Ownership structure, firm size, and performance: a panel data investigation of pharmaceutical manufacturing industry in China

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Abstract

This paper uses the data of A-share listed pharmaceutical manufacturing companies in both Shanghai and Shenzhen Stock Exchange in China for the period from 2014 to 2016. The empirical investigation shows that there is a positive correlation between ownership concentration and firm performance, and firm size plays a negative moderator role in the relationship between ownership concentration and firm performance. There is a positive relationship between equity blockholders and firm performance, in which firm size plays a negative moderator role in the relationship between equity blockholders and firm performance. This also shows that for firms in the pharmaceutical manufacturing industry in China, ownership concentration with equity blockholders, i.e. ownership controlled by only a small number of large shareholders, will improve firm performance. We also conclude, however, firms of large size should be more careful in designing its ownership structure and they are advised to keep balance between ownership concentration and equity blockholders so as to reduce the negative moderator role played by firm size.

Keywords: *ownership concentration; equity blockholders; firm size; firm performance*

1 Introduction

Based on studying the managing behavior of the corporate executives, corporate management is mainly concerned with process of leading, administrating and directing a company toward attaining the company's objectives by managers after they have been authorized by the company's owners to do so. Diff8erent from the meaning of corporate management, corporate governance focuses on ownership of the company's owners and studies on the proper authorization to professional managers and effective control and monitoring of the managing behavior of managers of the company.

Berle and Means(1999) were the first to demonstrate the relationship between corporate governance and firm performance[1]. Through a series of technical studies, they argued that the separation of ownership and control is an inevitable trend of the relationship between corporate governance and firm performance for American firms under market economy. Berle and Means also looked into the principal-agent problems associated with the separation, including the two categories: principal-agent problems between owners and managers; principal-agent problems among different owners.

The system of ownership by stock is part of the internal governance structure. The internal governance structure of the company is a hierarchical system arrangement. The system ensures the separation of ownership and control, and establishes a principal-agent balancing relationship of the two to achieve optimal firm performance. This governance structure is a notion to attain optimal balance between internal interests and powers.

After 20 years of economic reform in China's market, the Shanghai and Shenzhen A-share markets have made impressive development, and as more policies on ownership structure of listed companies have been introduced, a large number of listed companies have emerged and their firm performance has been kept improving. The encouraging policies, however, are inadequate in coping with capricious market changes. We have to admit that there are still many listed companies with inadequately designed ownership structure in China, and ownership structure reform is not completed. Some companies feature in single large shareholder, while others feature in a large number of dispersed small shareholders. In 2016, the market is not in good condition. Many companies with dispersed small shareholders were acquired and their ownerships were transferred. Even China Vanke Co., Ltd, one of the largest companies in China, was involved in equity disputes because of its dispersed ownership. There will be both opportunities and challenges for 2017. Companies of different sizes should clearly understand the relationship between ownership structure and business performance. Ownership structure is not only the first thing an emerging company should take into account, but also an urgent issue when the company expands and aims at achieving optimal business performance.

2 Literature review

2.1 Ownership concentration and firm performance

McConnell and Servaes (1990) carried out an empirical investigation into the relationship of equity ownership structure and Tobin's Q, finding a significant curvilinear relation between Q and corporate insider ownership[9]. The results of a study by Bukart, Gromb and Panunzi (1997)

show that higher ownership concentration may negatively affect the value of the firm[2]. Jense and Meckling (1976) argue that the higher the value of internal shareholders, the more likely a positive relationship between internal control concentration and the firm's value[7]. Gao and Yang (2002) investigated 300 Chinese companies in 2001, and concluded that ownership concentration is negatively correlated with firm performance[5]. Tan and Wu (2005) selected more than a dozen industries to carry out regression analysis, and found that less control produces better business performance, and the size of assets is positively related to a firm's efficiency[12].

2.2 Large shareholders and firm performance

Pagano and Roell (1998) argue that equity blockholders are helpful in restricting the dominance of a single large shareholder, forming a multiple monitoring ownership so as to prevent any individual large shareholder from improperly profiting from ownership and improve firm performance[10]. After analyzing the data of German companies, Lehmann and Weigand (2000) demonstrated the negative correlation between large shareholders and firm performance[8]. Yan (2012) argued that the higher the ownership concentration and proportion of large shareholders, the higher the financial risks the firm will face, and the two are negatively correlated[14]. Hao (2007) analyzed A-share firm data from 2003 to 2005 and found a positive correlation between large shareholders and firm performance[6]. Chen and Bian (2015) used data of A-share companies listed on Shanghai or Shenzhen Stock Exchanges and concluded that there is a inverted N-curve like relationship between dispersed internal control and firm income[3].

2.3 Ownership structure, firm size, and firm performance

By surveying firms from three industries on the Shanghai Stock Exchange, Wei et al (2005) pointed out that firm performance has a positive effect on firm size[13]. Cong (2008) incorporated firm size as a prerequisite into her empirical analysis and concluded that firm size is an important factor influencing ownership structure and business income and the relationship between ownership concentration and firm performance does not always present an inverted U-shaped correlation curve[4]. Using samples from manufacturing industry, Quan (2010) selected firm size and ownership structure as independent variables. His empirical analysis results have shown that larger firms are significantly associated with better firm performance and there is a U-shape relationship between the shares held by the largest shareholder and the growth capability of the firm[11]. He also pointed out that the relationship among the three variables differs for firms in different industries.

The literature review indicates that different methods produce different results, and studies on the relationship between ownership structure and firm performance have not reached consistent conclusions.

3 Research hypotheses

3.1 Impact of ownership concentration on firm performance

According to the theory about the first category of principal-agent issues, on the one hand, when ownership concentration is relatively low, the company is controlled by the top largest shareholders, and monitoring can be realized between equity blockholders and managers, so as to reduce agent costs. Appropriate incentive plan help improve the cooperation between managers and shareholders and significantly reduce the negative effects of information asymmetry. On the other hand, when the ownership concentration is high, the largest shareholder has absolutely dominance in controlling the company, and here comes the solution to the second category of principal-agent issues. First, internally speaking, the absolute control by the largest shareholder can reduce the dispersion of information, saving time costs, improving decision-making efficiency, and preventing managers from any deceptive behavior. In this regard, the absolute control by the largest shareholder can improve firm performance. Thus, we derive the following hypothesis:

Hypothesis 1: Firm performance in the pharmaceutical manufacturing industry will be improved as ownership is more concentrated.

3.2 Influencing mechanism of large shareholders on firm performance

To addressing the second kind of principal-agent issues, the theory of blockholder holds that moderate governance structure can monitor the professional managers to reduce agent costs and prevent equity blockholders from harming the minority shareholders' interests. Thus:

Hypothesis 2: Firm performance of pharmaceutical manufacturers will be improved by the strengthening of equity blockholders.

3.3 Moderator role of firm size

Under the current situation of China's capital market, the impact of ownership structure on firm performance is complicated when considering different firm sizes. Hence, we will consider two situations: the ownership of single large shareholder and the ownership structure of several top largest shareholders. Both Shanghai and Shenzhen A-share markets are China's

highest level capital markets. Companies to be listed on A-share markets will have to meet their asset requirements, so these companies are usually large in size and the leaders in their industries. Currently, however, most China's A-share market listed companies have a concentrated ownership. As firm size gets larger, highly concentrated ownership hampers a firm's market operations. Thus, we propose:

3.3.1 Hypothesis 3: In China, firm size plays a negative moderator role in the impact of ownership concentration on firm performance.

3.3.2 Hypothesis 4: Chinese companies' firm sizes play a negative moderator role in the impact of large shareholders on firm performance.

4 Research design

4.1 Sample selection

Our study is mainly focused on the A-share companies listed on both Shanghai and Shenzhen Stock Exchanges. We use data of a period from 2014 to 2016 in our regression models. In processing the data of companies in pharmaceutical manufacturing industry, we excluded ST and * ST companies, and removed companies that cannot provide complete financial data or data concerning ownership structure. We finally obtained samples of more than 1,000 companies and about 5,000 observations, and all the data come from databases by Wind Info.

4.2 Variable definitions

4.2.1 Explained variable

The explained variable (dependent variable) of our investigation is firm performance. As return on assets (ROA) represents the profitability of each asset, the profitability of the common funds of shareholders and creditors, and even the profitability of a firm's assets, we use ROA to measure firm performance.

4.2.2 Explanatory variables

The explanatory variables (independent variables) we use are two indicators related with ownership structure: ownership concentration (CR1, CR5, and CR10) and large shareholders (Z). To thoroughly investigate the issue, we use three proxies to measure ownership concentration: the proportion of the largest shareholder's holdings (CR1), the proportion of the top five shareholders (CR5), and the proportion of the top 10 shareholders (CR10). The indicator Z is composed of five sub-indicators, which are five ratios. These ratios have a

common denominator, which is the proportion of shares held by the largest shareholder. The other five numerators are the proportion of shares held by the 2nd largest shareholder, the sum of share proportions of the 2nd and 3rd largest shareholders, the sum of share proportions of the 2nd to 4th largest shareholders, the sum of share proportions of 2nd to 5th largest shareholders, and the sum of share proportions of 2nd to 10th largest shareholders. Table 1 lists the sub-indicators and their definitions.

Table 1- Sub-indicators of large shareholders

Code	Definitions
Z21	Ratio of the proportion of shares held by the 2nd largest shareholder to the proportion of shares held by the largest shareholder
Z31	Ratio of the sum of share proportions of the 2nd and 3rd largest shareholders to the proportion of shares held by the largest shareholder
Z41	Ratio of the sum of share proportions of the 2nd to 4th largest shareholders to the proportion of shares held by the largest shareholder
Z51	Ratio of the sum of share proportions of 2nd to 5th largest shareholders to the proportion of shares held by the largest shareholder
Z101	Ratio of the sum of share proportions of 2nd to 10th largest shareholders to the proportion of shares held by the largest shareholder

We use principal component analysis to find out the contributions made by each sub-indicator, which are shown in Table 1. Indicators Z21 to Z101 are standardized with STATA 12.0 to maintain their stability, and the principal component analysis results are in Table 2. Only the eigenvalue of the principal component Comp1 are greater than 1, and its contribution to variance is more than 90%. Hence, sub-indicators from Z21 to Z101 has a strong correlation and they can be used to find Z.

Table 2- Principal component analysis results

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	4.68882	4.44334	0.9378	0.9378
Comp2	0.245485	0.192363	0.0491	0.9869
Comp3	0.0531226	0.042303	0.0106	0.9975
Comp4	0.0108197	0.009071	0.0022	0.9997
Comp5	0.0017492		0.0003	1.0000

We also use STATA 12.0 to find the weights of sub-indicators and the results are shown in Table 3. The weighted coefficients of the indicators from Z21 to Z101 are around 0.4, indicating that all the sub-indicators make very strong contribution to Comp1.

Table 3- Analysis of Weight Coefficient of Indicators

Variable	Comp1	Comp2	Comp3	Comp4	Comp5
Z21	0.4271	0.7363	0.4498	0.2683	-0.0329
Z31	0.4564	0.2168	-0.3266	-0.7359	0.3105
Z41	0.4589	-0.0877	-0.4207	0.1214	-0.7681
Z51	0.4557	-0.2662	-0.2966	0.5702	0.5553
Z101	0.4370	-0.5764	0.6527	-0.2158	-0.0647

We then use KMO test to determine the number of sub-indicators and the results are shown in Table 4. Table 4 shows that the KMO value of Z21 is 0.8543 and that of Z101 0.8786, both of which are much greater than the KMO values of the other three sub-indicators, indicating that Z21 and Z101 make the largest contribution to Comp1. To ensure the accuracy of Z value, we choose the weighted sum of two component indexes (Z21 and Z101) to derive the Z index, i.e. Z = 0.4271*Z21 + 0.4370* Z101.

Table 4- KMO test results

Variable	KMO
Z21	0.8543
Z31	0.7496
Z41	0.7153
Z51	0.7322
Z101	0.8786
Overall	0.7763

4.2.3 Moderator variable and control variables

We selected firm size (SIZE) as moderator variable. Many researchers choose the Standard of Small and Medium-sized Industrial Enterprises as reference and use the number of firm employees, sales, or total assets as quantitative indicators of firm size. Considering the availability and the reliability of information disclosure, we use the logarithm of the total assets of listed companies as a measure of firm size.

The control variables in this paper are type of industry and debt-to-asset ratio (DTAR). The industry we have selected is pharmaceutical manufacturing because China's pharmaceutical manufacturing industry is well regulated and, as many companies are restructured state-owned enterprises, their ownership structures are more representative and more in line with national conditions. In addition, because of the highly correlated relationship between capital structure and firm performance, we select debt-to-asset ratio (DTAR) as control variable. The variables are defined in Table 5.

Table 5- Definitions of variables

Variables	Descriptio-ns	Indicator-s	Indicator definitions
Explained variable (dependent variable)	*Firm performan-ce*	ROA	Total asset turnover = net profit / average total assets
Explanatory variables (independent variables)	*Ownershi-p concentrat-ion*	CR1	The proportion of the largest shareholder
		CR5	The sum of the proportion of top five shareholders
		CR10	The sum of the proportion of top 10 shareholders
	Large shareholde-rs	Z	Comprehensive index
Moderator variable	*Firm size*	SIZE	LOG value of the total assets
Control variable	*Debt to asset ratio*	DTAR	Total liabilities / total assets

4.3 Model specification

Based on the above theoretical analysis, variables including ownership concentration, large shareholders, firm size and others are factors that have effects on firm performance. According to the definitions of variables in section 4.2, we have determined the dependent variable, independent variables, and moderator variable in the model. The following eight models are established to examine the relationships between the variables.

- Model 1: $ROA = \alpha + \beta 1CR1 + \beta 2SIZE + \beta 3DTAR$;
- Model 2: $ROA = \alpha + \beta 1CR5 + \beta 2SIZE + \beta 3DTAR$;
- Model 3: $ROA = \alpha + \beta 1CR10 + \beta 2SIZE + \beta 3DTAR$;
- Model 4: $ROA = \alpha + \beta 1CR1 + \beta 2SIZE + \beta 3CR1*SIZE + \beta 4DTAR$;
- Model 5: $ROA = \alpha + \beta 1CR5 + \beta 2SIZE + \beta 3CR5*SIZE + \beta 4DTAR$;
- Model 6: $ROA = \alpha + \beta 1CR10 + \beta 2SIZE + \beta 3CR10*SIZE + \beta 4DTAR$;
- Model 7: $ROA = \alpha + \beta 1Z + \beta 2SIZE + \beta 3DTAR$;
- Model 8: $ROA = \alpha + \beta 1Z + \beta 2SIZE + \beta 3Z*SIZE + \beta 4DTAR$

4.4 Regression analysis

4.4.1 Descriptive analysis

The descriptive statistical analysis results of the data with STATA 12.0 are shown in Table 6, which indicates that the gap between firm performances (ROA) is large. From 2014 to 2016, the performance of A-share listed pharmaceutical manufacturing companies is not stable. The means of CR1, CR5, and CR10 are 33.237, 52.803, and 58.841 respectively. The standard deviation, minimum, and maximum values of Z index are 0.817, -1.081, and 4.207

respectively, and the mean value is too small. There are also large gaps in firm size and debt to asset ratio.

Table 6- Descriptive summary

Variable	Mean	Std. Dev.	Min	Max
ROA	6.894	5.160	0.010	58.702
CR1	33.237	13.913	3.62	89.41
CR5	52.804	14.346	10.76	100
CR10	58.841	14.093	12.72	100
Z	–	0.817	-1.081	4.207
SIZE	9.536	0.468	8.110	11.878
DTAR	37.778	19.452	0.906	95.260

4.4.2 Correlation analysis

We use STATA 12.0 for correlation analysis, and the correlation between variables is shown in Table 7.

Table 7- Correlation analysis

Varia-bles	ROA	CR1	CR5	CR10	Z	SIZE	DT-AR
ROA	1						
CR1	0.109	1					
CR5	0.194	0.701	1				
CR10	0.207	0.583	0.949	1			
Z	-0.0003	-0.699	-0.092	0.055	1		
SIZE	-0.074	0.068	-0.012	-0.029	-0.059	1	
DTA-R	-0.211	0.085	-0.018	-0.063	-0.130	0.551	1

Table 7 indicates that ownership concentration is positively correlated with firm performance. The correlation coefficients of CR1, CR5 and CR10 are 0.109, 0.194 and 0.207 respectively. Index Z is negatively correlated with firm performance. It shows that the relationship between large shareholders and firm performance contradicts Hypothesis 2. As the correlation analysis only concerns the correlation of variables in pair, the specific relationship need to be further tested in the model.

4.4.3 Regression analysis

Prior to the multivariate regression analysis of the panel data from 2014 to 2016, we use STATA 12.0 for Hausman test to determine the approapriate model. According to Hausman test results, we choose to use fixed effect model.

Table 8 shows that CR1, CR5 and CR10 are positively correlated with firm performance in Model 1-3 with correlation coefficients of 0.073, 0.132, and 0.136. Positive correlation is

significant at the 0.01 level, and the models have been approved for the significance test. It can be concluded that there is a positive correlation between ownership concentration and firm performance, verifying the Hypothesis 1. Models 4-6 examines the moderator role of firm size. The moderator coefficients are -0.057, -0.065, and -0.097 respectively, and the models passed the significance test at 0.01 level. Hence, firm size plays a negative moderator role in the relationship between all the three ownership concentration indicators (CR1, CR5, and CR10) and firm performance. As the firm expands, the positive effect of ownership concentration on firm performance will be weakened. This conclusion verifies Hypothesis 3.

As shown in Table 8, results of Model 7 indicate that large shareholders (Z) are positively correlated with firm performance, with correlation coefficient of 0.454 and significance level of 0.01. The adjusted R-square of Model 7 is 0.163 with F-value of 5.15, and the equation in Model 7 is valid. Large shareholders are positively correlated with firm performance, validating Hypothesis 2. The results of Model 8 show that the interaction term of large shareholders and firm size is significantly negatively correlated with firm performance, with correlation coefficient of -0.681, adjusted R-square of 0.066, and F-value of 5.15. The Hypothesis 4 has been accepted.

Table 8- Linear Regression Results

Variables/ Model	Mod-el 1	Mod-el 2	Mod-el 3	Mod-el 4	Mod-el 5	Mod-el 6	Mod-el 7	Mod-el 8
	ROA	*ROA*	*ROA*	*ROA*	*ROA*	*ROA*	*ROA*	*ROA*
CR1	0.073***			0.073***				
CR5		0.132***			0.124***			
CR10			0.136***			0.125***		
Z							0.454***	0.451**
SIZE	-4.924***	-4.732***	-5.682***	-4.921***	-4.537***	-5.121***	-5.843***	-5.765***
DATR	0.025***	0.026***	0.035***	0.024***	0.026***	0.032***	0.034***	0.034***
*CR1*SI-ZE*				-0.057**				
*CR5*SI-ZE*					-0.065***			
*CR10*SIZE*						-0.097***		
*Z*SIZE*								-0.681*
R-sq	0.071	0.109	0.111	0.073	0.113	0.120	0.063	0.066
F-value	5.10	5.24	5.25	5.11	5.23	5.25	5.15	5.15
*** p<0.01, ** p<0.05, * p<0.1								

4.4.4 Robustness test

To test the robustness of the models, we substitute ROE for ROA to measure the independent variable, firm performance, and keeping the explained variable and other explanatory variables unchanged. The regression analysis results are in Table 9:

Table 9- Robustness test

Variables /Model	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
	ROE	*ROE*	*ROE*	*ROE*	*ROE*	*ROE*	*ROE*	*ROE*
CR1	0.104***			1.437***				
CR5		0.129***			1.781***			
CR10			0.135***			1.774***		
Z							1.452***	1.026**
SIZE	-1.621***	-1.490**	-1.365**	-5.211**	-4.634**	-4.058**	-1.664**	-1.693***
DAT-R	0.035***	0.046***	0.053***	0.630**	0.843***	0.966***	0.037**	0.037***
CR1*SIZE				-0.131*				
CR5*SIZE					-0.120**			
CR10*SIZE						-0.244***		
Z*SI-ZE								-0.057*
R-sq	0.117	0.102	0.111	0.117	0.112	0.112	0.123	0.123
F-val-ue	19.35	16.77	18.26	19.47	16.82	18.18	20.42	20.13
*** p<0.01, ** p<0.05, * p<0.1								

As can be seen from Table 9, all the hypotheses have been verified, proving that the models are stable. In addition, by comparing the significance of the indicators, we find that the goodness of fit of firm performance as measured by ROA is better than that as measured by ROE, proving that ROA is a right choice for our analysis.

5 Conclusions and implications

5.1 Conclusions

Based on the data of the pharmaceutical companies listed in Shanghai and Shenzhen A shares markets, we analyze the relationship among ownership concentration, large shareholders, and firm performance during the period of 2014–2016, and by adding firm size as moderator variable, we also explore the moderator role the firm size plays in the relationship between ownership structure and firm performance. The conclusions we have reached are in line with the hypotheses we have proposed in this paper: there is a positive correlation between ownership structure and firm performance, and firm size plays a negative moderator role in this correlation.

5.2 Future investigation

The analysis results have proved a success in our data processing and are consistent with the theoretical results of this paper, but there are still some points that need to be improved: 1) the data only concern with A-share listed pharmaceutical manufacturing companies and their scope is limited; 2) all the models are of multiple linear regression, without taking into account of the possibility of U-shape relationship; 3) only two kinds of variables are taken into consideration for the reason of data availability; 4) the substitution of ROE with ROA to measure firm performance makes the conclusion a little less convincing. These limitations of this paper, however, will provide many future investigation opportunities for interested researchers.

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