The impact of equity incentive on the innovation ability of Listed Enterprises

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ABSTRACT:

Equity incentives address the limitation of short-term incentive effects associated with salary incentives and contribute significantly to enhancing the innovation capabilities of key employees. This paper focuses on A-share manufacturing listed companies from 2018 to 2022 to examine the impact of equity incentives on enterprise innovation abilities. The findings demonstrate the positive influence of equity incentives on enterprise innovation capabilities, particularly for core employees. Furthermore, there exists a positive correlation between the level of equity concentration and the innovation abilities of enterprises.

KEYWORDS: Equity incentive; Ownership concentration; Innovation ability, Manufacturing industry

1. Introduction

Innovation greatly expands human cognition's breadth, depth, and precision. It is an important engine of economic and social development and a powerful weapon to deal with many global challenges. It has increasingly become a key variable affecting the process of world modernization. The enterprise is the primary driving force behind innovation and creativity. Today, with the rapid development of information technology, Internet + innovation has become a key element of competition among enterprises. As the cornerstone of the capital market, listed companies are excellent representatives of Chinese enterprises and an important force in supporting economic development, and the demand for innovation is more urgent. Equity incentive is one of the effective methods to help enterprises motivate employees, and it plays a special role in promoting the innovation ability of core technical employees in enterprises. This study investigates the connection between equity incentives and corporate innovation capabilities by examining the impact of equity incentives on equity concentration. In doing so, we can determine how different ownership structures influence innovation capabilities and ultimately enhance corporate innovation. The existing literature studies the relationship between equity incentives and the innovation ability of listed enterprises in the earlier period, which can not reflect the latest development of the situation. This study uses the data from 2018 to 2022 to reflect the latest relationship between equity incentives and the innovation ability of listed companies.

2. The Literature Review and Research Hypothesis

The essence of equity incentive is to enable operators to have a certain residual claim through stocks, closely combining the interests of shareholders, enterprises, and personal interests of operators, to urge operators to attach importance to technological innovation and enterprise R&D activities and then enhance the core competitiveness of enterprises. In a business organization, core employees belong to high-knowledge people, who are directly responsible for the company's product technology research and development, project management, marketing, and other business, which has an important impact on enterprise innovation performance. Therefore, the company should set up the optimal incentive to fully mobilize the enthusiasm of employees to carry out innovation.

Many scholars believe that the implementation of equity incentives will help to improve the innovation ability of enterprises. According to Jense and Meckling[1] (1976), equity incentives implemented by enterprises can effectively enhance the innovation efficiency of the firm. Tang Qingquan and Yicui[2](2009) take the listed companies that disclose R&D investment data from 2002 to 2006 as the research object. Through examining the risk of R&D investment and decision-makers risk bias, it is observed that shareholders have a greater inclination towards conducting research and development activities compared to management. Consequently, the implementation of executive shareholding incentives can

stimulate shareholders to increase their R&D expenditure. Gao Yihang[3](2022) makes an empirical test on the A-share listed high-tech enterprises in Jiangsu, Zhejiang, and Shanghai from 2006 to 2017. The results show that the equity incentive of core employees can positively affect the innovation performance of enterprises. Based on the aforementioned findings, the hypothesis is proposed:

H1: the implementation of equity incentives to core technical staff promotes the technological innovation capability of enterprises.

The relationship between ownership concentration and corporate innovation has been a hot topic in the field of corporate governance for a long time, and the academic conclusions on the relationship between the two are not consistent. Feng Genfu and Wen Jun[4](2008) selected 343 sample companies from industries with intensive R&D activities from 2005 to 2007. However, it is concluded that there is an obvious inverted U-shaped relationship between equity concentration and innovation behavior. The research results of Snell[5](1989) show that there is a positive correlation between equity concentration and enterprise innovation investment. Ding Yafeng[6](2015) used data from listed companies in the Shanghai and Shenzhen stock markets between 2009 and 2011 as samples. The study highlights the significant influence of equity concentration and R&D investment on enhancing the technological innovation performance of enterprises. Consequently, the hypothesis proposed in this paper is:

H2: As equity concentration increases, the enterprise's innovation capability strengthens.

3. Sample selection and Research Model

3.1 Sample selection and data sources

Data from Chinese A-share manufacturing companies listed between 2018 and 2022 were chosen for analysis in this paper. The collected data are processed as follows: (1) excluding ST company; (2) eliminating samples with missing variables; (3) processing the data into balance panel data; (4) the data is tailed at the level of 1%. Finally, 457 sample data from 188 companies were obtained. In this paper, stata17.0 is used to analyze and process the data, and the sample data are from the CSMAR database.

3.2 variable definition

(1) explained variable. To study the innovation output of enterprises, The natural logarithm of the total number of patents is used as an index to measure the innovation output of enterprises, and after tail reduction, add 1 to take the logarithm to get the total number of patent applications (LPAT).

(2) explanatory variables. This paper selects the rights and interests of core technical business personnel granted by enterprises and the degree of ownership concentration as the measure of the degree of equity incentive and takes the logarithm of the rights and interests granted to core technical business personnel to be granted core technical business personnel rights (Lnct).

(3) control variables. Several factors can limit a corporation's innovative output, so it is essential to include relevant control variables during the empirical model analysis process. In this paper, return on assets, R&D investment, and company size are selected as control variables.

The specific related variables and explanations are shown in Table 1.The specific related variables and explanations are shown in Table 1.

Table 1: Variable definition table.

Variable type	Variable name	Variable symbol	Variable definition
Explained variable	Number of patents	LPAT	Logarithm of annual invention and practical patent applications
Explanatory variable	Granting rights and interests to core technical business personnel	Lnct	The logarithm of the number of equity incentives received by core technical employees
	Equity concentration degree	CR	Proportion of shares held by the largest shareholder of the company

Control variable	Company size	Lnsize	The natural logarithm of a company's total assets
	Return on assets	ROA	Net profit after tax / average total assets
	Research and development investment	LnRDFee	Logarithm of R & D expenditure

3.3 Model design

Referring to the research of previous scholars, the logarithm of "granting core technical business personnel rights (Lnct)" is taken as an explanatory variable to reflect the equity incentive to the core employees. The advantage of model (1) is that it is directly related to equity incentive and innovation ability, and can reflect the impact of core employee incentives on the company's innovation behavior. However, the disadvantage of this model is that it may oversimplify the complexity of the factors affecting corporate innovation, and may lead to estimation errors if other variables are not fully controlled.

To verify the influence of equity incentives on the core employees' ability to promote the innovation of listed companies, a model is established (1):

$$LPAT = \beta_0 + \beta_1 Lnct + \beta_2 LnSize + \beta_3 ROA + \beta_4 Lnsize + \beta_5 LnRDFee + \varepsilon \quad (1)$$

According to the theory of governance structure, high ownership concentration means that minority shareholders have more control over the company, which may have a significant impact on the company's business decision-making and strategic direction. Equity concentration can reduce agency costs, ensure quick decision-making, and promote investment in R&D projects. The advantage of the model (2) is that it reflects the influence of corporate governance structure on innovation decision-making and helps to understand how different ownership structure affects corporate strategy. Its shortcomings may include not taking into account other governance factors, such as board structure and market competition, which may also affect corporate innovation activities.

To examine the correlation between equity concentration and enterprise innovation capability, build a model (2):

$$LPAT = \beta_0 + \beta_1 \mathrm{CR} + \beta_2 LnSize + \beta_3 ROA + \beta_4 Lnsize + \beta_5 LnRDFee + \varepsilon \quad (2)$$

β_0 represents a constant term, while ε denotes a residual element.

4. Empirical analysis

4.1 Descriptive statistics

Table 2 is descriptive statistical findings that reveal a considerable disparity in innovative output among various businesses. While the maximum value reaches 6.423 (corresponding to 5,600 units), the average stands at only 5.242 (approximately 448.8 units). Additionally, the mean value for granting equity incentives to core technical staff is 15.325, with a standard deviation of 1.026. This suggests that, while the sample companies' equity incentives are relatively stable, some variability still exists.

Table 2: Descriptive statistical results.

Variable	The number of sample	Mean	SD	Median	Min	Max
LPAT	457	5.242	0.670	5.263	4.248	6.423
Lnct	457	15.325	1.026	15.378	13.799	16.761
CR	457	30.073	9.998	28.806	17.413	45.267
ROA	457	0.066	0.033	0.062	0.023	0.116
Lnsize	457	21.983	0.710	21.923	21.052	23.101
LnRDfee	457	18.596	0.748	18.525	17.623	19.741

4.2 correlation analysis

Table 3 displays the results of statistical correlation analysis between variables. These findings demonstrate that: (1) there is a 0.302 correlation between core technical personnel equity incentives (Lnct) and patent numbers (Lnct), highlighting that equity incentives have

a positive influence on corporate innovation capability (significant at a 1% significance level); (2) the correlation coefficient between ownership concentration and patent numbers is 0.046, indicating a weak connection. This lack of significance is attributed to the exclusion of other factors from the analysis.

Table 3: Results of correlation analysis.

	LPAT	Lnct	CR	ROA	Lnsize	LnRDfee
LPAT	1.000					
Lnct	0.302***	1.000				
CR	0.046	0.046	1.000			
ROA	-0.067	-0.086*	0.130***	1.000		
Lnsize	0.581***	0.357***	-0.024	0.053	1.000	
LnRDfee	0.681***	0.288***	-0.023	0.098**	0.785***	1.000

Note: * *, * *, * indicate significant at the level of 1%, 5% and 10%, respectively, the same below.

4.3 multiple regression analysis

By using the data from 2018 to 2022, a regression analysis was carried out to eliminate the influence of multicollinearity among variables, and the benchmark regression results are shown in Table 4. From the test results, we can see that there is a positive correlation between core technical business personnel and equity incentive and enterprise innovation ability, which is significant at 0.05 level, while equity concentration and enterprise innovation capability are also significant at 0.05 level. Therefore, improving the equity incentive level and equity concentration of core technical personnel can promote the innovation ability of enterprises.

Table 4: Benchmark regression results.

	(1)	(2)
	LPAT	LPAT
Lnct	0.057**	
	(2.536)	
CR		0.005**
		(2.531)
ROA	-2.505***	-2.918***
	(-3.629)	(-4.267)
Lnsize	0.079	0.107*
	(1.349)	(1.850)
LnRDfee	0.539***	0.544***
	(10.816)	(10.654)
_cons	-7.242***	-7.215***
	(-10.178)	(-10.023)
Obs.	457	457
R-squared	0.493	0.493

4.4 robustness test

Table 5 presents the results of the robustness test. Model (1) indicates a 0.057 regression coefficient between the patent number (LPAT) and core technical personnel equity incentives (Lnct), with a standard error of 2.438, aligning with previous findings. In model (2), the regression coefficient between patent numbers (LPAT) and ownership concentration (CR) is 0.005, with a standard error of 2.422, consistent with earlier results. The error variance for both models is 0.227, statistically significant at a 1% significance level, suggesting that the model's residual term exhibits robust heteroscedasticity.

Table 5: Results of robustness test.

	(1)	(2)
	LPAT	LPAT
Lnct	0.057**	
	(2.438)	
CR		0.005**
		(2.422)
ROA	-2.505***	-2.918***
	(-3.644)	(-4.234)
Lnsize	0.079	0.107**
	(1.528)	(2.115)
LnRDfee	0.539***	0.544***
	(11.145)	(11.255)
_cons	-7.242***	-7.215***
	(-10.378)	(-10.359)
/var(e.LPAT)	0.227***	0.227***
	(15.116)	(15.116)
Obs.	457	457

Pseudo R2	0.334	0.334

5. Conclusion

By examining data from 188 Chinese A-share-listed manufacturing organizations between 2018 and 2022, this research demonstrates that core technician shareholding positively influences enterprise innovation capability. Additionally, a positive correlation exists between equity concentration and corporate innovation capability. This study's findings can assist in understanding the relationship between equity incentives and innovation ability, ultimately enabling businesses to develop more effective incentive programs and promote innovation. Below are some suggestions:

(1) the enterprise can adopt the equity incentive to the core technology business employees to make the core employees devote more energy to the improvement of the enterprise's innovation ability, to enhance the competitive strength of the enterprise. On the one hand, equity incentives can reduce agency costs between shareholders and executives and form an effective interest alliance. On the other hand, implementing equity incentives for core technical staff can alleviate their concerns regarding uncertain income resulting from enterprise innovation activities. As a result, they can evaluate the long-term development of the enterprise more judiciously.

optimizing the ownership structure and appropriately increasing the equity concentration will help to improve the innovation ability of enterprises. Moderately increasing the degree of equity concentration will help to increase the voice and influence of major shareholders and enhance their attention and supervision of the company. Major shareholders usually have stronger risk tolerance and long-term investment willingness to support companies to carry out long-term, high-risk innovation activities. Moreover, the presence of major shareholders can mitigate the risk of self-serving management strategies, thereby enhancing corporate governance efficiency and effectiveness.

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