Major Shareholders' Shareholding Ratio on Corporate Investment Efficiency

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Abstract. Investment efficiency, a key indicator of core competitiveness, directly impacts a company's long-term value and risk resilience. The largest shareholder's shareholding ratio, due to its profound influence on corporate control, decision-making mechanisms, and agency problems, has become a key internal factor shaping a company's investment decisions. This paper uses a sample of Chinese A-share listed pharmaceutical and biological companies from 2020 to 2024 as a research sample. Using multiple regression analysis and the absolute value of the residuals from the Richardson model to measure investment efficiency, this paper empirically examines the impact of the largest shareholder's shareholding ratio on corporate investment efficiency. The results show that among listed companies in the pharmaceutical and biological industry, there is no significant linear relationship between the largest shareholder's shareholding ratio and corporate investment efficiency. This result may be due to factors such as the combined offsetting effects of the two opposing mechanisms of "interest synergy" and "tunneling effect" brought about by concentrated ownership. This study provides a foundation for further theoretical research and the refinement of empirical methods and has practical implications for optimizing corporate governance structures and improving resource allocation efficiency.

Keywords: Pharmaceutical and biological companies; investment efficiency; major shareholder shareholding ratio.

1. Introduction

As a strategic emerging industry related to national health and the forefront of science and technology, the pharmaceutical and biological industry presents an overall pattern of expanding scale and continuous innovation [1]. The maintenance and leap of this development trend is highly dependent on continuous, stable and efficient capital investment. Lakdawalla pointed out that the pharmaceutical and biological industry has significant characteristics such as huge Research and Development (R&D) investment, long cycle, and strict policy supervision [2]. This makes every investment decision within the enterprise particularly critical and sensitive. Any mistake in resource allocation may cause huge financial losses and time costs, and even affect the survival and development of the enterprise.

In this context, the level of investment efficiency has become an important yardstick for measuring the core competitiveness of pharmaceutical and biological enterprises, which directly determines the long-term value of the enterprise. The research of Ahsan et al. strongly supports this point. They found that higher investment efficiency can effectively drive enterprises to achieve excellent financial returns and significantly promote the growth of shareholder wealth [3]. More importantly, efficient investment is not only related to returns, but also a solid barrier for enterprises to resist and resolve various internal and external risks. In an uncertain market environment and under stringent regulatory requirements, precise and efficient investment is the core capability for enterprises to avoid risks such as R&D failure, market fluctuations, and policy adjustments and achieve stable and sustainable development. Focusing on the internal mechanisms that affect corporate investment decisions, corporate governance structure, especially the arrangement of equity structure, is generally regarded as the core element in shaping corporate business strategy and resource allocation efficiency [4]. Among them, the shareholding ratio of the largest shareholder is the most intuitive manifestation of equity concentration. Because of its profound impact on corporate control, decision-making mechanisms and agency problems, it naturally becomes a key entry point

for studying corporate behavior. Existing empirical literature has explored the relationship between equity concentration and investment efficiency, but the conclusions are not consistent, and there is a relative lack of research specifically targeting the high-characteristic industry of pharmaceuticals and biology. The characteristics of this industry, such as high free cash flow, may make the mechanism and intensity of the impact of the shareholding ratio of major shareholders on investment efficiency significantly different from other industries, which is worthy of in-depth exploration. Based on the in-depth consideration of the above research background, industry characteristics and existing literature gaps, this paper uses the data of Chinese A-share pharmaceutical and biological listed companies from 2020 to 2024 as a sample to empirically test the specific impact of the shareholding ratio of the largest shareholder on corporate investment efficiency. By focusing on this highly characteristic industry, the possible marginal contributions of this article are: first, revealing the unique pattern of how the shareholding ratio of major shareholders in the pharmaceutical and biological industry affects investment efficiency; second, providing a decision-making basis for related companies to optimize their equity structure to promote high-quality development of the industry.

2. Theoretical Analysis and Research Hypothesis

The core contradiction of corporate investment efficiency stems from the conflict of interests under the principal-agent relationship. When equity is highly concentrated, the shareholding ratio of major shareholders has a dual impact on investment decisions [5]. According to the interest synergy hypothesis, an increase in the shareholding ratio helps the interests of major shareholders converge with corporate value, and their supervisory motivation may suppress the agency problem of management, thereby improving investment efficiency [6]. However, the tunnel effect theory points out that as the control of major shareholders increases, their motivation to seek private control will become more prominent. Controlling shareholders may implement complex ownership arrangements such as separation of rights and interests, cross-holdings, and pyramid-shaped equity structures, or use related transactions to transfer interests, thereby hollowing out listed companies and damaging investment efficiency [7].

Drawing on the research of Xu Chenxi et al. and Zeng Ni, it is found that, in addition to the equity structure, corporate investment efficiency is constrained by multiple factors [8]. High management expense ratios reflect a failure of supervision and can easily induce managers to overinvest in pursuit of scale expansion; excessive financial leverage exacerbates financing constraints, forcing companies to abandon high-quality investment projects, while too low leverage may stimulate irrational investment due to cash flow hoarding; the level of operating cash flow constitutes a hard constraint on investment capacity; and the size and growth of the company change the cost of capital by affecting the degree of information asymmetry, thus restricting the efficiency of resource allocation [9].

In terms of the comprehensive theoretical mechanism, the negative effects of large shareholders' holdings often dominate: the control advantage enables them to circumvent governance checks and balances and maximize private benefits through targeted investment [10]. Based on the above analysis, hypothesis H1 is proposed:

H1: The shareholding ratio of the largest shareholder is negatively correlated with the investment efficiency of the company.

3. Research Design

3.1. Sample Selection and Data Source

This paper uses data from A-share pharmaceutical and biological listed companies from 2020 to 2024 as its sample. The following processing was performed: companies with a listing time of less than one year, all ST or *ST status, and companies with significant data missing were excluded. This

resulted in a sample of 1,778 companies. The research data primarily comes from the China Stock Market & Accounting Research (CSMAR) database.

3.2. Variable Definition

Referring to Richardson's definition of investment efficiency, the absolute value of the residual obtained from the regression model is used as the explained variable. The explanatory variable, the largest shareholder's shareholding ratio, is the shareholding ratio of the shareholder holding the most shares in the company. Control variables include cash flow intensity, management expense ratio, financial leverage, return on total assets, company size, growth, and year. Detailed variable definitions are shown in Table 1.

Table 1. Variable definition table

Variable Type	Variable Name	Variable Symbols	Variable Meaning
Explained Variable	Investment efficiency	InvEff	Absolute value of the Richardson model residual
Explanatory Variable	Shareholding ratio of the largest shareholder	Top1	Shareholding ratio of the shareholder holding the largest number of shares in the company
Control Variables	Cash flow intensity	Profit	Net cash flow from operating activities/total assets
	Management expense ratio	Mfee	Administrative expenses/operating income
	Financial leverage	Lev	Total liabilities/total assets
	Return on total assets	ROA	Net profit/total assets
	Enterprise size	Size	Natural logarithm of the company's total assets at the end of the period
	Growth potential	Growth	Tobin's Q
	Year	Year	Year dummy variable

3.3. Model Building

This paper constructs the following regression model to test:

$$InvEff_{i,\ t}=n_0+n_1Top1_{i,t}+n_2Profit_{i,t}+n_3Mfee_{i,t}+n_4Lev_{i,t}+n_5ROA_{i,t}+n_6Size_{i,t}+n_7Growth_{i,t}+\sum Year+\varepsilon_{i,t} \quad (1)$$

Where i represents the company and t represents the year. InvEff represents investment efficiency; Top1 represents the largest shareholder's shareholding; Profit represents cash flow intensity; Lev represents financial leverage; return on total asset (ROA) represents return on total assets; Size represents firm size; and Growth represents growth potential, expressed as Tobin's Q.

4. Empirical Research

4.1. Descriptive Analysis

As shown in Table 2, the sample size for each of the eight variables was 1,778. The mean of InvEff is 3.23%, with a median of only 2% and a standard deviation of 4.6%, indicating that most companies have low investment efficiency and a right-skewed distribution. A few companies have overinvestment, reaching as high as 81%. The mean of Top1 is 30.21% and the median is 27.78%, but the range of 3.08% to 77.08% and the standard deviation of 12.82% reveal significant differences in equity structure among companies. The mean of Profit is 6.74%, showing a relatively symmetrical distribution, but with some negative values and outliers of excessive holdings. The mean of Mfee is 0.17%, significantly deviating from the median of 0.08%. Combined with a maximum value of 114.88% and a high standard deviation of 2.727, this suggests that the majority of companies have minimal

Mfee ratios. Lev has a mean of 33.64% and a median of 30%, ranging from 1% to 158%, indicating a divergence in corporate debt strategies, but overall, risk is manageable. The mean of ROA is 3.97%, close to the median of 4%. However, the extreme values of -93% to 76% and the standard deviation of 10.2% reveal a severe polarization of profitability. Size has a mean of 22.27, a standard deviation of 1.085, and a stable range of 18.73 to 26.12, indicating that the sample is primarily composed of medium-sized enterprises. Growth has a mean of 245.5%, far exceeding the median of 185%, with a high standard deviation of 206.8% and a maximum of 2917%, confirming that high-growth companies significantly elevate the overall performance, resulting in an extremely right-skewed distribution.

Table 2. Descriptive statistics

VarName	Obs	Mean	SD	Min	Median	Max
InvEff	1778	0.0323	0.046	0.00	0.02	0.81
Top1	1778	30.2060	12.820	3.08	27.78	77.08
Profit	1778	0.0674	0.083	-0.65	0.06	0.84
Mfee	1778	0.1731	2.727	0.00	0.08	114.88
Lev	1778	0.3364	0.196	0.01	0.30	1.58
ROA	1778	0.0397	0.102	-0.93	0.04	0.76
Size	1778	22.2677	1.085	18.73	22.17	26.12
Growth	1778	2.4553	2.068	0.65	1.85	29.17

4.2. Correlation Analysis

Table 3. Correlation analysis table

	InvEff	Top1	Profit	Mfee	Lev	ROA	Size	Growth
InvEff	1							
Top1	-0.00200	1						
Profit	0.117***	0.054**	1					
Mfee	-0.00500	-0.0340	-0.080***	1				
Lev	-0.0250	-0.074***	-0.219***	-0.0280	1			
ROA	0.139***	0.141***	0.681***	-0.065***	-0.363***	1		
Size	-0.134***	0.0300	0.111***	-0.0390	0.235***	0.148***	1	
Growth	0.106***	0.044*	0.218***	-0.00500	-0.148***	0.211***	-0.170***	1

As shown in Table 3, InvEff is significantly positively correlated with Profit (0.117), indicating that companies with ample funds are more likely to expand investment. Its positive correlation with Growth (0.106) further supports the logic that high growth drives investment expansion. Its significant negative correlation with Size (-0.134) suggests that large companies may face diminishing marginal returns on investment. The impact of Top1 is relatively weak, showing only a slight positive correlation with Profit (0.054) and Growth (0.044). Top1, however, is significantly negatively correlated with Lev (-0.074), reflecting the tendency of major shareholders to avoid high debt. Profit is the core pivot variable. Its strong positive correlation with ROA (0.681) supports a virtuous cycle of "cash-earnings". Its significant negative correlation with Lev (-0.219) highlights the squeeze of cash resources by debt. It also has a weak negative correlation with Mfee (-0.080).

4.3. Benchmark Regression

As shown in Table 4, the coefficient of influence of Top1 on InvEff is only 0.0002, and its p-value is not statistically significant (standard error 0.0004). This result indicates that the proportion of major shareholders holding shares has no linear effect on investment efficiency. Therefore, based on the current model, there is no significant linear relationship between Top1 and InvEff.

The lack of a significant impact of Top1 may stem from a variety of complex reasons. First, in terms of theoretical mechanisms, concentrated ownership may simultaneously produce two conflicting effects: reducing agency costs and improving efficiency, and large shareholders' misappropriation of resources and reducing efficiency. The net effect may be very weak or even offset

by the other. Second, the model may contain omitted variable bias. For example, key factors such as the nature of corporate ownership, industry competitiveness, or management power are not adequately controlled, resulting in the true effect of the Top1 factor being confounded or obscured. Finally, the model may ignore potential nonlinear relationships. For example, the impact of the Top1 factor may have a threshold effect, and a simple linear model cannot effectively capture this complex curve shape.

Table 4. Benchmark regression results

	InvEff
Top1	0.0002
	(0.0004)
Profit	0.053**
	(0.023)
Mfee	0.024
	(0.021)
Lev	0.008
	(0.018)
ROA	0.095***
	(0.019)
Size	-0.005
	(0.007)
Growth	0.001
	(0.001)
_cons	0.131
	(0.159)
Firm FE	YES
Year FE	YES
N	1778.000
r2	0.091

To deepen the research and enhance the reliability of the results, the following optimization approaches can be taken: First, researchers can test the nonlinear relationship between Top1 and InvEff. Researchers can add a squared Top1 term to the model ($InvEff = \beta_1 Top1 + \beta_2 Top1^2 + controls$) to verify the existence of an inverted U-shaped or other curvilinear relationship. Second, researchers can examine group heterogeneity. Group regressions can be conducted by firm ownership (state-owned or private), industry (high-tech or traditional manufacturing), or scale to reveal potential opposing effects across subsamples. Moreover, researchers can optimize the sample. Researchers can winsorize continuous variables such as Top1 and Mfee at the 1% level to reduce the influence of extreme outliers. Furthermore, researchers can consider replacing core variables. For example, researchers can use the degree of separation of ownership and control, which more accurately measures the motivations of large shareholders, as an alternative indicator. Finally, researchers can enhance the model specification. By controlling for corporate governance variables such as board characteristics or management incentives, researchers can further reduce omitted variable bias and enhance the robustness of the research.

5. Conclusion

This paper uses Chinese A-share pharmaceutical and biological listed companies from 2020 to 2024 as a research sample. By constructing a multivariate regression model, researchers systematically conduct descriptive statistical analysis and intervariate correlation tests. The results show that the key variable, the largest shareholder's shareholding ratio, does not have a statistically significant effect on the investment efficiency of the company, thus failing to support the hypothesis that the largest shareholder's shareholding ratio is negatively correlated with investment efficiency.

Possible reasons for this finding include overly complex theoretical mechanisms, flawed model specifications, or neglect of nonlinear relationships.

Based on these findings and the analysis of the underlying causes, future research on this topic could explore alternatives to core variables or changes in model specifications. The value of these systematic follow-up studies lies not only in effectively clarifying the empirical disagreements in the current literature on the relationship between large shareholder ownership and investment efficiency, but also in providing a more solid evidence base for academic debate. Furthermore, by accurately identifying the key governance factors and mechanisms that influence the capital allocation efficiency of pharmaceutical and biological companies, the research findings can provide targeted theoretical guidance and practical insights for regulators to optimize relevant governance standards, for corporate boards and management to improve internal decision-making and oversight mechanisms, and for investors to conduct value assessments. Ultimately, this paper will contribute insights that have both academic depth and practical value to promote higher quality and more sustainable development of China's pharmaceutical and biological industry.

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