The firm performance measure Tobin's Q has a mean of 1.962782 which means that the average firm's stock price is overvalued. The average ROA is 0.0355937 so the total net income is around 3.5560% of total assets. Duality with a mean of 0.2412507 indicates that 24.12% of the CEOs that have a value for the variable duality are both CEO and chairman of the board of directors. Furthermore, the average stock ownership possessed by a CEO is 16.38187 higher over the firm outstanding common stocks. The mean tenure of the CEOs is 9.323 and the standard deviation is 7.387, which signify that most of the CEOs have an amount of years working for the company, which are not close to the mean tenure.

Table2 presents the correlation between our independent variables, control variables and two instrument variables. The presented results indicate that multicollinearity is not a problem. In general, the correlations range from -0.15 to 0.37, where the strongest significant negative correlation is between the CEO outsider with the firm size(ln[asset]). The strongest positive correlation is between age and CEO tenure. The correlations are fairly low between the variables, which points out that the relationship between them are also fairly low.

Table 2: Correlations

	Age	ownership	CEO tenure	CEO outside	duality	Tobins'q	ROA	ln[asset]	Vp	mean cps
Age	1									
ownership	0.12	1								
CEO tenure	0.37	0.31	1							
CEO outsider	0.03	0	0.17	1						
Duality	0.21	0.23	0.16	-0.08	1					
Tobin s' q	-0.07	0.03	0.04	0.04	-0.01	1				
ROA	0.04	0.01	0.06	-0.08	0.07	0.31	1			
ln[asset]	0.09	-0.17	-0.07	-0.15	0.15	-0.15	0.15	1		
Vp	-0.02	-0.09	-0.08	0.05	-0.04	-0.06	-0.07	-0.04	1	
mean_cps	0.07	-0.01	-0.04	-0.08	0.14	-0.02	0.01	0.11	0.03	1

4. Empirical results and analysis

4.1 Stock return volatility and tournament inventive

The results of the regressions between lagged CPS (the independent variable) and stock return volatility (the dependent variable) are reported in Table3.The results from the OLS regression are reported in column 2(with firm fixed effect) and 3(with industry fixed effect). In the column 2, we find that the coefficient on the CPSt-1 is -0.00277 (-0.00276 in the column 3) and is

significantly negative at the 1% level. The reason for adding several control variables to the regression is to control for CEO characteristics and firm characteristics that may be related to firm risk, not including these variables in the analysis might bias the statistical tests on the associations. In term of control variables, CEO ownership, ROA and firm size in this model are positively related with stock return volatility.

However, considering endogeneity issue cannot be eliminated in the OLS regression, when we shift to IV regression, we employ number of VPs, industry-mean CPS as instruments in this analysis. After the Durbin-Wu-Hausman test, we find that IV is preferable to OLS. Which confirms that OLS has endogeneity problem. After adding instrument variables correct this problem, we find that in the 2sls regression (column 3 in Table 3), there is a positive correlation between lagged CPS and stock return volatility, which means that OLS coefficient have downward biased. The coefficient on lagged CPS is 0.00866 and is significantly positive at the 1% level in column 3. This result indicates that our first hypothesis that with an increase in tournament incentive, the senior manager has more risk-taking incentives to implements risk projects. Therefore, after we correct for endogeneity, we discover the risk-taking behavior is higher in firms when senior managers are given greater tournament.

The coefficient of the tournament incentive on risk-taking within firm appears to be no longer significant after checking heteroscedasticity. (Column 4) Further, in terms of control variables, the coefficient on ROA is -0.0368 and is statistically significant. We discover that with a higher accounting (ROA) performance, the stock risk declines significantly. Further, we find that among the CEO characteristics, the CEO age, duality and ownership show differently significant influence on firm return volatility, which support many previous literatures, that with a higher CEO power, the firm risk also increases.

The coefficient of each instrument variable is individually significant at the 1% level in the first stage (not shown), which indicates that the instruments are individually relevant. Further, we find the f-statistics for lagged CPS in the first stage (Cragg-Donald-Wald-F statistic) is 191.6, and the under-identification test are statistically significant at the 1% level, indicates that our instruments are jointly relevant and we reject the null hypothesis that our instruments are weak. Meanwhile, our test passes the Sargan-Hansen-statistic, the value is 0.0438 and is insignificantly different from zero, thereby indicating that instruments are valid. （results are in the Appendix）

Table 3: Return volatility and tournament incentive

The instruments used in the IV 2sls regression are Industry-mean CPS and number of vice presidents among the top 5 executives. All variables are winsorized at 1% and 99%. t-statistics are reported robust standard errors clustered by firms in parentheses（except column3）, where *, **, and *** state the 10%, 5%, and 1% significance level respectively.

Dependent variables	(Firm fixed) OLS Return volatility$_t$	(Industry FE) OLS Return volatility$_t$	(Industry FE) IV(2SLS) Return volatility$_t$ (without Robust)	(Industry FE) IV(2SLS) Return volatility$_t$
CPS_{t-1}	-0.00161**	-0.00276***	0.00866***	0.00866
	(-2.044)	(-3.692)	(2.675)	(1.027)
Age	-2.99e-05	-7.13e-05***	-7.31e-05***	-7.31e-05***
	(-1.344)	(-3.170)	(-6.644)	(-3.249)
Ownership	0.000128***	7.45e-05**	0.000120***	0.000120**
	(2.766)	(2.086)	(5.394)	(2.505)
CEO tenure	1.12e-05	-5.00e-06	-1.01e-05	-1.01e-05
	(0.457)	(-0.233)	(-0.909)	(-0.474)
CEO outsider	0.000516	0.000810**	0.000672***	0.000672*
	(0.997)	(2.362)	(3.393)	(1.911)
Duality	-0.000312	-0.000468	-0.000606***	-0.000606*
	(-1.156)	(-1.409)	(-3.104)	(-1.687)
Tobin s'q	-0.000219	-0.000237	-0.000221***	-0.000221
	(-1.366)	(-1.566)	(-3.180)	(-1.426)
ROA	-0.0240***	-0.0367***	-0.0368***	-0.0368***
	(-17.23)	(-15.85)	(-53.48)	(-15.84)
In[asset]	-0.00236***	-0.00239***	-0.00247***	-0.00247***
	(-7.059)	(-17.69)	(-45.39)	(-18.54)
Constant	0.0535***	0.0574***	0.0537***	0.0537***
	(20.54)	(33.74)	(41.88)	(22.07)
Observations	15,183	15,183	15,183	15,183
R-squared	0.551	0.551		

4.2 Corporate policies and tournament incentive

In the earlier section, we demonstrate that there is a positive relationship between firm stock return volatility and tournament incentive. In this section, we examine the extent to how the tournament incentive can motivate senior managers to implement corporate policies. We examine the relation between investment policy and financing policy, such as R&D intensity, capital expenditures intensity and firm leverage. According to Myers (1977), R&D activity is an intangible and regarded as firm specific asset and generate firm growth opportunities. Kothari, Laguerre, and Leone (2002) discover that R&D investment produces more uncertain future benefits than CAPEX activity, therefore, R&D expenditures can be regarded as more risky investments than capital expenditures. Finally, Coles et al., (2006) discover that managers can increase firm risk through more aggressive financing policy. Thus, we expect a higher CPS will result in larger R&D intensity and firm leverage while negatively affect capital expenditure intensity.

4.2.1 R&D intensity and tournament incentive

The results in model 1 and model 2 from table 4 reports regressions with firm fixed and industry fixed effect respectively, which do not show a significant impact of lagged CPS on R&D intensity. While after we run the Durbin-Wu-White test, we find that IV regression is preferable to OLS. We find that in the column 3, the coefficient on lagged CPS is 0.134 and is significantly in 1% level, which indicates that there is a positive relationship between R&D intensity and tournament incentive. We report the regression after correcting for heterogeneity in column4 and unfortunately, we do not find a statistically significant effect on lagged CPS. However, in terms of control variables, we find that except for CEO tenure, other CEO characteristics and firm characteristics all show a significant statistically effect on R&D intensity. Which means that, with a higher CEO power, CEO will also implement more riskier policies through R&D intensity.

The coefficient for each instrument is individually significant at the 1% level in the first stage (not shown), which indicates that the instruments are individually relevant. Further, we find the f-statistics for lagged CPS in the first stage (Cragg-Donald Wald F statistic) is 126.4, and the under-identification test are statistically significant at 1% level, indicates that our instruments are jointly relevant and we reject the null hypothesis that our instruments are weak. Meanwhile, the Sargan-Hansen-statistic is 19.96 and is insignificantly different from zero, thereby indicating that instruments are valid. （results are in the Appendix）

Table 4: R&D intensity and tournament incentive

The instruments used in the IV 2sls regression are Industry-mean CPS and number of vice presidents among the top 5 executives. All variables are winsorized at 1% and 99%. t-statistics are reported robust standard error clustered by firms in parentheses（except column3）, where *, **, and *** state the 10%, 5%, and 1% significance level respectively.

Dependent variables	(Firm fixed) OLS R&D intensity$_t$	(industry FE) OLS R&D intensity$_t$	(industry FE) IV(2SLS) R&D intensity$_t$ (without robust)	(industry FE) IV(2SLS) R&D intensity$_t$
CPS_{t-1}	-0.00291	-0.0126	0.134***	0.134***
	(-0.966)	(-1.052)	(4.913)	(3.438)
Age	-5.33e-05	-0.000423	-0.000417***	-0.000417
	(-0.556)	(-1.549)	(-5.329)	(-1.555)
Ownership	0.000195	0.000801	0.00130***	0.00130**
	(0.697)	(1.509)	(8.428)	(2.236)
CEO tenure	0.000159	0.000244*	0.000149*	0.000149
	(1.360)	(1.701)	(1.813)	(0.952)
CEO outsider	0.000973	0.0137***	0.0116***	0.0116***
	(0.477)	(4.482)	(8.342)	(4.227)
Duality	-0.00135	-0.00784*	-0.0100***	-0.0100**
	(-1.031)	(-1.838)	(-7.036)	(-2.225)
Tobin s'q	0.00514***	0.0173***	0.0176***	0.0176***

	(4.792)	(4.652)	(37.01)	(4.574)
ROA	-0.0704***	-0.182***	-0.183***	-0.183***
	(-8.063)	(-3.789)	(-38.49)	(-3.835)
In[asset]	-0.0185***	-0.00379***	-0.00462***	-0.00462***
	(-9.481)	(-3.670)	(-12.18)	(-4.408)
Constant	0.170***	0.0663***	0.0164***	0.0164
	(10.92)	(3.060)	(1.542)	(0.652)
Observations	9,988	9,988	9,988	9,988
R-squared	0.180	0.285		

4.2.2 Book leverage and tournament incentive

The concerning relationship between leverage and firm risk-taking behavior is mixed. On the one hand, higher levels of leverage encourage top management team to transfer wealth from bondholders to shareholders (Leland, 1998), which would lead to a positive relationship between leverage and risk taking. On the other hand, however, leverage can also decrease a firm's risk taking. If firms take on more risk they have a higher exposure with financial distress, therefore those firms should have less leverage (Friend & Lang, 1998; Lewellen, 2006). Considering the mixed evidence in prior literature, it is not clear whether senior executives with more tournament incentives will increase leverage compared to executives with relatively less tournament incentives.

One way to increase firm risk is to increase leverage. Thus, higher CPS should imply higher leverage. In table 5, consistent with previous studies on firm leverage, we employ book leverage as the dependent variable, which is persuaded by Welch (2004), who states that market leverage is likely to change passively merely due to changes in stock price performance and may not be an active managerial choice.

The results in model 1 and model 2 from table 4 reports regressions with firm fixed and industry fixed effect. In the model 1, it can be seen that a negative coefficient (-0.0291) of lagged CPS on book leverage. While after we run the Durbin-Wu-White test, we find that IV regression is preferable to OLS and we find a positive relationship between lagged CPS and book leverage. The regression result on CPS in column 3 is consistent with our prediction by using the 2sls coefficient of lagged CPS is 0.124 and is significant at 5% level, while no statistically significance after reporting robust standard errors. Among the control variables, we can discover that, the CEO ownership show a negative relationship on book leverage, which can be explained by CEOs risk-averse attitude regarding financing policy.

The coefficient for each instrument was individually significant at the 1% level in the first stage (we do not show any first stage for space limitations), which indicates that the instruments are

individually relevant. Further, we find the f-statistics for lagged CPS in the first stage (Cragg-Donald-Wald-F statistic) is 190.8, and the under-identification test are statistically significant at the 1% level, indicates that our instruments are jointly relevant and we reject the null hypothesis that our instruments are weak. Meanwhile, the Sargan-Hansen-statistic is 0.0559 and is insignificantly different from zero, thereby indicating that instruments are valid. （results are in the Appendix）

Table 5: Book leverage and tournament incentives

The instruments used in the IV 2sls regression are Industry-mean CPS and number of vice presidents among the top 5 executives. All variables are winsorized at 1% and 99%. t-statistics are reported robust standard errors clustered by firms in parentheses（except column3）, where *, **, and *** state the 10%, 5%, and 1% significance level respectively.

Dependent variable	(Firm fixed) OLS Book leverage$_t$	(Industry FE) OLS Book leverage$_t$	(Industry FE) IV(2SLS) Book leverage$_t$ (without robust)	(Industry FE) IV(2SLS) Book leverage$_t$
CPS_{t-1}	-0.0291**	0.0582***	0.124**	0.124
	(-2.519)	(2.913)	(1.994)	(1.018)
Age	0.000326	0.000327	0.000316	0.000316
	(0.878)	(0.640)	(1.485)	(0.609)
Ownership	0.000639	-0.00314***	-0.00289***	-0.00289***
	(0.880)	(-5.117)	(-6.754)	(-3.858)
CEO tenure	0.000517	-0.000393	-0.000421**	-0.000421
	(1.137)	(-0.879)	(-1.966)	(-0.968)
CEO outsider	-0.00990	-0.00477	-0.00554	-0.00554
	(-1.118)	(-0.632)	(-1.451)	(-0.730)
Duality	-0.00494	-0.00539	-0.00619	-0.00619
	(-1.038)	(-0.729)	(-1.641)	(-0.788)
Tobin s' q	-0.00363	-0.000270	-0.000182	-0.000182
	(-1.397)	(-0.0630)	(-0.135)	(-0.0431)
ROA	-0.236***	-0.371***	-0.371***	-0.371***
	(-12.79)	(-8.017)	(-28.00)	(-8.021)
In[asset]	0.0284***	0.0286***	0.0282***	0.0282***
	(4.443)	(7.928)	(26.83)	(7.130)
Constant	0.0133	-0.0103	-0.0315	-0.0315
	(0.272)	(-0.220)	(-1.280)	(-0.644)
Observations	15,151	15,151	15,151	15,151
R-squared	0.133	0.136		

4.2.3 CAPEX intensity and tournament incentive

With the significant impact of the industry fixed effects specification in OLS regression, the coefficient estimates of lagged CPS is -0.00872 in column 3, which indicates that senior managers with higher lagged CPS implements less capital expenditures. For R&D, the coefficient on lagged CPS is positive, and for CAPEX, the estimate is negative, which implies that higher tournament incentive is associated with higher R&D and lower capital expenditures. In theory, this demonstrates a reallocation of investment capital to riskier assets. Top

management team with higher tournament incentive allocates investment dollars away from less risky capital expenditures to much riskier R&D. However, after empirical analysis, we did not find a significant impact of CPS on Capital expenditures in the 2sls approach. And in terms of CEO characteristics under the correcting for heteroscedasticity in the last column, we do not find strong empirical results.

The coefficient for each instrument was individually significant at the 1% level in the first stage (not shown), which indicates that the instruments are individually relevant. Further, we find the f-statistics for lagged CPS in the first stage (Cragg-Donald-Wald-F statistic) is 105.6, and the under-identification test are statistically significant at the 1% level, indicates that our instruments are strongly joint relevant and we reject the null hypothesis that our instruments are weak. Meanwhile, the Sargan-Hansen-statistic is 0.93 and is insignificantly different from zero, thereby indicating that instruments are valid. （results are in the Appendix）

Table 6: CAPEX intensity and tournament incentive

The instruments used in the IV 2sls regression are Industry-mean CPS and number of vice presidents among the top 5 executives. All variables are winsorized at 1% and 99%. t-statistics are reported robust standard errors clustered by firms in parentheses（except column3）, where *, **, and *** state the 10%, 5%, and 1% significance level respectively.

	(firm fixed) OLS	(Industry FE) OLS	(Industry FE) IV(2SLS)	(Industry FE) IV(2SLS)
Dependent variable	CAPEX intensity$_t$	CAPEX intensity$_t$	CAPEX intensity$_t$ (without Robust）	CAPEX intensity$_t$
CPS_{t-1}	0.00301	-0.00872**	-0.0121	-0.0121
	(1.031)	(-2.186)	(-0.710)	(-0.449)
Age	-6.40e-05	-0.000202**	-0.000202***	-0.000202**
	(-0.693)	(-2.480)	(-3.613)	(-2.472)
Ownership	0.000479**	0.000118	0.000103	0.000103
	(2.134)	(0.920)	(0.912)	(0.526)
CEO tenure	2.97e-05	0.000108	0.000110*	0.000110
	(0.267)	(1.080)	(1.954)	(1.024)
CEO outsider	-0.00500**	-0.000352	-0.000306	-0.000306
	(-2.575)	(-0.158)	(-0.305)	(-0.142)
Duality	0.000586	-0.000468	-0.000418	-0.000418
	(0.451)	(-0.268)	(-0.411)	(-0.245)
Tobin s' q	0.00368***	0.00334***	0.00333***	0.00333***
	(6.474)	(3.352)	(9.797)	(3.352)
ROA	0.0113**	0.0266***	0.0266***	0.0266***
	(2.019)	(3.117)	(7.835)	(3.120)
In[asset]	-0.000573	-0.00172**	-0.00170***	-0.00170**
	(-0.417)	(-2.102)	(-6.151)	(-2.000)
Constant	0.0478***	0.0653***	0.0664***	0.0664***
	(4.387)	(7.540)	(9.804)	(6.753)
Observations	10,904	10,904	10,904	10,904
R-squared	0.047	0.041		

4.3 CEO turnover and tournament incentive

In this part, I conduct a regression on a logit model in which the dependent variable equals to 1 if there is a CEO turnover event in year t. I define a CEO turnover event as the CEO of a firm documented in ExecuComp database has changed. To estimate CEO turnover during fiscal year t, I use the values of CPS at the end of fiscal year t-1, I also control for firm characteristics and executive characteristics that may affect the probability of changing CEO in all regressions.

In this table, model 1 and model 3 show result of regression on the relationship between lagged CPS and CEO turnover without firm fixed effect, model 2 and model 4 shows the results of regressions on the relationship with firm fixed effect. For all regressions, the coefficient on lagged CPS is negative and significant at 1% level, indicating that higher tournament incentives do not increase CEO turnover, a direct sign showing that the incentive does not induce senior managers to be promoted to CEO position. The results reject our third hypothesis that tournament incentive can induce the probability of senior manager to get promotion to CEO. One of the possible explanation is the CEO entrenchment problem. Given that powerful CEOs often get entrenched in the position, senior executives are unlikely to challenge them. Shen et al., (2010) also find similar result. We can conclude that even with a higher tournament incentive, CEO still hold the power and are less likely to be replaced. The conclusion can also be inferred from the effect of other characteristics. In model 1, the coefficient of CEO duality is -0.735 and is statistically significant at 1% level, and the coefficient of CEO ownership is -0.0544 and is statistically significant at 1% level. CEO ownership and CEO duality are proxies for CEO power (Bebchuk et al., 2011). The negative coefficient indicates that higher concentration of CEO power can bring lower CEO turnover, confirming our explanation that powerful CEO are entrenched and are less likely to be replaced.

Another explanation is that when senior managers want to improve their performance and status, they may maliciously adopt some extreme projects, which will finally make the CEO's decision suspected, but in turn, this action will also hurt the interests of these senior managers. However, other senior managers benefit from this action because they now have more space for promotion. Thus, senior managers will collectively perform their duties in their respective positions to make their abilities appreciated. However, even with a higher tournament incentive, senior managers still cannot challenge the CEO position because eventually board of directors and shareholders within the firm attribute the company's performance to the CEO's contribution.

Additionally, I investigate how performance-sensitivity changes with the CPS by adding variables of stock return and their interaction term with lagged CPS in model 1 and model

2(with fixed effect). The coefficient effect of stock return is 0.127 in model 1, which is not significant, and 0.357, which is statistically significant effect after adding firm fixed effect. This can support the explanation that all managers perform good in their respective positions. The coefficient on the interaction effect of stock return with lagged CPS is -1.348 and are significant in both model 1 and 2. The coefficient on the stock return interaction variable is negative, indicating that with a higher tournament incentive, the firm performance is attributed to the effort of CEO, while decline the performance of senior managers.

According to Jenter and Kanaan (2006), we decompose the stock return into firm-specific and market returns in model 3, a model without firm fixed effect and model 4, a model with firm fixed effect. The variable, firm-specific return, is measured by subtracting the market return from the overall stock return. Confirmed the findings of Jenter and Kanaan (2006), which finds that CEO turnover is sensitive to firm-specific returns but less sensitivity to market return. The coefficient of firm specific return is 0.400 and is significantly at 5% level, which means that with a higher firm specific return, the performance of senior managers can be discerned, however, the interaction of firm specific return is -2.311 and significantly at 1% level, which demonstrates that when controlled for a higher CPS, a higher firm specific turn is eventually associated with a lower probability of CEO turnover. The underlying reason supports our explanation, that even when the senior managers excel at good performance, CEO remain the position because his company as a whole is more profitable, thus the board of directors and shareholders attribute the company's performance to the CEO's contribution.

Shift to the empirical evidence of market return, in the model 3, we find that the coefficient on market return is -1.022 and is less significant, the probably explanation is that when the market return is high, then the senior management team will have more opportunity in the whole market other than only within the firm, so the tournament incentive inside the company will reduce, which will have a negative influence on the CEO turnover.

Overall, our hypothesis regarding tournament theory is rejected, thus the tournament theory cannot induce senior manager to get promoted of the CEO position, the potential reason is that CEOs are entrenched. And we find that CEO turnover is sensitive to firm-specific returns, thus the CEO’s performance will overwhelm the senior managers’ performance which reduce senior managers’ probability of promotion to CEO.

Table7：This table presents the results of logit regressions on CEO turnover for the sample firm-year observations from 2001-2016 in column 1 and 3(with fixed effect in column 2 and column4). Stock return, t-1 is the annualized stock return over the calendar year prior to the CEO turnover in CRSP. Market Return is the value-weighted CRSP return. Firm-Specific Return is the difference between the firm and the market return. Interaction1 is the Stock return t-1 times CPS_{t-1}, interaction 2 is the specific return times CPS_{t-1}, interaction 3 is the market return times CPS_{t-1}, where *, **, and *** state the 10%, 5%, and 1% significance level respectively.

	(1)	(2)	(3)	(4)
Dependent variable			CEO turnover dummy	
CPS_{t-1}	-2.687***	-2.920***	-2.960***	-3.240***
	(0.248)	(0.307)	(0.265)	(0.326)
Stock return$_{t-1}$	0.127	0.357*		
	(0.174)	(0.208)		
Interaction1$_{t-1}$	-1.348***	-1.481***		
	(0.413)	(0.503)		
Specific return$_{t-1}$			0.400**	0.558**
			(0.201)	(0.236)
Interaction2$_{t-1}$			-2.311***	-2.350***
			(0.532)	(0.626)
Market return$_{t-1}$			-1.022*	-1.158*
			(0.523)	(0.622)
Interaction3			2.625*	3.296**
			(1.369)	(1.634)
Age	-0.0206***	-0.0894***	-0.0208***	-0.0896***
	(0.00468)	(0.00806)	(0.00469)	(0.00807)
Ownership	-0.0544***	-0.108***	-0.0542***	-0.107***
	(0.0165)	(0.0300)	(0.0165)	(0.0300)
CEO tenure	-0.343***	-0.421***	-0.343***	-0.421***
	(0.0104)	(0.0157)	(0.0104)	(0.0157)
CEO outsider	-0.0429	-0.371**	-0.0269	-0.354**
	(0.0931)	(0.173)	(0.0935)	(0.173)
duality	-0.735***	-1.006***	-0.737***	-1.000***
	(0.0900)	(0.124)	(0.0901)	(0.124)
Tobin s'q	-0.0364	-0.253***	-0.0348	-0.249***
	(0.0302)	(0.0617)	(0.0302)	(0.0617)
ROA	-0.717***	-0.574	-0.693***	-0.518
	(0.267)	(0.383)	(0.268)	(0.384)
ln[asset]	0.0262	-0.645***	0.0253	-0.656***
	(0.0203)	(0.104)	(0.0204)	(0.105)
Constant	2.010***		2.097***	
	(0.301)		(0.303)	
Observations	15,142	10,830	15,142	10,830
Pseudo R2	0.375	0.375	0.375	0.375

5. Robustness check：subsample excluding the financial crisis

In this robustness check, I reduce the considered time period into 2001-2007 and 2009-2016 The reason behind this is to rule out the possibility that the main results are influenced by the economic crisis. The outcomes of these IV 2sls regressions will be compared to our main results.

Table8：the relationship between CPS and frim risk, policies before financial crisis from 2001-2007 are reported in the 2sls IV regression. The instruments used in the IV 2sls regression are Industry-mean CPS and number of vice presidents among the top 5 executives. All variables are winsorized at 1% and 99%. t-statistics are all reported

robust standard error clustered by firms in parentheses, where *, **, and *** state the 10%, 5%, and 1% significance level respectively.

	(1)	(2)	(3)	(4)
Dependent variables	Return volatility	R&D	Book leverage	CAPEX
CPS_{t-1}	0.0747***	0.0905	0.00561**	-0.0333
	(5.106)	(1.615)	(0.0347)	(-0.919)
Age	-0.000146**	-0.000137	0.000726	-5.29e-05
	(-2.315)	(-0.860)	(1.273)	(-0.420)
Ownership	0.000238*	-3.50e-05	-0.00245***	0.000277
	(1.930)	(-0.0786)	(-2.862)	(0.861)
CEO tenure	7.51e-05	9.46e-05	-0.000279	8.21e-05
	(0.911)	(0.532)	(-0.528)	(0.686)
CEO outsider	0.00108	0.0109***	-0.00504	-0.00357
	(0.806)	(3.577)	(-0.614)	(-1.386)
Tobin s' q	-0.00203***	0.0184***	-0.00771	0.00443***
	(-4.527)	(6.065)	(-1.612)	(4.465)
ROA	-0.0306***	-0.188***	-0.350***	0.0357***
	(-9.365)	(-4.433)	(-5.813)	(3.376)
ln[asset]	-0.00715***	-0.00480***	0.0202***	-0.00170*
	(-8.331)	(-3.109)	(4.176)	(-1.653)
Constant	0.0605***	0.0217	0.0486	0.0633***
	(8.743)	(0.986)	(0.803)	(4.269)
Observations	5,576	3,713	5,574	4,036

During the prior to financial crisis period, from table 8, the coefficient of lagged CPS on return volatility is 0.0747 and is significant at 1% level, which has more economic impact than our main analysis during the whole 16 years. (the coefficient is 0.00866 without significance after correcting for heteroscedasticity at column4 in table3) However, the coefficient of lagged CPS on R&D intensity is no longer significant (compared with column 4 table 4). Compared with column4 table 5, we still did not find a significant effect of lagged CPS on capital expenditure intensity. Thus, based on this robustness test, the tournament incentive provide senior manager with more risk-taking incentive mainly through the financing policy to increase the firm risk prior to the financial crisis.

Table9：the relationship between CPS and frim risk, policies after financial crisis from 2009-2016 are reported in the 2sls IV regression.. The instruments used in the IV 2sls regression are Industry-mean CPS and number of vice presidents among the top 5 executives. All variables are winsorized at 1% and 99%. t-statistics are reported robust standard error clustered by firms in parentheses, where *, **, and *** state the 10%, 5%, and 1% significance level respectively.

	(1)	(2)	(3)	(4)
Dependent variables	Return volatility	R&D	Book leverage	CAPEX
CPS_{t-1}	-0.00771	0.160***	0.377**	0.0261
	(-1.214)	(2.906)	(2.400)	(0.719)
Age	-9.34e-05***	-0.000619	0.000326	-0.000274**
	(-2.926)	(-1.417)	(0.446)	(-2.249)
Ownership	0.000135*	0.00216**	-0.00273***	-5.87e-05
	(1.674)	(2.375)	(-2.963)	(-0.265)
CEO tenure	0.000104***	0.000198	-0.000839	3.78e-05
	(3.061)	(1.364)	(-0.913)	(0.265)

CEO outsider	-0.00138	0.0130***	-0.0160	0.00210
	(-1.274)	(3.184)	(-1.029)	(0.860)
Duality	5.14e-05	-0.0111**	-0.0121	0.000459
	(0.136)	(-2.388)	(-1.373)	(0.224)
Tobin s' q	-0.00154***	0.0174***	0.00804	0.00282**
	(-7.852)	(3.894)	(1.482)	(2.012)
ROA	-0.0106***	-0.212***	-0.453***	0.0256**
	(-4.741)	(-3.874)	(-10.95)	(2.023)
ln[asset]	-0.00401***	-0.00448***	0.0345***	-0.00245**
	(-7.954)	(-3.961)	(7.781)	(-2.469)
Constant	0.0646***	0.0245	-0.174***	0.0598***
	(17.30)	(1.038)	(-2.737)	(4.708)
Observations	7,522	4,919	7,500	5,360

Applying the main regression specification to the 2009-2016 sample show a different result than our main analysis in table 9. It demonstrates that there is no significant effect of lagged CPS on stock return volatility. The probably reason is that after the financial crisis, managers are less likely to invest in risky projects. This probably means that tournament incentive is less critical in this period than prior to crisis period. But we still discover a significant effect of lagged CPS on R&D intensity book leverage, which partly support our predictions.

Table10：the relationship between CPS and CEO turnover before and after financial crisis

The period of before crisis is from 2001-2007. The period of after crisis is from 2009-2016. All variables are winsorized at 1% and 99%. t-statistics are reported robust standard error clustered by firms in parentheses, where *, **, and *** state the 10%, 5%, and 1% significance level respectively.

Dependent variable	(1)	（2）	(3)	(4)
	CEO turnover dummy			
	Prior crisis	After crisis	Prior crisis	After crisis
CPS_{t-1}	-2.952***	-2.002***	-2.924***	-3.009***
	(0.510)	(0.496)	(0.517)	(0.574)
$Stock\ return_{t-1}$	0.280	0.0973		
	(0.352)	(0.306)		
$Interaction1_{t-1}$	-2.308**	-0.543		
	(0.953)	(0.770)		
$Specific\ return_{t-1}$			0.217	0.743**
			(0.379)	(0.376)
$Interaction2_{t-1}$			-2.185**	-2.326**
			(1.021)	(0.996)
$Market\ return_{t-1}$			0.712	-3.787***
			(1.041)	(1.072)
$Interaction3_{t-1}$			-3.224	9.810***
			(2.738)	(2.811)
Age	-0.195***	-0.0892***	-0.196***	-0.0885***
	(0.0185)	(0.0156)	(0.0186)	(0.0156)
Ownership	-0.391***	-0.0708	-0.390***	-0.0633
	(0.0735)	(0.0465)	(0.0737)	(0.0473)
CEO tenure	-0.339***	-0.827***	-0.339***	-0.834***
	(0.0374)	(0.0465)	(0.0375)	(0.0468)
CEO outsider	-0.957***	-3.199***	-0.962***	-3.070***
	(0.329)	(1.035)	(0.329)	(1.046)
Tobin s'q	-0.0515	-0.659***	-0.0536	-0.665***
	(0.121)	(0.127)	(0.121)	(0.127)
ROA	-1.983***	1.195*	-2.009***	1.174*

	(0.736)	(0.694)	(0.738)	(0.699)
ln[asset]	-0.838***	-1.310***	-0.863***	-1.275***
	(0.269)	(0.235)	(0.278)	(0.239)
Duality		-0.597***		-0.624***
		(0.202)		(0.203)
Observations	2,548	4,646	2,548	4,646
Pseudo R2	0.519	0.519	0.519	0.519

Additionally, we run the subsample analysis to investigate the effect of lagged CPS on CEO turnover without year 2008. And it similarly rejects our tournament theory as our main analysis did. During the period prior to financial crisis, the coefficient of lagged CPS on CEO is -2.952 and is significant at 1% level (model 1), which is almost the same effect of our main results. And still no significant effect shown by stock return. Thus, even with a higher tournament incentive, the senior manager cannot challenge the positon of CEO. Interestingly, the interaction between CPS and stock return is almost twice stronger than in our main results prior to financial crisis (model 1). That means during 2001-2007, CEO turnover is much more performance sensitive with a higher CPS level. However, during the period of after the financial crisis, the effect of interaction between CPS and stock return on CEO turnover is no longer significant.

6. Conclusion and further research

6.1 Conclusion

This thesis focuses on the research of tournament incentive of senior executives by investigating its influence on the firm risk and policies, while further extends to investigate how it influence the likelihood of CEO turnover. Most prior literature exclusively investigates the importance of CEO role while neglect the importance of the risk-taking incentives of senior managers.

My study started by employing the CPS as the tournament incentive and firstly, test the relationship between CPS and firm stock return volatility. We employ both the OLS and IV 2sls regression approaches. In the OLS, I discover a negative effect of lagged CPS on return volatility with both firm fixed effect and industry fixed effect. However, because the endogeneity problem exits in the OLS regression, the estimates will be biased. After the statistical test, we prefer the IV results, from where we find that lagged CPS has a positive effect on firm stock return volatility, which means that senior executives are likely to have greater risk-taking incentives in firms when the CEO's compensation is higher, and consequently their tournament incentive increases the firms risk-taking behavior. However, after checking heteroscedasticity, this result is not significant any more.

As we expect that the tournament incentive of senior managers increases firm volatility by implementing the risky policies. I repeated the analysis using different policy measures. These policy measures are R&D investment, leverage and capital expenditure intensity. In terms of R&D investment, regarded as risky investment, we expect that the R&D expenditures can increase with a higher tournament incentive of senior executives. However, under the OLS regression with both industry fixed effect and industry effect, we find an opposite sign on the coefficient of lagged CPS compared with our propositions in the presence of endogeneity. We perform the IV regression approach with effective IV instruments (industry-mean CPS and number of VPs among the top 5 executives) and eventually the result support our prediction that the tournament incentive induces the senior manager to implement risky R&D expenditures, which also holds after checking for the robust standard error clustered by firms.

We measure the firm leverage by using book leverage. Under the analysis, we find that under firm fixed effect, we notice a negative and significant coefficient on lagged CPS, while for the industry fixed effect, the sign of the coefficient is positive. In order to eliminate the presence of endogeneity, we prefer the approach of IV regression, and the results shows a significantly positive effect between our tournament incentive and the book leverage, which means that senior managers with higher tournament incentive implement more risky financing policy. This outcome also holds after checking for the robust standard error clustered by firms.

Further, I examine the relationship between the capital expenditure intensity and lagged CPS. I expect to get a negative effect on the coefficient on the lagged CPS, however, there is no significance shown under the OLS model with firm fixed effect as well as under the IV 2sls approach. Overall, our second hypothesis that the tournament incentive significantly induces senior manager to implement firm policies is partly confirmed.

Finally, I investigate whether the performance of senior executives will be discerned under the tournament and whether the winner among them can subsequently challenge the power of CEO. I conduct a regression on a logit model between CEO turnover dummy and lagged CPS. However, under all regressions, we discover a negative coefficient effect on the lagged CPS to CEO turnover, which reject out third hypothesis. The possible reason is that,in order to make the individual performance recognized, senior managers will collectively excel at their own divisions and accordingly enhance their power among the management team. However, even with a higher tournament incentive, the senior manager still cannot challenge the CEO position.

Beyond our particular findings and their interpretation, our general conclusion is that CPS, the fraction of top-five compensation captured by the CEO has a positive effect on the firm stock return volatility, which increased by implementing risky firm investment policy and financing policy. However, because the CEO is the highest executive, the board of directors and shareholders attribute the company' s performance to the CEO's contribution.

6.2 Further research

As with other studies, this study is not exempt from limitations. One limitation is that the effect from the financial crisis period that has not been included in the current study. We do discover different impacts between the prior financial crisis and after financial crisis periods in terms of firm risk, policies and CEO turnover in our robustness check. Thus, further study can explore deeply the underlying reason behind the financial crisis impact of tournament incentive on the firm risk-taking behavior.

Further, we directly follow the measure of Bebchuk et al., (2011) upon executive compensation, however, we did not investigate into how the remuneration structure of senior executives actually affect the firm risk and firm policy. Usually, researchers investigate the compensation structure based on the executives' base salary, bonus and equity-based options. When we employ the total compensation, which directly merge the impact from the cash compensation and the long-term equity-based stock options. However, the cash compensation and the equity-based options usually have different impact on the firm risk-taking behavior. Thus, the future research can deeply investigate the different influence on these two components.

7. Appendix

The test results of instrument variables: All the p-value of Sargan statistics is insignificant(not shown)

Return Volatility	
Under-identification test	372.8***
Weak identification test	191.6
Sargan statistic	0.0438
R&D intensity	
Under-identification test	246.9***
Weak identification test	126.4
Sargan statistic	19.96
Book Leverage	
Under-identification test	371.3***
Weak identification test	190.8
Sargan statistic	0.0559
CAPEX intensity	
Under-identification test	206.7***
Weak identification test	105.6
Sargan statistic	0.930

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