

Top Manager Shareholding and Technological Innovation under Uncertain Environment: An Empirical Test on Resource-based listed Companies

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Abstract: Based on the study sample of 108 resource-based enterprises, this paper explores mutual relationship between top manager shareholding and technological innovation under the uncertain environment. The results show that there is significant positive relationship between top manager shareholding and technological innovation. It also concludes that the uncertainty of external environment plays a moderating role between them.

Keywords: Top Manager Shareholding; Technological Innovation; Uncertainty of External Environment; Resource-Based listed Companies

I. Introduction

Under the competitive environment with an increasing uncertainty, how to help resource-based companies change the linear development model of “resources - products - waste” to a new model based on technological innovation has attract more and more attention in academic field. Some scholars have investigated the effect of top manager shareholding on technological innovation from the perspective of corporate governance^[1], but few of them take resource-based enterprises as the study sample. This article chooses resource-based listed companies as the research sample to investigate the effect of top manager shareholding on technological innovation, in order to provide empirical support for resource-based companies to improve the level of technological innovation.

II. Literature Review and Research Hypothesis

Top Manager Shareholding and Technological Innovation

In modern enterprises, the owners usually realize their own interests through their impact on top managers. Take technological innovation for instance, top manager's strong support is one of the most important factor to promote technological innovation in enterprises (Nakahara, 1997)^[2]. As technological innovation is an activity with higher input, longer period, and larger uncertainty (Holmstrom, 1989)^[3], besides there are asymmetric information and incompatible interests between top managers and shareholders, they have different preferences: shareholders focus on long-term

development of the enterprises and tend to support technological innovation; on the other side, top managers prefer to risk-aversion and tend to hamper technological innovation in order to meet their individual preferences. Therefore, whether there is motivation of innovation becomes the key for technological innovation (GaryTighe, 1998)^[4]; and the effect of innovation motivation on innovative decision-making depends on the deviation of different goals between top managers and the shareholders. If the two are the same, top managers will make conducive choice for enterprises' innovation; on the other hand, if there is large deviation, innovation motivation will be weakened, and top managers might make choice not conducive to innovation (Yang et al. 2002)^[5]. However, whether the interests are the same between top managers and shareholders is largely determined by the top manager payment system. Miller et al. (2002) have gained the result that top manager shareholding could reduce the interest conflicts between top managers and shareholders, and lead to attitude convergence between the two, that could improve the input on technological innovation^[6]. Zahra et al. (2000) found in their empirical study on medium-sized enterprises innovation that if top managers hold shares of the company, the increase of their personal wealth would largely depend on the value of the company, which would weaken the opportunism, and thus lead to interest convergence between the two. There was significant positive relationship between top manager shareholding and technological innovation^[7]. Therefore, this study proposes the following hypothesis:
 H1: There is positive relationship between top manager shareholding and technological innovation.

The uncertainty of external environment and its moderating effect

Uncertainty is an important feature of organization environment, which is originated from the change of external environment, but also related with the skills and knowledge of decision-makers^[8]. The perception extent of different decision-makers on environment uncertainty has quite close relationship with whether an enterprise will conduct technological innovation. When the uncertainty of external environment is high, enterprises will face some harsh realities, such as rapid change in market demand, shortened product life cycle, and rapid development in technology, etc., which require rapid reaction and innovation

mechanisms, and companies are also asked to improve the technological innovation. If companies are stuck on development of the existing knowledge and product, and do not explore the opportunities in time, they will be out of new markets with advanced technology^[9]. When the uncertainty of external environment is low, as the changes in market demand and technology development are slower, enterprises are facing more problems on structure, they can just rely on existing knowledge, techniques, methods and regulations to resolve them, thereby reducing the demand on technological innovation. Jansen et al. (2005) suggested that the higher the environmental uncertainty is, the stronger the innovation level of multi-business enterprise is^[10]. Therefore, this study proposes the following hypothesis:

H2: The uncertainty of external environment plays a moderating role between the top manager shareholding and technological innovation. The higher the uncertainty of external environment is, the more significant the positive relationship between two is.

III. Research Design

Sample Selection and Data Source

In this study, 108 resource-based companies are selected as research samples. The selecting process is as follows: First based on guidelines of listed company industrial classification, 129 listed companies were preliminary selected, main business of which are on extractive industries, and providing products and services based on mineral resources direct use or create process; Secondly, removed companies failed to maintain relevant data disclosing during the research process. And 108 listed companies were selected by the end. As there is potential lag effect between

top manager shareholding and technological innovation, data of top manager shareholding and control variables were from the year of 2008; data of technological innovation was selected from year 2009; data of the uncertainty of external environment was selected from the 2005-2009 annual data; all data above are from CSMAR database. In this study, data processing was conducted by statistical software SPSS15.0

Research Model and Variables Design

Based on the theoretical hypotheses of the study, the research model is set up as shown in Figure I. This study adopts R&D investment to measure the technological innovation level; uses top manager shareholding rate to measure the top managers shareholding situation; selects standard deviation of latest 5 years sales revenue / average to measure the uncertainty degree of external environment; chooses firm size, performance of enterprises and ownership structure as the control variables (see table I for definitions).

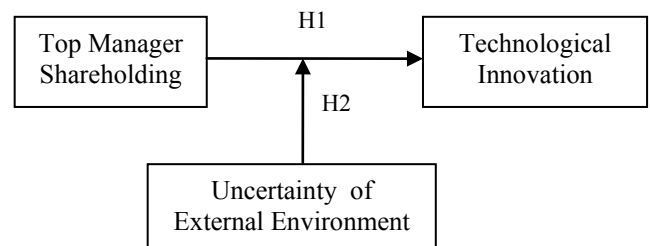


Figure I Model of the Research

Table I Research Variables and Definition

Variables	Code	Definition
R&D Investment	RDI	R&D input/ main business revenue
Top Manager Shareholding Rate	MSR	Total shareholding number of TMT members/total equity
Uncertainty of External Environment	UEE	Standard deviation of latest 5 years' sales revenue / average
Firm Size	Size	Logarithm of total assets
Performance of Enterprise	ROA	Profit after tax/total assets
Ownership Structure	OS	State-owned shares/total number of shares

IV. Empirical Analysis

Statistical Description of Variables

Table II lists the statistics descriptive of variables in the study sample, we can find that: (1) The average R & D investment intensity is quite low, and there are gaps among R & D investment intensities of different companies. This was mainly due to the funding and support that a number of resource-based companies received from government, and

thus they have a stronger motivation and ability of innovation. For example, in July 2006, the Ministry of Science and Technology (MOST), State-owned Assets Supervision and Administration Commission (SASAC) and All China Federation of Trade Unions (ACFTU) launched the construction of the "Innovation Enterprise", 11 of the first 103 enterprises selected as pilot work are resource-based listed companies. (2) Shareholding for TMT is not universal and the shareholding rate is relatively low, but it has been improved comparing with the situation before the

“Listed Companies’ Equity Incentive Regulations” was introduced. (3) Companies are facing greater uncertainty of the external environment.

Regression Analysis

The analysis results of this study are shown in Table III, F-values of all 4 models are all significant, which means that the overall regression model is significant. Variance inflation factor (VIF) and the DW test of the four models indicates that there is no multi-co-linearity and sequence-related issues (due to length limitations, the results cannot be provided), so the model has quite good fitting effect. As shown in table III, model 1 is the analysis on control variables: firm size has a significant positive correlation with technological innovation, which indicates that the larger the firm size is, the stronger the finance capabilities and risk-resisting ability are, thus the more conducive to technological innovation; There’s a significant positive correlation between the performance of enterprise and R & D investment intensity, indicating a good performance

company would have more funds for R & D investment. Model 2 examined the impact of the top manager shareholding rate on technological innovation. All the measures’ regression coefficients are small but significant, which illustrates that, top manager shareholding can reduce the interest conflicts between top managers and shareholders, and lead to attitude convergence towards risks between the two, thus improve the technological innovation. H1 has been verified. Model 3 is the test for the moderating effect of external environment uncertainty. Fitting rate of model 3(Adjusted R2) is larger than that of model 2, as a result, the interaction between the external environment uncertainty and top manager shareholding has better explanation on technological innovation than that each of the two variables has. Therefore the uncertainty of external environment plays a moderating role between the top manager shareholding rate and technological innovation. H2 has been verified.

Table II Statistical Description of Variables

Variables	Max.	Min.	Medium	Mean	Standard Deviation
RDI	0.0792	0.000003	0.0076	0.0073	0.0291
MSR	0.4600	0.0000	0.0000	0.0001	0.1546
UEE	0.4510	0.0019	0.1710	0.1512	0.2013
Size	22.762 5	17.8910	19.8210	19.7800	0.7964
ROA	0.1254	0.0012	0.0425	0.0421	0.0812
OS	0.8205	0.0000	0.3810	0.3454	24.3214

Table III The results of Multiple Regression Analysis

	Model 1	Model 2	Model 3
Size	0.152 (2.327) *	0.154(2.425)*	0.252(3.325)**
ROA	0.113 (2.059) *	0.152(2.326)*	0.101(1.184)
OS	-0.012 (-0.165)	-0.111(-1.447)	-0.109(-1.441)
MSR		0.051(2.019)*	0.097(2.044)*
MSR×UEE			0.134 (2.112) *
Adjusted R2	0.141	0.188	0.356
F	2. 629*	3.642**	13.897***

*** P <0.001, ** p <0.01, * p <0.05.

V. Conclusions and Implications

This paper chooses resource-based listed companies as the research sample, and examines the relationship between top manager shareholding and technological innovation under the uncertain environment. The results show that there is

significant positive relationship between top manager shareholding and technological innovation; the uncertainty of external environment plays a moderating role between the two. This study has important political implications on improving the level of technological innovation of resource-based listed companies: First, enterprises should expedite the pace of conducting shareholding incentive, and the establishment of an effective incentive mechanism for top

managers under the guidance of “Equity Incentive for the Listed Companies Administration” published by SFC; Second, based on constantly changing external environment, enterprises should implement its own technological innovation decision-making based on their own characteristics.

Although the findings of this study have great importance on both organization management theory and practice, there are still some deficiencies such as the inadequate sample size, incomprehensive measures of technological innovation, etc. With the development of resource-based companies and improvement of institutional environment, it will enter a higher stage of the life cycle with increased competition. Scholars should continue to conduct research and reveal the path to improve the level of the technological innovation of resource-based listed companies .

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