Impact of shareholding structure on Chinese bio-pharmaceutical listing companies' R & D investment

Liu Bin and Wei Changsheng

Department of Accounting, Business School, Hohai University, Nanjing, Jiangsu, P. R. China

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ABSTRACT

R&D activities is an important way of knowledge accumulation and technological innovation, which promote the development of enterprises. R&D activities is becoming an important form of bio-pharmaceutical enterprise activity, which is typical of high-tech industries. This article studies the impact of ownership structure of listing companies in biomedical R&D investment. The result shows a significant negative correlation between ownership concentration and R&D investment intensity in biomedical companies, a significant positive correlation between equity balance degree and R & D investment intensity. And it also shows that R & D investment intensity of State-controlled biomedical enterprises is weaker than the non-state-owned holding biomedical companies.

Keywords: Bio-pharmaceutical industry; R&D intensity; shareholding structure; shareholding concentration; equity balance degree.

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INTRODUCTION

As a representative of the high-tech industries, Bio-pharmaceutical industry has attracted national attention for its impact on public health. Therefore, R&D(research and development, hereinafter referred to as R&D) activities is an important way of knowledge accumulation and technological innovation, which promote the development of enterprises [1].R&D plays an increasingly important role in the economic development process, and R&D activities is becoming the main form of biological pharmaceutical enterprises. R&D expenditure accounts for an increasing proportion of the operating costs. This paper studies the impact of ownership structure on biomedical companies' R&D activities.

EXPERIMENTAL SECTION

1 Research Design
1. 1 The Research Hypothesis
1.1.1Negative Relationship between R&D Investment and Ownership Concentration
Separation of ownership and control is a typical characteristic of the modern enterprise, which brought the principal-agent problem.Though the conflict between shareholders and managers may be weakened by increasing the concentration of ownership, high concentration of ownership will bring conflict between large shareholders and small shareholders. When the largest shareholder equity ratio reaches a certain level, the largest shareholders can get control of the enterprise, and engaged the projects satisfy their own interests.Investors failed to see the long-term benefits brought by R & D activities in the bio-pharmaceutical companies, resulting in weak R&D capability, large shareholders of the company to avoid the risks of research, urging operators to rely on the introduction of foreign products and technology to achieve profitability [2].Based on the above analysis, the first hypothesis is proposed:
Hypothesis 1: Bio-pharmaceutical companies' R&D investment and Ownership concentration have a negative relationship.

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1.1.2 Positive Relationship between R&D Investment and Equity Balance Degree
Many scholars believe that equity balance degree is an effective way to curb speculative behavior of large shareholders.Equity balance degree is to make a number of large shareholders entitled to joint control of the company, which can effectively avoid the major shareholder's individual intervention in the company's decision-making activities [3].Therefore, the major shareholders' pursuit of private interests will be correspondingly weakened.Based on the above analysis, the second hypothesis is proposed:

Hypothesis 2:Bio-pharmaceutical companies' R&D investment and equity balance degree have a positive relationship.

1.1.3 Lower Level of R&D Investment IntensityState-controlled Listing Bio-pharmaceutical Companies
From previous studies we found that the nature of equity would affect R&D investment activities. Unlike the non-state-owned enterprises, China's state-controlled listing companies bear a lot of social responsibility, such as the development of the local economy and improving employment rates [4]. Some state-owned holding company executives are often only concerned about short-term gains. Therefore, the state-owned holding enterprises do not pay attention to R&D investment activities.In bio-pharmaceutical Companies, equity incentive is an important way to encourage R &D staff to work hard. But Chinese equity incentive has just started, and it can only be implemented on a small scale.Many Chinese listing bio-pharmaceutical companies are controlled by the State, so the development of these listing companies tend to be more conservative, in order to achieve short-term goals at the cost of low R&D investment [5]. Based on the above analysis, the third hypothesis is proposed:

Hypothesis 2:State-controlled listing bio-pharmaceutical companies has a lower level of R&D investment intensity than that of the non-state-owned holding companies.

1.2   The Variable Design and Model Building
1.2.1 The Variables Design
(1) The explanatory variables. R&D investment intensity (RDRt). In general,there are two ways to measure the intensity of R&D investment, one is absolute index and the other is relative index.Absolute indicators commonly measure the R&D intensity by logarithmic lnRD, and RD refers to the amount of the enterprise's annual investment in R&D. Relative indicators (R&D intensity) is the ratio of R&D spending to the indicators which reflect business conditions.In this paper, R&D investment intensity is represented by the ratio of R&D investment to the company's main business revenue. The specific formula is: RDRt = annual R&D investment /the company's main business revenue.

(2) Selection of explanatory variables. ①Ownership concentration (HERFt): This article reflects the ownership concentration by the shareholding ratio of the largest shareholder [6].②equity balance degree (EBDt):Equity balance degree primarily reflects the extent of other large shareholders to restrict the largest shareholder.The specific formula is: EBDt = (Σ Shareholding ratio of the top ten shareholders -Shareholding ratio of the largest shareholder) / (Shareholding ratio of the largest shareholder). ③ Nature of equity (SRNt): Figure 1 represents the company is state-owned while the figure 0 for non-state-owned holding.

(3) Selection of control variables. Previous studies have shown there are other factors affecting R&D investment activities, such as corporate performance, enterprise scale and so on.①Corporate performance (ROEt-1), the specific formula is: ROEt-1= (Net profit of the previous year) / (Average of total shareholders' equity value).②The scale of the enterprise(SIZEt-1): Logarithmic function represents the total assets of the previous year, namely Ln (SIZEt-1).

1.2.2Model Building
Construction of the model:

$$RDR_t = \alpha + \beta_1 HERF_t + \beta_2 EBD_t + \beta_3 SRN_t + \beta_4 ROE_{t-1} + \beta_5 SIZE_{t-1} + \varepsilon$$

In the formula, the letter α is a constant; β_i (i = 1,2,3,4) are the regression coefficients, representing the random error; other variables have been introduced in front.

1.2.3 Sample Selection
This paper selects the companies which continued to disclose their R&D investment activities in their financial statements from 2009 to 2012. Screening principles are as follows: Annual financial report continued to disclose the R&D expenditures of the company from 2009 to 2012; Companies lack of variables have been excluded.Based on the above principles this paper screened 185 samples.From 2009 to 2012, the number of samples per year, respectively 41,43,47,54.R&Dexpenditures primarily disclosed in the notes to the financial statements.Other variable data were obtained directly or by calculation from the annual financial statements of listing companies.In this paper, the listing

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company annual report data is obtained from Shanghai Stock Exchange Web site and Cninfo Web site.

1.2.4 Descriptive Statistics of Variables

Descriptive statistics of R&D expenditures of companies shows that R&D investment intensity of the non-state-owned holding companies is significantly higher than the state-owned holding companies. This indicates that the R & D investment activities of non-state-owned holding enterprises are more active than that of state-controlled enterprises [7].By comparing the explanatory variable data from 2009 to 2012, the authors found the average shareholding ratio of the largest shareholder of bio-pharmaceutical companies remained at 36.5%, this value is relatively modest.Through observation, the average equity balance degree is between 60% -90%.Both this ratio and ownership concentration indicate equity balance degree of Chinese bio-pharmaceutical listing corporations is not stable,and these corporations are lack of long-term mechanism to achieve a reasonable balance of the equity which may affect companies make right investment decisions [8].

RESULTS AND DISCUSSION

1 Regression Analysis

Through regression analysis, regression coefficients and significance of each variable is displayed as follows:

Table 1 Model Summary

Model	R	R2	R2 after adjustment	Estimate error
1	.782a	0.611	0.6	1.86103

The letter a in the table above represents the predictor variables:(Constant),SIZEt-1,ROEt-1,SRNt,EBDt,HERFt.

Table 2 Regression Coefficients

Model		Non-standardized coefficients		Standardized coefficients	t	Correlation Sig.	Collinearity statistics	
		B	Std.Error	Beta			Values of tolerance	VIF
1	(constant)	6.247	3.221		1.939	.054		
	SRNt	1.455	.290	.245	5.017	.000	.913	1.095
	HERFt	-.020	.009	-.124	-2.191	.030	.676	1.479
	EBDt	.025	.002	.634	11.761	.000	.750	1.333
	ROEt-1	.031	.011	.138	2.903	.004	.970	1.031
	SIZEt-1	-.310	.156	.102	-1.995	.048	.839	1.191

2 Analysis of the Regression Results
2.1Explanatory Variables

In Table 1, the adjusted R2 has reached 60.0%, indicating a good situation: The explanatory variables can explain 60.0% of the variation in the R&D investment intensity.

2.2 Nature of Equity

The regression results of the nature of equity (SRNt) variables consistent with the assumptions in this paper. The standardized coefficientBETA of SRNt is 0.245, indicating that it has explanatory power. The value of t is 5.017, and the value of sig is 0.000, passed the test of significance of 5%.Therefore, the regression results are meaningful.The value of Standardized coefficient BETA is positive, indicating that non-state-owned enterprises and R&D investment intensity have a significant positive correlation.

2.3Degree of Ownership Concentration

The regression results of variables of the degree of ownership concentration(HERFt) consistent with the assumptions in this paper. The standardized coefficients BETA of HERFt is -0.124, indicating that it has explanatory power. The value of t is -2.191, and the value of sig is 0.03, passed the test of significance of 5%.Therefore, the regression results are meaningful [9]. The value of Standardized coefficient BETA is negative, indicating that when indicators of company size and enterprise performance are fixed, ownership concentration and R & D investment intensity have a negative correlation.

2.4 Variable of Equity Balance

In order to get further verification of the conclusions in this paper, the variable of equity balance degree is introduced.The regression results of variables of equity balance degree(EBDt) consistent with the assumptions in this paper. The standardized coefficients BETA of EBDt is 0.634, indicating that it has explanatory power. The value of t is 11.761, and the value of sig is 0.000, passed the test of significance of 5%.Therefore, the regression results are meaningful.The value of Standardized coefficient BETA is positive, indicating that equity restriction and R&D

investment intensity have a positive correlation.VIF in table 2 refers to variance inflation factor,which work together with tolerance value to assess the influence ofcollinearity.Smaller values of Tolerance and larger values of VIF can indicates collinearity is more significant.

CONCLUSION

1 Negative Correlation between Ownership Concentration and R&D Investment Intensity
First, without considering other factors, there is a negative correlation between ownership concentration and R&D investment intensity, that is the first assumption has been confirmed；And the second assumption has been confirmed by the positive correlation between equity balance degree and R&D investment intensity. Reduction in ownership concentration can increase R & D investment intensity.Combined with the above analysis, China's bio-pharmaceutical listing companies in the ownership concentration varies greatly from 2009 to 2012, indicating that there is no long-term mechanism for equity balance established within the industry, and the lack of constraints largest shareholder is not conducive to the sustainable development of R & D investment. To maintain the vitality of the company's investment in R&D, we must establish a long-term mechanism for equity balance.Higher degree of equity balance can promote the largest shareholder to participate actively in the company's management activities and expand the scale of investment in R&D activities in order to enhance the company's market competitiveness and maintain sustainable development of enterprises.

2 R&D Investment Intensity
Second, R&D investment intensity in the non-state-owned holding enterprises is higher than in the state-owned holding enterprises.Although biopharmaceutical companies affects the national health and the development of bio-pharmaceutical industry has got national attention. But this will not solve the problem faced by the state-owned holding enterprises, such as social responsibility, macroeconomic benefits and so on.And Chinese equity incentive policy has just started, the shareholding ratio of managers in state-owned holding companies has difficult in supporting R&D investment activities in a long term.In such a situation, in addition to continuing to improve the equity allocation reform, equity incentive policies should be used to make the company managers and researchers pay enough attention to R&D activities.Emphasis on R&D activities in investment can guarantee the long-term development of the bio pharmaceutical listing corporations.

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