Dynamic Environment, Tournament Incentive and State-owned Listed Firms Risk Taking

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Abstract. This paper constructs the theoretical framework of dynamic environment, tournament incentive and firms risk taking based on tournament theory and contingency theory. Treating environment as a contingency factor, measuring tournament incentives as the pay gap between executives at different levels, utilizing 2SLS estimation methodology, we find that the tournament incentive compensation system will stimulate state-owned listed firms executives risk taking behavior, and in the circumstances of dynamic environment, the tournament incentive will trigger executives over risk taking tendency for the more complicated environment and over confidence. The theoretical analysis and empirical evidences of this study will provide enlightenment and references for the reform and regulation of state-owned listed firms compensation system.

Introduction

Risk taking is the origin of firms innovation and value creating(Datta et al., 2001)[1]. To achieve and maintain competition advantages in the dynamic and competitive environment, it is precious for firms to have the spirit of risk taking. The researches on what drives risk taking will be beneficial for guiding firms management practice and realizing performance, which makes the topic worthy deeply researched. In China, state-owned listed firms constitute the major part of national economy, involving almost all the important economy field, including energy supplying, transportation and communication, etc. Accordingly, risk taking behavior of state-owned listed firms concerns the country economy sustained vigor. However, Over risk taking may have the power of making the firms collapse, bringing huge costs to shareholders. Consequently, firms risk taking behaviors need to be managed properly and cautiously.

The extant literatures mainly discussed risk taking from the perspectives of compensation distribution and structure, but generated mixed findings. In this study, we propose the idea of integrating both external environment condition and compensation system into the research framework of firms risk taking. The main theoretical contributions of this paper can be expressed as follows. Firstly, it discovers that the tournament incentive compensation system has its incentive effects of promoting executives endeavor level and risk taking behavior. Secondly, it highlights the importance of consideration external environment condition in the exploring of executives behavior. We find that external environment will change executives decision practice and impel them more risk taking, which extends the present research visual field. Incorporating environmental factors into executives behavior researches will be a better perspective deserving more attention in the future researches. Finally, our theoretical analysis and empirical evidences demonstrate that both tournament incentive compensation system and external dynamic environment constitute the important drivers of executives risk taking behavior, which will provide enlightenment and references for future compensation system reform and regulation of state-owned listed firms.

Theory Analysis and Hypothesis Development

According to contingency theory, the environment in which firms operate is the key circumstances variable. The academic circle has long acknowledged that external environment is a kind of key
contingencies, rendering firms performance being really the outcomes of both external environment and management behavior (Cyert and March, 1963) [2]. Recent years, The turbulence of politics and economy situation at home and abroad and the heat competition in global market make a dynamic external environment, which aggravate the uncertainty of operating results. In such a complicated environment, firms management strategies and methods are being raised into an unprecedented importance height. Among them, compensation distribution system is generally adopted as a major incentive and restraint mechanism for arousing the initiative of executives and employees.

In the year of 1981, Lazear and Rosen proposed the tournament theory, which advocates that in the condition of high agency costs and monitoring costs, we can introduce a comparative performance evaluation mechanism to design compensation contracts. That is, to introduce a compensation system that has a wide compensation gap between executives at different levels. According to the tournament theory, the executives at higher levels will make more endeavor on firms affairs for the higher compensation value they’ve gotten, and the executives at lower levels will also work harder to hope to be elevated.

In the eighties of last century, China state-owned firms generally adopted the average compensation system, in which there was small compensation gap between different levels of executives. However, such an average compensation distribution was not beneficial to encourage executives initiative, and restrained the development of productivity to some extent. At the beginning of the nineties of last century, China central government decided to reform the compensation system, permitted introducing compensation differentiation mechanism, and encouraged to widen the compensation gap inside state-owned firms. Zhou and Zhu (2010) point out that since government is the representative of national property right and state-owned firms undertakes multiple tasks, including supporting society stability, development and performance growth, it is difficult to find suitable indexes to evaluate executives performance, therefore, the tournament incentive mechanism is adaptable to China system environment[3]. Since this new century, the tournament compensation system has been widely used in China state-owned firms. Just as several previous researches point out that tournament incentives will trigger competitions among executives and lead to greater risk taking behaviors with the aim of being promoted (Rajgopal and Shevlin, 2002; Coles et al., 2006; Kini and Williams, 2012) [4,6], we formulate the first hypothesis.

\[ H1: \text{Tournament incentive compensation system will promote state-owned listed firms risk taking} \]

As contingency theory points out, the external environment is an important contingency variable, which will modify executives decision making mode, including their risk taking decision. In a highly dynamic environment, where national and global economy situation may have unpredictable changes, consumers demand may vary for various reasons, the information that firms obtains may be tremendous and complex, firms executives need to cope with all the changes and surprises swiftly and properly. That means, dynamic environment may raise the requirement for executives ability and intensify the risks of decision making (Siegel and Hambrick, 2005)[7].

As successful business people, the executives may have stronger desire and over confidence to obtain higher achievement and explore innovative ideas while ignoring the threat of failure (Lim, 2018)[8]. They may utilize higher leverage to execute their ambitious risk strategies and set challenging goals with their ample confidence (McClelland, 1961)[9]. Concurrently, in the dynamic environment, the wrong of executives judgment may be concealed for the difficulty to discern between the responsibility of executives and the source of risky environment, which may further promote executives courage for taking risky strategy. However, risk taking is a variance increasing behavior which will not only bring about upside opportunity but also imply potential downside threats. Then, we have some doubt that in highly dynamic environment, whether the tournament incentive compensation system will result in executives over risk taking that may trigger decision failure and further operating failure. The graveness of the consequence makes it very necessary to explore cautiously. Therefore, we put forward the second hypothesis.

\[ H2: \text{In highly dynamic environment, tournament incentive compensation system will promote state-owned listed firms over risk taking} \]
Research Design and Sample Selection

Research Design

It has long been recognized that there exists endogeneity issue in the researches of the relationship between risk taking and compensation system. To overcome the problem, we use the two-stage least squares (2SLS) estimation procedure. In the first stage, we use the median of compensation gap in the same industry (Mecomgap) as the instrument to estimate the firm’s individual compensation gap. In the second stage, we run the panel data regression model with firm fixed effects using the firms estimated individual compensation gap as independent variable and risk taking as dependent variable. To handle the possibility of omission variable problems, the estimating model include year and industry dummies. We also control some variables that may exert their effects on firms risk taking behavior. In brief, to test our two sets of hypotheses, on the basis of Fredrickson et al. (2010)[10], our regression models are designed as following equations. Eq. 1 is used in the first stage of 2SLS regression to estimate the endogenous variable Comgap, while Eq. 2 and Eq. 3 are the second stage models for estimating the hypothesis 1 and 2 respectively.

\[
\text{Comgap}_{i,t} = \beta_0 + \beta_1 \times \text{Mecomgap}_{i,t} + \beta_2 \times \text{Dyenv}_{i,t} + \beta_3 \times \text{Mashare}_{i,t} + \beta_4 \times \ln(\text{Assets}_{i,t}) + \beta_5 \times \text{Sagrow}_{i,t} + \beta_6 \times \text{Lev}_{i,t} + \beta_7 \times \text{Roe}_{i,t} + \text{Indudum} + \text{Yeardum} + \epsilon_{i,t}
\]  

(1)

\[
\text{Risk}_{i,t} = \beta_0 + \beta_1 \times \text{Dyenv}_{i,t} + \beta_2 \times \text{Comgap}_{i,t} + \beta_3 \times \text{Dyenv}_{i,t} \times \text{Comgap}_{i,t} + \beta_4 \times \text{Mashare}_{i,t} + \beta_5 \times \ln(\text{Assets}_{i,t}) + \beta_6 \times \text{Sagrow}_{i,t} + \beta_7 \times \text{Lev}_{i,t} + \beta_8 \times \text{Roe}_{i,t} + \text{Indudum} + \text{Yeardum} + \epsilon_{i,t}
\]  

(2)

\[
\text{Overrisk}_{i,t} = \beta_0 + \beta_1 \times \text{Dyenv}_{i,t} + \beta_2 \times \text{Comgap}_{i,t} + \beta_3 \times \text{Dyenv}_{i,t} \times \text{Comgap}_{i,t} + \beta_4 \times \text{Mashare}_{i,t} + \beta_5 \times \ln(\text{Assets}_{i,t}) + \beta_6 \times \text{Sagrow}_{i,t} + \beta_7 \times \text{Lev}_{i,t} + \beta_8 \times \text{Roe}_{i,t} + \text{Indudum} + \text{Yeardum} + \epsilon_{i,t}
\]  

(3)

Dependent Variables

Firms risk taking involves new technology innovation and improvement, new products research and development, new processes modification and reform, which will promote firms making significant technological advances and win the competitive superiority in markets (Labianca et al., 2009)[11]. The above R&D spending has long been deemed as highly risky investment, which represents firms input on innovation but accompanying higher uncertainty. Therefore, the amount of R&D expenditure denotes the courage of executives seeking future advantages and success. We measure the dependent variable Risk of Eq. 2 as current year R&D expenditure divided by current year end total assets. We rank the value of Risk from big to small into four groups. If the firm in the first group operates failure in current year, that is, its net profit is lower than zero, then the firm can be considered as having over risk taking behavior. Consequently, the dependent variable of Eq. 3 Overrisk is a dummy variable.

Independent Variables

Dyenv is to measure the dynamism of environment. Following Lim(2018)[8], Dyenv is constructed as the standard deviation of operating income in recent five years. Comgap is measured as the average compensation value of the top three executives divided by the average compensation value of other executives to get the ratio between them. We measure compensation value as the sum of salary, bonuses, allowance and other annual pay. Mashare is a dummy variable indicating whether a firm has executives share holding system. As many previous researches point out that executives share holding can coordinate the interests between executives and shareholders. Assets is the total assets at the end of current year. We define Sagrow as the growing percentage of current year sales amount compared to last year. Lev is measured as the ratio of year end total liabilities to total assets. Roe is the rate of return on common stockholders’ equity of current year.
Sample Selection

Our sample consists of China state-owned listed firms on Shanghai and Shenzhen stock exchanges by the end of year 2010. Financial firms are excluded for their abiding by special accounting principles. We also eliminate the firms that have missing data and abnormal variable value, such as the value of Comgap is lower than 1. Ultimately, we got a sample size which is comprised of 736 state-owned listed firms. Our study spans the years from 2011 to 2016 with 4416 firm-year observations. The financial ratios and data are acquired from Wind databases, and the compensation related data are acquired from CSMAR databases.

Empirical Results and Analysis

Descriptive Statistics

Table 1 lists the descriptive statistics of all the variables. During the years from 2011 to 2016, the mean of Risk is 0.0268 with the maximum reaching 0.156, showing that the yearly average R&D expenditure amounts to more than 2 percent of total assets and some state-owned listed firms yearly R&D spending even over 15 percent of total assets. The mean of Overrisk is 0.106, which indicates the firms that are regarded as over risk taking reaching 10.6 percent of the whole sample. The average Comgap is 3.583 with the maximum of 65.126 in the year of 2012, suggesting the compensation ratio between the highest rank of executives and the other executives being over 60 in some firms, which is too broad to be believed. The mean of Dyenv is 0.689 with its maximum and standard deviation achieves 2.467 and 0.826 respectively, indicating that the dynamism of state-owned listed firms is relatively high and there exists great uncertainty difference among them.

2SLS Regression Results

To better alleviate the problem of endogeneity, we utilize the 2SLS estimation procedure. All the continuous variables are winsorized at 1st and 99th percentiles to avoid the effects of extreme values. We carry out an array of tests to confirm the relevance and validity of the instrument. The column (1) of table 2 reports the coefficient estimate results from the second stage regression of Eq. 2. We can find that the coefficient on the predicted Comgap is 0.0556 and significantly positive at the 5% level, the hypothesis H1 is confirmed. Since risk taking is an important way for firms to create competition advantages, we can find introducing tournament incentive compensation system has significant meaning for firms to improve executives endeavor level. The coefficient on Dyenv is 0.0387 but insignificant. The coefficient on Dyenv*Comgap is 0.0346 and significantly positive at the 5% level. The coefficients sum wald test shows that the sum of the coefficients on Comgap and Dyenv*Comgap is positive and significant at the 5% level, which suggests that dynamic environment will enhance the tournament incentive compensation system effects on executives risk taking tendency. The column (2) of table 2 lists the coefficient estimate results from the second stage regression of Eq. 3. Again, the coefficients on the predicted Comgap is positive and significantly. The result of the coefficients sum wald test shows that the sum of the coefficients on Comgap and
Dyenv*Comgap is positive and significant at the 5% level too. Since the dependent variable of Eq. 3 is Overrisk, we can conclude that the hypothesis 2 is supported. The greater uncertainty in the dynamic environment make difficult to differentiate between decision failure and environment reason, and the executives over confidence endowed by the tournament incentive compensation system, which will both give impetus to executives risk taking idea, more easily resulting in firms over risk taking behavior.

As for control variables, in the second stage regressions of Eq.2, which estimate results are reported in column (1) of table 2, the coefficient on ln(Assets) is positive and significant at the 1% level, which means bigger firms have abundant financial resources to launch researches and development activities. The coefficients on Sagrow and Lev are also positive and significant at the 5% level, which suggests the firms with higher sale growth and the firms utilizing more leverage have the tendency to input more resources to risk taking. As for the second stage regression of Eq.3, which estimate results are listed in column (2) of table 2, the coefficient on Lev are positive and significant at the 5% level, indicating that over utilizing leverage may induce state-owned listed firms over risk taking behavior. However, the coefficients on Mshare, ln(Assets), Sagrow and Roe are all not significant, which indicates that the above variables will not promote executives over risk taking preference.

Table 2. The second stage of 2SLS regression results.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Eq. 2 (1)</th>
<th>Eq. 3 (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>coefficients</td>
<td>T-value</td>
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<tr>
<td>Dyenv</td>
<td>0.0387</td>
<td>1.34</td>
</tr>
<tr>
<td>Comgap</td>
<td>0.0556**</td>
<td>2.54</td>
</tr>
<tr>
<td>Dyenv*Comgap</td>
<td>0.0346**</td>
<td>2.06</td>
</tr>
<tr>
<td>Mshare</td>
<td>0.0004*</td>
<td>1.88</td>
</tr>
<tr>
<td>Ln(Assets)</td>
<td>0.0616***</td>
<td>3.11</td>
</tr>
<tr>
<td>Sagrow</td>
<td>0.0204**</td>
<td>2.15</td>
</tr>
<tr>
<td>Lev</td>
<td>0.0519**</td>
<td>2.02</td>
</tr>
<tr>
<td>Roe</td>
<td>0.0117</td>
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</tr>
<tr>
<td>cons</td>
<td>0.0816</td>
<td>0.58</td>
</tr>
<tr>
<td>Industry</td>
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<tr>
<td>Year</td>
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<tr>
<td>R²</td>
<td>0.1868</td>
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<tr>
<td>Observations</td>
<td>4416</td>
<td></td>
</tr>
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</table>

The simultaneous equation models is a generally accepted method to overcome endogeneity problem. We utilize this methodology to run the equations with the main findings never changed(regression results are available on request). We also use capital expenditure(Capexp) as the dependent variable to denote risk taking. Capexp is measured as the firms yearly total expenditures on acquisition, purchasing or building of plants and equipment divided by the year-end total assets. We run 2SLS regressions again, the main results still retain. Furthermore, we also calculate the compensation absolute gap between executives at different levels measured as ln(average top three executives compensation- average other executives compensation) to substitute the original measure of Comgap and run the 2SLS once more, the major results remain unchanged. In summary, the above additional tests better guarantee the robustness of our findings.

Conclusions

This study constructs and tests the theory model of dynamic environment, tournament incentive compensation system and firms risk taking based on tournament theory and contingency theory.
Through 2SLS regression methodology and series robustness tests, our main research discoveries include that the tournament incentive compensation system as demonstrated in the form of compensation gap between executives at different levels will stimulate state-owned listed firms executives endeavor level and risk taking behavior, and in the circumstances of dynamic environment, the tournament incentive will trigger executives over risk taking tendency for the more complicated environment and their over confidence. This study finds that both tournament incentive compensation system and external environment will impel executives risk taking behavior, which will shed light on a new perspective for future behavior related researches to pay plenty of attention to the role of environment. Although risk taking will improve firms competition superiority, which is the basis for future business success and long-term development, over risk taking will damage state-owned listed firms prospects and value. In view of the economic significance position of state-owned listed firms in national economy, the over risk taking problem needs to be deeply pondered and further explored. The theoretical viewpoints and empirical evidences of this study will provide enlightenment and references for the reform and regulation of China state-owned listed firms compensation system.

Acknowledgement
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References