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The Influence of Executive Shareholding in Pharmaceutical Industry on Corporate Performance from the Perspective of R&D

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Abstract: ***This paper takes 138 pharmaceutical manufacturing listed companies in 2008-2018 as researchsamples, proposes hypotheses and establishes multiple regression models for empirical research, and explores the impact of executive shareholding ratio on firm performance, and between executives' holdings and R&D investment.The relationship between R&D expenditure as an intermediary variable between equity incentives and firm performance, explores the impact of executive shareholdings on firm performance through R&D investment, and provides a reference for pharmaceutical manufacturing listed companies to improve performance and maximize value.***

Keywords: Executive shareholding; R&D investment; company performance

1. Introduction

In 2016, the Central Committee of the Communist Party of China and the State Council issued the Outline of the National Innovation-Driven Development Strategy, which divided China's innovation strategy goals into three phases. In the first stage, China will enter the ranks of innovative countries by 2020. In the second stage, China will be among the forefront of innovative countries by 2030. The third step is to build a world science and technology innovation power and become the world's major science center by 2050. And innovative highlands. The above three goals are enough to see China's emphasis on innovation capabilities and the determination to build China into a world-class innovation country.

The development of pharmaceutical manufacturing industry is related to a country's national economy and people's livelihood. It is a basic and strategic industry of a country. Its competitiveness has an extremely important impact on a country's national economic development and people's rights and interests in life and health. Technological innovation is the main way to enhance industrial competitiveness, and R&D investment is the core of technological innovation for an enterprise, and also an important indicator to measure the degree of technological innovation. In 2016, China issued the Outline of the "Healthy China 2030" Plan, which proposed to "strengthen pharmaceutical technology innovation, promote pharmaceutical innovation and transformation and upgrading". The performance of technological innovation in pharmaceutical manufacturing industry is to innovate drug research and development, and to improve the ability of innovative drug research and development in pharmaceutical manufacturing industry is the key to improve the competitiveness of pharmaceutical manufacturing industry in China.

Along with the modern enterprise system, the problem of "Principal-agent" arises, which will cause short-sighted behavior of the operators. One of the most prominent manifestations is that operators will negatively deal with technological innovation activities with long cycle, high investment and high risk. Giving senior management incentives to equity can effectively solve this problem. Because this measure will enable operators to regard their own interests and company interests as a community, and equity incentives can effectively avoid adverse selection, moral hazard and management corruption, thus contributing to the long-term development of pharmaceutical manufacturing enterprises and enhancing the competitiveness of the industry. Create a good internal environment.

2. Research Background

Foreign research on equity incentives is mainly based on the two theories of "defense hypothesis" and "consistion of interest convergence". In the 1930s, Berle and Means first proposed the concept of separation of ownership and management of modern companies in Modern Company and Private Property. Jensen and Meckling proposed the principal-agent theory. The theory holds that in the principal-agent relationship, the shareholder is the principal and the executive is the agent. The utility function of the principal and the agent is different. The principal pursues the maximization of his own interests, while the agent has an opportunistic tendency. In the face of the company's production and operation decisions, the agent will pursue the maximization of his own interests at the expense of the principal. At the same time, the agent will also pursue his own salary allowance income, luxury consumption and leisure time maximization. The problem of adverse selection and moral hazard of agents under asymmetric information is generated. Without an effective restraint mechanism, the agent's behavior is likely to ultimately damage the principal's interests, and the agent must be bound by power in a contract or system. To this end, the client proposed an incentive mechanism to satisfy the agent's "participation constraint" and "incentive compatibility constraint" to reduce the agency

cost between shareholders and executives to maximize their expected utility.

In terms of executive shareholding and corporate performance research, Stulz (1988) believes that as the proportion of shares held by corporate management increases, the market value of the enterprise reflected by Tobin's Q value rises first and then declines. According to Morck (1988), when the executives hold less than 5% of the shares, the market value of the company increases as the proportion of shares held by the management increases. But when management's shareholding ratio exceeds 5%, corporate value begins to decline. When the management's shareholding ratio exceeds 25%, the value of the company begins to rise slowly.

In the research of executive shareholding and technology R&D investment, many foreign scholars have pointed out that long-term corporate incentives such as executive stock holdings can effectively increase R&D investment, especially for technology-intensive enterprises. After researching more than 200 companies in 12 technology-intensive industries in the United States, Marianna (2006) also found that executive equity incentives significantly promote corporate innovation. According to the research by Banker, Huang, Natarajan et al.(2011), when the future income generated by enterprises increasing long-term investment is greater than the short-term investment, the short-term investment behavior will be reduced, and the promotion effect of executive equity incentives on R&D investment depends on the long-term of different enterprises. The future income of investment can be compared with other companies. The long-term investment of high-tech enterprises can generate higher future returns. Therefore, the incentive effect of executive stock holdings is more obvious, that is, for high-tech listed companies, equity incentives are implemented. It can improve the level of R&D investment more effectively. According to Abdullah and Faud's (2002)research, the proportion of executives' shareholdings will also have an impact on R&D investment. They found that when the proportion of executives holding shares is between 10% and 15%, they are the most significant.

In terms of R&D investment and company performance, Griliches(1989) researched 20 years of data from about 1,000 manufacturing companies in the United States. Through empirical tests, it was found that increasing R&D investment can effectively improve the production efficiency of enterprises. Ehie and Olie(1982), by studying the US service industry and manufacturing industry, found that the higher the company's R&D investment, the higher the company's value.

3. Problem Definition

In order to study the relationship between executive shareholding, R&D investment and corporate performance, this paper sets the following assumptions. In the following pages, the data of WIND database will be used to verify these assumptions.

H1: Executive equity incentives have a positive impact on the strength of R&D investment.
H2: Executive equity incentives have a positive impact on corporate performance.
H3: R&D investment can positively promote the relationship between executive equity incentives and company performance.
H4: Among non-state-owned enterprises, R&D investment has a more obvious effect on the relationship between executive equity incentives and company performance.

4. Methodology & Results

4.1 Sample selection and data source

The sample is derived from the annual financial statements of the pharmaceutical manufacturing enterprises in the wind database from 2012 to 2018. The shareholding ratio of the executives is manually entered, and 54 companies with incomplete data and ST shares are excluded, and 138 samples are finally obtained.

4.2 Variable selection

Table 1: Main variable definition

Variable type	Variable name	Variable symbol	Variable definitions
Explained variable	Business Performance	ROA	Net profit/Average balance of total assets
Explanatory variables	Executive shareholding ratio	SP	Ln(Number of shares held by executives/Total share capital)
	Enterprise R&D investment intensity	Rdi	Corporate R&D expenditure/ Operating income
Control variable	Equity concentration	FirS	Number of shares held by the top ten shareholders/ Total share capital
	Institutional shareholding ratio	IO	Total institutional holdings/ Circulating A shares
	Board size	Bsize	Number of board members
	Ratio of independent directors	ID	Number of independent directors/Number of directors
	Executive compensation	Salary	Ln(The top three executive compensation totals)
	Debt Asset ratio	Lev	Total Liabilities/total assets
	Business scale	Size	Ln（Total assets at the end of the year）
	Nature of property	PR	Virtual variables, 1 for state-owned enterprises and 0 for non-state enterprises

4.3Measurement model construction

Models (1), (2), (3), and (4) correspond to H1, H2, H3, and H4,

respectively.

$$Rdi = \alpha_0 + \alpha_1 SP + \alpha_2 salary + \alpha_3 size + \alpha_4 Bsize + \alpha_5 firs + \alpha_6 id + \alpha_7 io + \alpha_8 lev + \varepsilon \quad (1)$$

$$ROA = \alpha_0 + \alpha_1 SP + \alpha_2 Rdi + \alpha_3 size + \alpha_4 Bsize + \alpha_5 firs + \alpha_6 id + \alpha_7 io + \alpha_8 lev + \alpha_9 salary + \varepsilon \quad (2)$$

$$ROA = \alpha_0 + \alpha_1 SP + \alpha_2 Rdi + \alpha_3 SP \times Rdi + \alpha_4 size + \alpha_5 Bsize + \alpha_6 firs + \alpha_7 id + \alpha_8 io + \alpha_9 lev + \alpha_{10} salary + \varepsilon \quad (3)$$

$$ROA = \alpha_0 + \alpha_1 SP + \alpha_2 Rdi + \alpha_3 SP \times Rdi + \alpha_4 pr + \alpha_5 pr \times SP + \alpha_6 pr \times Rdi + \alpha_7 pr \times SP \times Rdi + \alpha_8 salary + \alpha_9 size + \alpha_{10} Bsize + \alpha_{11} firs + \alpha_{12} id + \alpha_{13} io + \alpha_{14} lev + \varepsilon \quad (4)$$

4. Conclusion

4.1 Descriptive statistics of related variables

In this paper, descriptive statistics are carried out on the raw data of the interpreted and explanatory variables. The results are shown in Table 2.

Table 2: Descriptive statistics of interpreted and explanatory variables

Variable name	Average	Maximum	Minimum	Standard deviation	Number of samples
SP	0.114	0.795	0	0.183	966
RDI	0.042	0.526	0	0.045	966
ROA	7.129	53.047	-32.566	7.598	966
FIRS	57.211	100	10.57	15.425	966
IO	91.632	43275	0.058	1391.605	966
BSIZE	8.667	15	0	1.705	966
ID	0.366	0.625	0	0.052	966
SALARY	13.898	17.595	0	2.633	966
LEV	33.991	122.259	2.609	19.119	966
SIZE	21.945	25.566	18.822	1.065	966

From the data in Table 2, it can be found that the average R&D investment (RDI) of China's pharmaceutical manufacturing enterprises in the sample is 4.2%, the maximum value is 52.6%, and the minimum value is 0. Compared with the R&D investment intensity of the US pharmaceutical manufacturing industry of 15 years, the R&D investment of China's pharmaceutical manufacturing enterprises is generally low, which is far from the international level; the average shareholding ratio of executives (SP) is 11.4%. The maximum value is 79.5%, and the minimum value is 0. It can be seen that the gap between equity incentives among different pharmaceutical manufacturing enterprises is large; the average value of enterprise performance (ROA) is 7.129%, the maximum value is 53%, and the minimum value is -32. %, the standard deviation is 7.598, which shows that the degree of development of enterprises in China's pharmaceutical manufacturing enterprises is large.

4.2 Empirical test result

Table 3: Model regression results

variable name	Model (1)	variable name	Model (2)	variable name	Model (3)	variable name	Model (4)
SP	0.00122* (2.373)	SP	0.068575* (0.683)	SP	0.899974* (0.841116)	SP	0.423409* (1.635)
SALARY	0.00121*** (2.727)	RDI	0.349874** (5.132)	RDI	1.930184* (0.790)	RDI	0.941660* (0.699)
SIZE	0.00312* (0.112)	SIZE	0.122389* (0.225)	SP×RDI	0.388090* (1.159)	SP×RDI	4.906829** (2.375)
BSIZE	0.00347*** (3.954)	BSIZE	-0.561375** (-3.254)	SALARY	-0.864464 (-0.567)	PR	0.269665* (0.625)
FIRS	-0.001242** (-2.316)	FIRS	0.098586*** (4.057)	SIZE	1.174435** (1.090)	PR×SP	-3.647309* (0.590)
ID	0.019096 (0.738)	ID	-6.809015** (-1.353)	BSIZE	1.108112* (1.895)	PR×RDI	-7.460427* (-0.603)
IO	-0.000183 (-0.300)	IO	-0.000525 (-0.443)	FIRS	-0.079227 (-1.088)	PR×SP×RDI	-1.186646 (-0.626)
LEV	0.000338* (0.425)	LEV	-0.120929** (-7.814)	ID	-4.308010 (-0.278)	SALARY	-0.470613 (-0.296)
c	0.00895** (0.147)	SALARY	0.589152*** (6.806)	IO	0.056625* (1.126)	SIZE	0.769225* (0.665)
		C	0.196108* (1.654)	LEV	-0.196746** (-4.874)	BSIZE	1.312711 (2.058)
				C	1.216008 (0.041)	FIRS	-0.070269* (-0.909)

						ID	1.038 (0.064)
						IO	0.055125* (0.1.083)
						LEV	-0.187393* (-4.635607)
						C	1.156037 (-0.401)
Adjusted R-Square	0.794		0.63		0.67		0.65

(T test values are shown in parentheses; ***, **, and * represent significant levels at 1%, 5%, and 10%, respectively.)

The model test results are shown in Table 3.Firstly, model (1) corresponds to H1, with the enterprise R&D investment intensity as the explanatory variable, the coefficient of executive equity ratio (SP) is significantly positive, indicating that executive equity incentives play a positive role in the R&D investment intensity of enterprises. Impact, which also validates H1.

Secondly, model (2) corresponds to H2, with enterprise performance (ROA) as the explanatory variable, the coefficient of executive shareholding ratio (SP) is significantly positive, and hypothesis 2 is verified.

Thirdly, model (3) corresponds to H3, with enterprise performance (ROA) as the explanatory variable, The cross-over item of Rdi and SP (SP * Rdi) is added. The purpose of adding the cross-over item is to study how much the influence of SP on ROA is affected by Rdi. The cross-over item (SP * Rdi) is significantly positive, indicating that Rdi can positively promote the relationship between SP and ROA.

Finally, model (4) corresponds to H4, with enterprise performance (ROA) as the explanatory variable. In order to study the influence of Rdi on the relationship between SP and ROA in state-owned enterprises and non-state-owned enterprises .Increase the dummy variable PR (property right nature).In model (4), the cross-over items PR*Rdi, PR*SP and PR*Rdi*SP are added. We can find that the coefficient of SP is significantly positive, but the coefficient of PR * SP is significantly negative after adding the dummy variable PR, which indicates that state-owned enterprises will inhibit the effect of executive shareholding on corporate performance. For the same reason, the coefficient of Rdi is significantly positive, but the coefficient of PR * Rdi is significantly negative after adding PR, which indicates that the R&D activities of state-owned enterprises have less impact on corporate performance than those of non-state-owned enterprises. Although the coefficients of PR * Rdi * SP are not significant, they are still negative, while the coefficients of SP * Rdi are significantly positive, and their symbols are opposite. It shows that in non-state-owned pharmaceutical manufacturing enterprises, R&D investment has a stronger promotion relationship between executive equity incentive and corporate performance than state-owned enterprises.

5. Recommendations

Firstly, attach importance to the equity incentives for executives: For enterprises, they should give full attention to executive equity incentives and determine a reasonable shareholding ratio. In China, the current emphasis on equity incentives by business owners is still insufficient, and there is a lack of experience in this area. The incentives for executives still use salary mechanisms, and the degree of executive ownership is generally low. Therefore, companies should be fully aware that incentives for senior management should not only be rewarded from remuneration, but also reward incentives at the same time, so that executives and business owners stand in the same interest camp, so that executives do Business decision-making is beneficial to the long-term development of the company, not just to meet the immediate interests of executives.

Secondly, strengthen R&D investment: In most western developed countries, at least 20% of the sales in the medical manufacturing industry are used for the development and research of new drugs, while the R&D investment in China's pharmaceutical manufacturing industry only accounts for business. 4.2% of revenue and low investment costs have greatly limited the company's innovation activities. The R&D investment and technological innovation of pharmaceutical manufacturing enterprises will have a great impact on corporate performance, and the improvement of corporate performance will in turn provide financial support for the next round of technological innovation. The interaction between the two will affect each other, so pharmaceutical manufacturing Enterprises must pay attention to the originality of drugs and strengthen investment in research and development activities in order to improve the core competitiveness of enterprises.

Thirdly, continue to promote the deepening reform of state-owned enterprises: the function and positioning of state-owned enterprises will create a contradiction, that is, the conflict between "profitable mission" and "public policy mission." On the one hand, it requires state-owned enterprises to develop and grow themselves. On the other hand, it also requires state-owned enterprises to make up for some defects in the market for the country. Although the country's unremitting efforts have made important achievements in the reform of state-owned enterprises, there are still three contradictions: First, the contradiction between the "owner's illusion" of state-owned enterprises and the

increase in the role of market competition for the owners. Second, the contradiction between the de facto departments and regions of state-owned capital and the increase in the degree of socialization of production. The third is the contradiction between the long-term struggle of the state-owned economic front and the "market failure" problem that arises with the expansion of market competition. In order to resolve these contradictions, the first is to promote the rationalization of the organizational structure of state-owned enterprises, the staff structure should be clear, improve office efficiency, and reduce institutional redundancy. The second is to reduce the political burden of state-owned enterprises and enhance the incentive effect of executives' shareholdings on corporate performance.

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