Analysis of the Impact of Ownership Structure before IPO on the Valuation of Domestic Semiconductor Companies

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Abstract. The valuation of semiconductor listing financing is one of the key issues in current research. The researchers have found that science and technology policies and enterprise size are of great significance to corporate financing, and have improved the model to better value the semiconductor industry. However, for the domestic semiconductor financing valuation, there is a lack of analysis from the perspective of equity structure heterogeneity. Therefore, this paper studies from the perspective of founder and management shareholding, state-owned shareholding, and the interaction effect of the two. The research methods of this paper are as follows. This paper studies 50 semiconductor companies listed on China's A-share scientific and technological innovation board from 2020 to 2025, and makes descriptive statistical analysis, second-order polynomial regression analysis and correlation analysis on the data. The study found that the shareholding combination of founders and state-owned shareholders would be significantly different. Based on the research results, the study suggests that semiconductor companies should pay attention to the optimization of ownership structure governance and straighten out the relationship of mixed ownership to give better play to the equity synergy mechanism. Future research will further deepen the research on the interaction between founders and state-owned shares and expand the exploration of the impact of other types of ownership structures on valuation.

Keywords: Semiconductor, Ownership Structure, Listed Financing, Valuation Level, Signal Transmission

1 Introduction

In recent years, as an industry with both core growth momentum and systematic strategic value, the semiconductor is developing at an unprecedented speed. According to the preliminary statistics of Gartner, a business and technology insight company, the global total revenue of semiconductors has reached US$793 billion in 2025, which is larger than the economic aggregate of most countries in the world. In terms of the Chinese market, the demand for chips in industry 4.0, robotics, intelligent equipment and other fields continues to increase. From the national tax relief, targeted subsidies,

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acting as patient capital through the guidance fund, to the local government bringing dividends in combination with characteristic advantages, the policy has given great support to the semiconductor industry. Affected by these factors, China's semiconductor industry presents a multi-dimensional dynamic development trend. However, most of China's semiconductors are enterprises in the initial or early stage of development. Their business scale is relatively small, and their business structure has not been fully determined. They have the characteristics of high growth and high risk, high R&D investment, and a large proportion of intangible assets, showing the urgency of high-level financing requirements[1]. Among them, the ownership structure, as the key role of listed companies' financing, has high research value.

Mirzaei et al.studied TSE small and medium-sized enterprises and realized the importance of enterprise scale and intangible assets to SME financing [2]. Ong et al. found the importance of institutional investors in IPO valuation by studying listed companies on the Malaysian Stock Exchange[3]. Xu et al. took the pilot implementation of China Industrial Technology Innovation Strategic Alliance (CITISA) as the background to explain the importance of science and technology policy for enterprise IPO [4]. Peng et al. believe that the dual ownership structure has greater financing constraints on enterprises[5]. Chu Cheng et al.used the improved Schwartz moon model, GRNN neural network model, and other methods to evaluate the value of semiconductor enterprises[6,7]. At present, few scholars analyze the IPO of companies from the heterogeneity of ownership structure, especially in the semiconductor field. And the evaluation of the value of China's semiconductor enterprises focuses on the method level. Therefore, this study is innovative in both market selection and research perspective. This paper uses the second-order polynomial regression model to study the impact of founder and management shareholding, state-owned shareholding and their interaction on the listing valuation of Chinese semiconductor companies. The research provides more references for the optimization of ownership structure governance of semiconductor companies, straightening out the relationship of mixed ownership, and expanding ideas for the choice of China's equity system. The research also supplements the data for the Chinese market for research in related fields.

Based on the research on the IPO of 50 semiconductor companies listed in China from 2020 to 2025, this paper analyzes the impact of different types of shareholders on the valuation of companies, and attempts to use data to show the relationship between semiconductor listing financing and ownership structure. This paper is expanded as follows. The second part describes the research design and method, and the third part uses the model to calculate the results. The fourth part summarizes the research.

2 Methodology

2.1 Variable Definition

The explanatory variable of this study is the company valuation level, which is measured by the logarithm of price earnings ratio (Ln PE) and the logarithm of price to book ratio (Ln PB). The explanatory variables are the logarithm of state-owned shareholding ratio (LnCStateHold) and the logarithm of management and founder

shareholding ratio (LnCFounderHold), which are used to test the impact of state-owned equity and management equity on enterprise valuation, respectively. Among them, state-owned shareholders include the central enterprise background fund, local state-owned assets platform and government guidance fund. The management and founder shareholders include actual controllers, directors, senior managers and key employee stock ownership platforms. The control variables are the logarithm of total asset net interest rate (Ln ROA) and asset liability ratio (LEV) to represent the profitability and solvency of the company, respectively, and eliminate the interference of enterprise characteristic factors on the regression results. See Table 1 for detailed definitions and calculation methods of each variable.

Table 1. Variable Definition

Type of Variable	Symbol	Variable Definition
Explained Variable	Ln PE	Measure the valuation level of the market on corporate profits, and take the natural logarithm to alleviate heteroscedasticity.
	Ln PB	Measure the valuation level of the market on the net assets of enterprises, and take the natural logarithm to alleviate heteroscedasticity.
Explanatory Variable (original)	FounderHold	Measure the equity control of founders and management
	StateHold	Measuring the degree of equity control of state-owned shareholders
Explanatory Variable (centralization)	LnCFounderHold	The logarithm of founders' shareholding after centralized treatment is used to alleviate multicollinearity
	LnCStateHold	The logarithm of shares held by state-owned shareholders after centralized treatment is used to alleviate multicollinearity
Explanatory Variable (nonlinear term)	LnCFounderHold_Sq	Inverted U-shaped nonlinear effect of founder shareholding on valuation
	LnCStateHold_Sq	Testing the inverted U-shaped nonlinear effect of state-owned shareholding on valuation
Explanatory Variable (interactive term)	Interact_C	Used to test the interaction effect between founders' shareholding and state-owned shareholders' shareholding
Control Variable	Ln ROA	Measuring the impact of corporate profitability on valuation
	LEV	Measuring the level of financial leverage and operational risk of enterprises

2.2 Data Source and Sample Selection

Considering the reliability of data and the representativeness of the industry, this paper selects 50 Chinese companies listed on the A-share science and innovation board from January 1, 2020, to December 31, 2025, which are classified as semiconductors by Dongcai. The data comes from the Wind Financial Terminal, the Choice Financial Terminal and the company prospectus. In recent years, the domestic semiconductor industry has entered a stable period of large-scale and independent innovation, and the industrial chain structure, corporate governance and information disclosure have become increasingly standardized. The policy and external environment tend to be stable, and the fluctuations of valuation and equity structure are reduced, which can better reflect the development law of the industry. It is more authoritative and reliable to select samples according to the Dongcai classification.

2.3 Research Methods and Tools

The study uses descriptive statistical analysis, regression analysis, correlation analysis, cross-sectional data analysis and other analysis methods to comprehensively analyze the relationship between listed financing valuation and equity types. With the help of the Python data analysis tool, this study uses the pandas library, Scipy library and Statsmodels library to complete data analysis. At the same time, this study uses Excel to realize the visualization and preservation of the results.

2.4 Modelling

In order to test the impact of management shareholding and state-owned shareholding on enterprise valuation, this paper constructs the following second-order polynomial regression model.

$$\begin{aligned} LnPE = {} & \alpha + \beta_1 Ln\,CFounderHold + \beta_2 Ln\,CStateHold \\ & + \beta_3 (Ln\,CFounderHold)^2 + \beta_4 (Ln\,CStateHold)^2 \\ & + \beta_5\, Interact_C + \beta_6 Ln\,ROA + \beta_7 LEV + \varepsilon \end{aligned} \tag{1}$$

$$\begin{aligned} LnPB = {} & \alpha + \beta_1 Ln\,CFounderHold + \beta_2 LnCStatehold \\ & + \beta_3 (Ln\,CFounderHold)^2 + \beta_4 (Ln\,CStateHold)^2 \\ & + \beta_5 Interact_C + \beta_6 Ln\,ROA + \beta_7\, LEV + \varepsilon \end{aligned} \tag{2}$$

α=constant，β1-β7=coefficient，ε=random error term

3 Empirical Results

3.1 Data Processing and Descriptive Statistics

By eliminating the missing samples of key variables, non-positive samples of valuation, scale and other variables from the samples, and eliminating the extreme value of | Z | >2.5 with the Z-score method, 41 effective samples were finally obtained. Through data processing, the descriptive statistical results are shown in Table 2.

Table 2. Descriptive statistics

Variable	N	Mean	Std	Min	Q1	Median	Q3	Max
Ln PE	41	4.14	0.79	2.88	3.58	4.07	4.60	6.06
Ln PB	41	1.13	0.34	0.15	1.00	1.16	1.28	1.94
StateHold	41	26.76	17.45	6.01	13.32	23.44	43.25	73.79
FounderHold	41	41.11	16.95	11.90	30.61	39.99	49.49	86.21
Ln ROA	41	-2.35	0.82	-4.21	-2.88	-2.34	-1.64	-0.92
LEV	41	0.28	0.18	0.06	0.12	0.23	0.42	0.61

According to Table 2, in terms of company valuation, the average and median of Ln PE and Ln PB are close, indicating that the distribution of valuation levels of the sample companies is relatively symmetrical, and the overall stability and the degree of differentiation are controllable. According to the comprehensive mean and median judgment, the overall shareholding level of the management and founders is much higher than that of the state-owned shareholding, and some enterprises have achieved a high degree of control by the management. In terms of the company's financial characteristics, the average of Ln ROA is negative, reflecting that the overall profitability of the industry needs to be improved.

3.2 Correlation Analysis and Interpretation Ability Analysis

The results of the Spearman rank correlation coefficient analysis are shown in Table 3.

According to Table 3, there is a significant positive correlation between the explained variables, and the market valuation direction of the two is basically the same. The founder_hold is negatively correlated with Ln PE (coefficient=-0.254), and it is speculated that the market is relatively conservative about its profit growth cycle. The state_hold is positively correlated with Ln PE (coefficient=0.374), indicating that the market is more confident in the profit expectation of state-owned enterprises. The low correlation between the explained variable and Ln PB is mainly due to the limited sample size in this paper.

Table 3. Spearman rank correlation coefficient matrix

	Ln PE	Ln PB	Interact_C	Ln ROA	LEV
Ln PE	1	0.505	-0.098	0.142	-0.106
Ln PB	0.505	1	-0.419	0.367	-0.147
LnCFounderHold	-0.254	0.079	-0.211	-0.019	-0.413
LnCStateHold	0.374	-0.019	0.177	0.272	0.018
Interact_C	-0.098	-0.419	1	-0.070	0.221
Ln ROA	0.142	0.367	-0.071	1	-0.331
LEV	-0.106	-0.147	0.221	-0.331	1

Table 4. Summary of Core R2 Values

Model	R^2	Adjusted R^2	F-statistic P value	sample size
Ln PE model_C	0.2581	0.1007	0.1588	41
Ln PB model_C	0.33	0.1878	0.0484	41

According to Table 4, the model interpretation is limited due to the restriction of sample size and cross-sectional data. The explanatory variables in the PE model can explain about 10.07%. The ability of PB model to explain the variation of PB ratio is about 18.78%, and the fitting degree is better than that of the PE model. Because the p-value of F statistic of the PB model fails to pass the significance test, the next regression model analysis is only for PB.

3.3 Analysis of Regression Results

According to Table 5, the regression coefficients of founder and management shareholding and state-owned shareholding fail to pass the significance test, indicating that their impact on PB is not statistically significant. The main reason is that the sample size is limited. The significant level of equity interaction is high (coefficient=-0.7739), indicating that the interaction between founders' shareholding and state-owned shareholders' shareholding will significantly inhibit the PB ratio. The control variable fails the significance test.

Table 5. Ln PB_centered OLS Regression Results

	coefficient	SE	T-statistics	LCI 95%	UCI 95%	P value
Constant	0.8737***	0.2391	8.2876	0.3872	1.3603	0.0009
LnCFounderHold	-0.0569	0.1827	-2.0411	-0.4286	0.3148	0.7573
LnCStateHold	-0.0231	0.088	1.0422	-0.2022	0.156	0.7948
LnCFounderHold_Sq	-0.4876	0.2764	-1.7788	-1.0499	0.0747	0.087
LnCStateHold_Sq	-0.1886	0.1434	-0.4531	-0.4804	0.1031	0.1974
Interact_C	-0.7739**	0.2672	-1.5401	-1.3175	-0.2304	0.0066
Ln ROA	0.1367	0.0692	-0.3287	-0.0042	0.2775	0.0567
LEV	0.0017	0.0035	-1.5585	-0.0054	0.0088	0.6357

Note:***p<0.001,**p<0.01,*p<0.05

3.4 Discussion on Regression Results

The study finds that the shareholding combination of founders and state-owned shareholders will significantly lower the value. This finding shows that mixed ownership governance has a synergistic dilemma in the semiconductor industry. This paper speculates on the reasons. First, the difference between the two goals may reduce the efficiency of enterprise decision-making. State-owned shareholders often assume the functions of ensuring employment and maintaining strategic stability, and the primary goal of management is enterprise growth and profitability [8]. The mixed ownership of the two may lead to decision-making conflict. Second, in the semiconductor industry, the market prefers a clear property right structure and market-oriented incentives. In terms of signal transmission, mixed ownership is easy to be considered by investors that property disputes and control rights may occur in the future, thus reducing the valuation. Third, if there is no effective check and balance in

the mixed shareholding state, the management may use the fuzzy property right background of state-owned shareholders to avoid supervision and obtain private interests [9]. External investors predict this behavior, thus reducing the valuation. Fourth, state-owned shareholders may bring policy burden and governance efficiency problems, offsetting financing advantages [10]. The decision-making chain of state-owned assets is long, and the system's flexibility cannot match the demands of the semiconductor industry.

4 Conclusion

Due to the lack of analysis of China's semiconductor financing valuation from the perspective of equity structure heterogeneity, this paper studies the impact of founder and management shareholding and state-owned shareholding on the valuation. This paper studies 50 semiconductor companies listed on China's A-share scientific and technological innovation board from 2020 to 2025, and conducts second-order polynomial regression analysis on the data. It is found that the shareholding combination of founders and state-owned shareholders will significantly lower the value. This conclusion also provides a new reference for the optimization of ownership structure governance, financing structure and mixed ownership relationship of semiconductor companies.

Therefore, this paper suggests that scientific innovation board semiconductor companies, especially mixed ownership enterprises, need to straighten out the governance mechanism, resolve the decision-making conflict between management and state-owned shareholders, and better release the equity synergy value. When introducing state-owned assets, to reduce the policy burden as much as possible, this study suggests that enterprises strictly limit the proportion of state-owned shares, clearly limit the intervention of state-owned enterprises in daily operations in the investment agreement, and set up a special R&D area to enjoy a certain degree of autonomy in finance, procurement and other aspects, to simplify the approval process. Future research should expand data collection and classify the semiconductor industry into OEM, materials, equipment, packaging and testing, engineering and other links. Future research will further deepen the research on the interaction between founders and state-owned shareholding, and the research on the valuation of semiconductor listing by other types of ownership structure, so as to better deepen the research on the industry.

The limitation of the study is that since the number of listed semiconductor companies in China is limited after 2020, this paper only studies 50 companies with a limited number of samples, so the correlation analysis shows that the correlation between the explanatory variable and Ln PB is low, and the regression analysis shows that the impact of China's shareholder ownership and founder and management ownership on PB is not statistically significant. At the same time, this paper does not conduct corresponding research on semiconductor companies after detailed classification according to each link of their industrial chain.

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