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RESEARCH ARTICLE

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Top management team heterogeneity and firm performance: An empirical research on Chinese listed companies

Abstract An empirical study of the 2001–2002 data from 356 Chinese companies listed in the Shanghai and Shenzhen stock exchanges indicates that within the social context of China the characteristics of a firm's top management team have a different impact on firm performance from those of foreign countries. Also, the tenure heterogeneity and functional experience heterogeneity of the top management team are inversely related to firm performance. This paper analyzes and discusses the findings in detail and points out areas for future research.

Keywords top management team, heterogeneity, social context

1 Introduction

Much has been achieved from research on the relationship between the characteristics of top management team and the organizational output since the development of the "upper echelons theory" by Hambrick and Mason (1984), and focus has been on two dimensions of top management team (TMT) characteristics: TMT demographics and heterogeneity of the team (Tihanyi et al., 2001). All the related researches have centered around the impact of TMT heterogeneity on firm performance. Overseas researches in this field take place mainly in developed countries (e.g., the United States of America), but since the contexts and dynamics of TMT vary across countries (Glunk et al., 2001), their

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impacts on firm performance may be different. Therefore, a cross-cultural comparative study of TMT heterogeneity is necessary. The psychological and behavioral patterns of TMT members under the influence of Chinese social contexts are different from those of other countries and the impact of the team composition characteristics on firm performance is different. This paper discusses the relationship between TMT heterogeneity of Chinese companies and firm performance, and intends to obtain new insights.

2 Literature review

Top management team heterogeneity refers to the differences among team members in demographics and important cognitive aspects, values, and experiences. By contrast, homogeneity refers to similarities among team members in the characters above (Finkelstein and Hambrick, 1996). Team heterogeneity includes many dimensions, such as age, team tenure, degree of education and major, functional experience, culture, sex, and nationality. The research on TMT heterogeneity under the guidance of upper echelons theory is based on the premise that TMT heterogeneity has an impact on the social dynamics of team members including frequency of communications among team members, communication effect, integration degree and coherence, thereby determining organizational performance. Along this route, overseas scholars argue that TMT heterogeneity has a positive correlation with its performance and the main reason is that heterogeneous TMT has a strong problem-solving capability. Hambrick and Mason (1984) assumed that TMT heterogeneity mean cognitive difference among team members and this team can obtain information from different sources and different opinions on the problem from team members. This difference in opinions would lead the team to discuss and analyze the opportunities and threats that exist in the external environment, the internal strengths and weaknesses, and the advantages and disadvantages of different alternatives. Therefore, the TMT could make high-quality decisions and obtain a greater capability to solve problems (Richard and Maier, 1961; Simons, 1995).

Unlike heterogeneous TMT, homogeneous TMT can create better communications, develop effective work relationships, and ultimately improve team coherence, which is considered to be positively related with team performance, because its members have similar social backgrounds, education and work experiences. Hambrick and Mason (1984) also argued that the internal coherence of TMT could help to avoid the internal loss and enable the TMT to quickly make effective strategic decisions.

It can be seen that there is a lack of agreement among academicians as to whether heterogeneous or homogeneous TMT is good for firm performance. West and

Schwenk (1996) adopted a very strict study method but did not discover that top management homogeneity had a significant correlation with firm performance. Therefore, they concluded that "pursuing this line of inquiry further will yield results inconsistent at best and fruitless at worst."

3 Theory and hypotheses

3.1 Impact of social contexts on the research of TMT heterogeneity

One of the reasons why the research on TMT heterogeneity does not acquire a convincing, consistent conclusion is that social contexts that may impact the operation of TMT are neglected. Social context has two kinds of impact on TMT: first, cultural differences affect the attitudes, values and faith of managers (Ronen and Shenkar, 1985), thereby influencing their strategy selection. Second, the constitutional environment shapes the external environments in which firms operate (Whitely, 1992), especially the education system and the manager market, which affect the skill, business career and composition of top managers. So a more rigorous research on TMT heterogeneity should take account of the impact of social context in which team members are embedded.

3.2 Hypotheses

The social context in which the organization exists impacts the relationship between the demographics of TMT and firm performance. This section analyzes the impact of socio-cultural factors and the constitutional environment of our country on the composition and operation of TMT, and discusses the relationship between TMT heterogeneity and firm performance.

As indicated earlier, TMT heterogeneity has many dimensions. This paper studies the impact of team age heterogeneity, tenure heterogeneity, educational background heterogeneity, and functional experience heterogeneity on firm performance, as the above four variables are the most widely-used in TMT research currently (Whitely, 1992; Hambrick et al., 1996; Knight et al. 1999; Carpenter, 2002; Wei and Wang, 2002).

Managers in the same age bracket generally have similar experiences and values, so their behaviors are almost the same and it is easy for them to communicate with each other. Because our country is in a transition economy, and the social structure and the constitutional environment are changing rapidly, managers with a vast age difference tend to have conflicting values and ideas. Therefore, the coherence of TMT composed of members with similar ages is higher than that of different ages, and the cooperation among members is better, and it can develop

effective strategies more quickly. All this can help the team to deal with unexpected things better. Under the dual impact of economic transition and globalization, the external environment of Chinese enterprises is getting increasingly complicated, and the competition becomes fiercer. So we can assume that the ability for TMTs to make decisions quickly can contribute to the improvement of firm performance. Hence, we tentatively propose the following hypothesis.

H1: There is a negative correlation between age heterogeneity of TMT of Chinese enterprises and firm performance.

The tenure of TMT refers to the work time of managers as a team. The length of team tenure affects the nature and depth of internal communications (Zenger and Lawrence, 1989), and the modes of interaction among members (Pfeffer, 1983). Similar team tenure indicates that team members experience the same development phases of the firm, have similar understanding on the firm's status quo and strategies, and are familiar with the manner of expressing opinions, all of which facilitate communication, cooperation, and agreement when making decisions. Therefore, we can also hold that the more similar the tenure of TMT members, the better the firm performance.

H2: There is a negative correlation between tenure heterogeneity of TMT of Chinese enterprises and firm performance.

We can deduce the different cognitive patterns and social psychology of TMT in the course of decision-making through the characteristics of educational background and functional experience of TMT. So some scholars argue that the diversity of TMT's backgrounds contributes to the improvement of decision-making quality, because they can analyze a complicated problem from different perspectives (Amason and Sapienza, 1997). However, it will increase the conflicts among team members and will be harmful to team efficiency if the difference is too significant. As Chinese enterprises are still in the process of modern enterprise system building, they have not developed a sound coordinating mechanism and a formal communication system that can tap the potential advantages of TMT heterogeneity. Therefore, this paper makes the following hypotheses.

H3: There is a negative correlation between educational background heterogeneity of TMT of Chinese enterprises and firm performance.

H4: There is a negative correlation between functional experience heterogeneity of TMT of Chinese enterprises and firm performance.

4 Research methods

4.1 Sample selection and source of data

This paper uses the companies listed in the Shanghai and Shenzhen stock exchanges before December 31, 2000 as the total sample. As the impact of TMT heterogeneity

on firm performance has a potential lagging effect, the research time period of this paper is restricted to 2001–2002. Independent variables and control variables such as TMT heterogeneity, average age, team size, average education level and average tenure are based on the data of 2001, whereas dependent variables (indicators of firm performance) are based on the year-end data of 2002. In order to avoid the impact of untruthful disclosure of information on the research result, this study eliminates some unsuitable samples by using some selection methods. The criteria for elimination are as follows: (1) financial and public-utility firms as these industries are different from other rival industries in terms of industry characteristics and competition patterns; (2) firms where the CEO or general manager is replaced or more than 1/3 of the members in the TMT are replaced; (3) firms of which TMT members' personal data are incomplete. We are finally left with 356 that meet the requirements for this study.

Except economic value added (EVA) which is from the database of Stern Stewart Consulting Company (China), all the data used are from the annual reports of the listed companies and the database of listed companies created by the National Information Center.

4.2 Measurement of variables

To obtain stable, reliable and convincing findings about TMT characteristics, researchers have tried to define TMT by selecting different methods, including questionnaire surveys directed to CEOs, in-depth interviews with CEOs and other methods based on titles and positions in the corporate hierarchy. The most popular way to define TMT is by titles and positions in the firm's hierarchy, because it is simple to use and easy to obtain data by this method. By adopting a prevalent practice in the world, this paper defines TMT as being composed of executives no lower than vice president or vice general manager, general accountant, general economist, finance director and engineer-in-chief.

4.2.1 Independent variables

Top management team's age heterogeneity and tenure heterogeneity are gauged using the coefficient of variation, which is the standard deviation divided by the mean, with higher values indicating greater TMT diversity. Allison has noted that among heterogeneity measures, the coefficient of variation is preferable when interval-level data such as age or time frames are used (Allison, 1978).

Measurement of educational background heterogeneity and functional experience heterogeneity of TMT relies on Herfindal-Hirschman coefficient, which is also called Blau's index, and it was Blau (1977) who first adopted it to measure team heterogeneity. The formula is

$$H = 1 - \sum_{i=1}^{n} p_i^2$$

where p_i is the percentage of the i type members in the team and the range of the value of H is 0 to 1, and the bigger the value, the higher the degree of team heterogeneity. Based on the classification of disciplines by the National Ministry of Education and the classification adopted in previous studies (Tihanyi et al., 2001; Hambrick et al., 1996), this paper readjusts the educational backgrounds of TMT by dividing them into five categories: science and engineering (science, engineering, agriculture and medicine), economics and management (economics, management), literature and arts (philosophy, literature and history), law, and others (education, military science). Tihanyi et al. (2001) divided the pre-team professions into seven categories: administration, engineering, finance, marketing and public relations, R&D, manufacturing, and law. Drawing on Tihanyi et al.'s classification and considering the peculiarity of Chinese enterprises, this paper divides the pre-team professions into manufacturing, R&D, finance, marketing, law, administration (Party affairs, the Communist Youth League, and labor unions), and government staffers. The occupation of a TMT member generally has some consistency. Following the approach adopted by Hambrick et al. (1996), this paper views a member the initial profession that lasted the longest time as the categorized profession.

4.2.2 Dependent variables

This paper adopts the firm's EVA to measure firm performance and views it as a dependent variable. The reasons why EVA is used as a measure of firm performance are as follows. First, researches by Wang et al. (2003) indicate that EVA is better than accounting measures (such as ROA, ROE and EPS) on the interpretation of Chinese listed companies' value alteration. Second, because of the faultiness of the Chinese stock market, the stock prices of Chinese listed companies deviate from their value and the replacement value of company assets is also difficult to estimate and at the same time only 40% of the total shares are bought and sold in the stock market. Under these circumstances, Tobin's Q cannot reflect genuine firm performance. So it is doubtful that Tobin's Q is a suitable measure of the performance of Chinese listed companies.

Instead of calculating the EVA of each company by strictly following the formula, this paper uses the related data provided by Chinese listed companies EVA database published by Stern Stewart, and this approach is consistent with the similar research abroad. This can avoid repeated work and save time and energy to widen the research, instead of focusing on EVA calculation. Also, this practice can help researchers to base their research on the same data, which makes their conclusions more comparable.

4.2.3 Control variables

This paper is mainly about research on the relationship between TMT heterogeneity and firm performance. Some factors may impact the relation of the selected independent variables and dependent variables. So this paper will take the factors of enterprise size, team size, average age of the team, average education of the team and average tenure of the team as control variables in the process of statistical analysis.

Enterprise size. This paper adopts the index of measuring enterprise size similar with that of Carpenter (2002), and Richard and Shelor (2002), which are the total employees of the enterprise, and the selected data were announced at the 2001 annual report. On the calculation of the variables of enterprise size we adopted a logarithm of the number of employees because it is better to use logarithm than original data and it is good to do regression analysis (Lan, 2004).

Team size. It refers to the number of the TMT as defined in this paper that the company had in 2001.

Average age of the team. It refers to the average age of all members of the TMT in 2001.

Average education of the team. According to the traditional way of classification, this paper classifies education as consisting of five levels: 1) representing secondary education and below; 2) representing junior college; 3) representing undergraduate education; 4) representing master; and 5) representing doctor. The larger the means, the higher the team average education level.

Average tenure of the team. It refers to the mean of the service time of all members of the TMT, ranging from the time when they joined the team up to 2001.

4.3 Research methods

Descriptive and correlative analyses are conducted with SPSS11.5 and the hypotheses are tested using OLS regression, for which hierarchical entry is selected. The process is as follows: analyze control variables of model 1 (see Table 3 in 5.3), and then add independent variables to the regression analysis of model 2 to test the hypotheses 1–4.

5 Results

5.1 Sample characteristics

This study selects 356 out of all the companies listed in the Shanghai and Shenzhen stock exchanges in accordance with the research needs, and the final sample is still

representative. The average sales of the sample companies in 2001 were 1.3444807 billion RMB and from Table 1 we can see that the average sales of all the 1137 listed companies in 2001 were 1.4161691 billion RMB. The fact that the two figures are nearly the same suggests that the sample is representative. The average net profit of the 356 companies in 2001 is 63.3572 million RMB while for all the 1137 listed companies it is 69.5197 million RMB. This further shows that the sample is representative.

Table 1 Sales income and net profit in 2001

Companies	Sales (ten thousand RMB)	Net profit (ten thousand RMB)	Number of companies
Sample	134448.07	6335.72	356
All listed companies	141616.91	6951.97	1137

Data source: based on the listed companies data-base of National Information Center.

5.2 Descriptive and correlative analysis of variables

The means, standard deviations, and bivariate correlations for all variables are presented in Table 2, from which we can see a strong correlation among some variables ($p < 0.01$). But the significance of correlation among variables may be influenced by some other factors, such as the sample size. The correlation coefficient must pass the hypothesis test because two variables may have a large correlation coefficient as a result of the fault of research design even though they actually have no relevance. At the same time it just shows that two variables may have primary relations though there are significant correlations among variables, the impact of system integration need further analysis.

5.3 Test results of hypotheses

As mentioned above, the hypotheses were tested using OLS regression. All regression results are presented in Table 3. Moreover, variable inflation factor (VIF) scores for all models were within acceptable parameters. Thus, multicollinearity does not exist.

From Table 3 we can see that model 2 passes the F test ($F = 2.744$, $p < 0.01$), and this indicates that the model is valid. The adjusted R^2 of the regression model is 0.128, which is not very high but satisfies our research needs. This is because this model is used to determine the correlations among variables rather than for the purpose of forecasting; the fitness value is not the main object of observation. We can also see a significant negative correlation between TMT tenure heterogeneity of Chinese enterprises and firm performance ($\beta = -0.147$, $p < 0.05$),

Table 2 Descriptive statistics and correlations

	Variable	Means	*SD*	1	2	3	4	5	6	7	8	9	10
1	EVA	–20.42	129.96	1.00									
2	Firm size	7.51	1.06	–0.157**	1.00								
3	Team size	5.81	2.04	–0.092	0.185**	1.00							
4	Mean age	43.74	3.97	–0.120*	0.118*	0.030	1.00						
5	Mean education	2.85	0.54	–0.018	–0.072	–0.087	–0.273**	1.00					
6	Mean tenure	3.19	1.28	–0.049	0.050	–0.028	0.290**	–0.122*	1.00				
7	Age heterogeneity	0.15	0.06	–0.063	–0.038	0.075	0.007	0.061	–0.165**	1.00			
8	Tenure heterogeneity	0.43	0.27	–0.081	0.146**	0.016	–0.081	0.109*	–0.089	–0.017	1.00		
9	Education heterogeneity	0.45	0.18	–0.042	–0.009	0.145**	–0.086	–0.208**	–0.054	0.035	0.033	1.00	
10	Experience heterogeneity	0.58	0.15	–0.057	–0.138**	0.133	–0.084	0.038	0.027	0.036	–0.018	0.221**	1.00

Notes: $N = 356$

** $p < 0.01$, * $p < 0.05$, two-tailed tests.

which supports H2. The regression coefficient of TMT's functional experience heterogeneity and firm performance, β, is –0.126 with $p < 0.05$, which indicates that the two variables have significant negative correlation and supports H4. Although the age heterogeneity and educational background heterogeneity of TMT and firm performance also have negative correlations, they do not pass the significance test, which means H1 and H3 are not supported.

Table 3 The regression results of TMT heterogeneity and firm performance (EVA)

Control variable	Model 1: Control variables	Model 2: H1–H4
Firm size	–0.130 (–2.246)**	–0.133 (–2.265)**
Team size	–0.037 (–0.631)	–0.010 (–0.022)
Mean age	–0.105 (1.738)*	–0.133 (–2.160)**
Mean education	–0.056 (–0.933)	–0.054 (–0.875)
Mean tenure	–0.003 (–0.049)	–0.016 (–0.273)
Independent variables:		
Age heterogeneity		–0.058 (–1.006)
Tenure heterogeneity		–0.147 (–2.564)**
Education heterogeneity		–0.058 (–0.941)
Experience heterogeneity		–0.126 (–2.116)**
R^2	0.086	0.148
Adjusted R^2	0.076	0.128
F	2.003*	2.744***

Notes: Sample $N = 356$ and standardized coefficients are shown.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$, two-tailed tests.

6 Analysis and discussion

The fact that two of the four hypotheses are supported indicates that TMT heterogeneity of Chinese listed companies is negatively related with firm performance. Research by Wei and Wang (2002) also indicated that TMT heterogeneity of Chinese listed companies is negatively related with firm performance but the result was not strongly verified in the research. They believed that the reason was that man-made and fictitious factors weakened the impact of top managers on firm performance. But the EVA adopted in this study as a measure of firm performance can avoid the impact brought by managers "managing" the firm's surplus, thereby providing an undisturbed estimation of the real economic profit of the firm (Yu and Chi, 2004). Therefore, it can measure the actual relationship between TMT heterogeneity and firm performance.

The fact that the result of this study is different from that of foreign mainstream researches indicates that the impact of TMT heterogeneity on firm performance varies with the modes of interaction among TMT members that exist in different social contexts. Another reason why the result of this study is different from that

of foreign researches is because of the imperfect manager market in China. The fact that many top managers are promoted within the organization causes TMT homogeneity to be relatively high. The questionnaire survey directed to 250 listed companies in the Shanghai stock exchange in 1999 shows that 79.1% of general managers of sample companies are promoted internally, so are the majority of vice managers. The internal market of top managers increases the homogeneity of TMT. This all-scale high homogeneity has increased team members' attention to similarities and differences within the team (Blau, 1977), preventing those who show a high degree of heterogeneity from fully performing. This scenario causes the firms with homogeneous TMT to be more productive.

This paper adopted the international popular research methods to study the relationship between the characteristicss of TMT of Chinese listed companies and firm performance and obtained results different from those of foreign researches. However, there are still some limitations. First, the data of this study were sectional and would reveal the impact of the characteristics of TMT on firm performance under Chinese social contexts if longitudinal data were adopted. Second, some factors may impact the relationship of the two above, such as enterprises' external constitutional environment, characteristics of the industry and strategy, and this should be taken into consideration in future researches.

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