Ownership Structure, Corporate Governance, and Performance of Listed Companies—An Empirical Application of a Semi-Parametric Quantile Regression Model

Jiamin Nie and Shanli Ye *

School of Sciences, Zhejiang University of Science and Technology, Hangzhou 310023, China
* Correspondence: slye@zust.edu.cn

Abstract: China’s listed companies have different ownership characteristics and market environments from those of other countries and thus exhibit vastly different changes. From the existing corporate life cycle perspective, companies differ in their different development stages, which makes each factor’s effect dynamic. How to adjust the governance mechanism to the requirements of the company’s stage of development is an urgent issue in sustainable corporate governance. To address the above issues, we establish a semi-parametric quantile regression model to analyze the relationship between the ownership structure and corporate performance based on the data of listed companies on the Shanghai Stock Exchange between 2013 and 2021. Moreover, corporate governance measures taken at different stages of the corporate life cycle are discussed to see whether they effectively improve corporate governance. We conclude that there are non-linear effects of ownership structure while dynamic changes in corporate governance mechanisms exist. Companies should be concerned about the non-linear effects of ownership structures while considering the company’s life cycle and choosing appropriate governance measures. The results will help develop a sustainable development strategy to ensure that the company can improve its profitability and mitigate agency problems.

Keywords: ownership structure; corporate governance; company performance; agency problems; corporate lifecycles

1. Introduction

Corporate governance has been a critical focus of business management since the beginning of the 21st century. In 2001, China joined the World Trade Organization (WTO), adopted the Organization for Economic Cooperation and Development (OECD) principles of corporate governance and began improving listed companies’ governance elements. The current corporate governance model in China is a combination of the Anglo-American models and the German-Japanese models [1,2], transplanting the advantages of governance into Chinese listed companies. However, due to the particular market environment in China, listed companies have different shareholding characteristics and governance structures than companies in other countries [3], which can have a different impact on the growth of company performance. So can corporate governance alleviate the agency problems of Chinese companies, as expected? This needs to undergo an empirical test in the context of Chinese reality.

The research around corporate governance is extensive. It can be combined with several factors to discuss a company’s sustainability [4–6] or more specific issues, such as Corporate Social Responsibility (CSR) [7], Environmental Social Governance (ESG) [8] and Sustainability Performance [9]. Pekovic’s study is on the relationship between CSR and corporate financial performance [10], which examines corporate governance as a component of CSR. At the same time, many scholars have considered corporate life-cycle theory in their research [11,12]. The corporate life-cycle theory provides a dynamic perspective on the study of corporate governance [13,14]. The correlation between corporate governance and
performance can be examined at different stages of a company’s development [15]. In terms of research methods, the main ones include regression analysis [16], data envelopment analysis [17] and stochastic frontier analysis [18], using firm performance as the dependent variable and then testing the association with governance mechanisms. Furthermore, some scholars have used the quantile regression approach [19] and they demonstrate that the relationship between ownership structure and banks’ risk behaviors depends on individual firm characteristics.

In recent years, researchers are beginning to consider the characteristics and status of individual companies [20] and corporate governance research is no longer confined to a fixed set of models that can be applied to all companies [21]. The results of most empirical studies cannot be standardized because many studies are based on a generic context and fail to consider the complexity and variability of individual companies [22].

Thus, applying a dynamic perspective to the study of corporate governance is also essential. The research in this area has mainly focused on theoretical analysis, with few empirical studies using Chinese-listed companies as samples. At the same time, most research methods have mainly used linear regression models based on the assumptions of a normal distribution to examine the role of governance mechanisms on firm performance. The results obtained explain the average level of firm performance by the independent variables. However, less attention has been paid to data distributed in the tails of empirical financial analyses. Furthermore, data out of the center of the distribution cause errors in the results, so the ability of traditional regression methods to predict the optimal relationship between corporate governance and performance is minimal.

Given this, in this paper, we consider the analysis through a semi-parametric quantile regression model and interpret it from the perspective of different quantile points with the theory of the firm’s life cycle. The semi-parametric model [23] is one of the many non-parametric models that combine the advantages of linear and non-linear models and can portray well the relationship between variables and identify the inflection points. Hence the method is considered for fitting the relationship between the variables of interest and firm performance. In addition, the quantile regression method captures the effects associated with the tail distribution more effectively. It is suitable for skewed data, allowing the effects of variables to be studied from different quantile-level perspectives. The results also analyze the different stages of the corporate life cycle, which can explain the dynamic differences in the effects of corporate governance and further improve the empirical research on corporate governance.

The rest of the paper is structured as follows: Section 2 presents a literature review of the impact mechanisms and makes assumptions. Section 3 describes the chosen model, data acquisition and variable definitions and analyses the distribution of the dependent variable. Section 4 presents the empirical analysis process. Section 5 presents the conclusions and corresponding observations.

2. Review of Literature and Research Hypothesis

Fama and Jensen proposed a theoretical explanation of corporate governance, that is, the arrangement of relationships within a company through various structural adjustments and mechanisms, so corporate governance aims mainly to solve the relationship problem [24]. These contradictory relationships exist mainly between operators and owners, large and small shareholders and stakeholders, resulting in agency problems that cause losses to the company. Scholars have proposed a range of corporate governance tools to reduce agency costs and improve financial performance, so much of the research on corporate governance is about measuring its impact on company performance [25].

2.1. Ownership Structure

The ownership structure is one of the mechanisms considered in terms of governance structure to achieve corporate governance objectives by adjusting the control and balancing the interests of all parties. A key research concern is the impact of ownership concentration
along with equity checks and balances on profitability by testing whether it can create value for the company without harming the interests of other shareholders.

Scholars who support the concentration of equity in major shareholders argue for a positive relationship between insider ownership and firm performance [26]. An increase in the shareholding percentage of major shareholders can alleviate the first type of agency costs. To a certain extent, the increase in ownership concentration allows stakeholders’ goals to be aligned, reducing managers’ self-interested decisions [27]. In a decentralized company, when the cost of supervision is higher than the profit obtained by the shareholders, the shareholders’ supervision of the company’s operation will decrease, resulting in a “free-riding” and “lazy” mentality, as well as failure to exercise the shareholders’ rights and shirking management responsibilities to each other [28]. This negative management style leads to excessive concentration of power in the hands of managers and makes the agency problem increasingly apparent, negatively impacting the company’s development. On the issue of whether it is necessary to strengthen the degree of equity checks and balances, most scholars have a positive attitude. Hu Haifeng [29] argues that strengthening equity checks and balances can effectively mitigate the problem of management’s short-sighted behavior and overconfidence, thereby improving the company’s risk-taking capacity and reducing financial risk. Huang [30] discusses the problem of reduced cash holdings of companies caused by unbalanced shareholder holdings after the shareholding reform in China. Pointing out that the problem is an essential factor contributing to the poor financial position of companies, he argues that ensuring a balanced shareholding is necessary to improve corporate governance.

In recent years, research attention has gradually focused on the discussion of non-linear relationships [31]. Thus several scholars have used different non-parametric models to explore this issue. Xia Jijun [32] tests the relationship between equity structure and agency costs in the context of China’s shareholding reform, where there is a non-linear effect of equity structure on firm performance, motivated by the shareholding reform and executive shareholding effects. The association between equity concentration and financial leverage was examined by Lo et al. [33]. They confirmed an “inverted U” type non-linear relationship between equity structure and agency costs in Taiwanese listed companies. In an analysis of innovation efficiency in Chinese renewable energy firms, Xu & Chen [34] note that equity concentration does not have a linear relationship with firm performance. They argued that controlling the largest shareholder’s holding within a reasonable range allows executives and shareholders to make decisions more conducive to firm performance. Therefore, the impact of equity structure on the company’s quality development is the result of a combination of factors, including differences in the equity nature, share reform policies and controlling shareholder attributes, which makes a difference in the direction as well as the intensity of the effect on the company’s performance. This shows as promoting, inhibiting, or insignificant. Together these analyses provide important insights into the relationship between ownership structure and corporate performance. We thus propose the hypothesis:

**Hypothesis 1 (H1).** The relationship between ownership structure and firm performance is nonlinear.

### 2.2. Corporate Governance

Wu Liqun [35] discusses the impact of corporate governance from the perspective of the cost of private debt and finds that private firms are more sensitive to changes in corporate governance than state-owned firms (SOEs), arguing for the establishment of long-lasting and flexible governance mechanisms to respond to different types of problems in the firm. Dinh et al. [36] explain corporate governance in China from two aspects: governance structure and governance mechanism. The structure includes the board of directors, the management, the supervisory board and the shareholders. In terms of mechanism, it includes incentives, internal supervision and external constraints.
Executive compensation is a central governance mechanism which plays a role in management effectiveness, as it reduces agency conflicts between managers and shareholders by aligning their common interests. However, there are several limitations to executive compensation incentives, whereby managers make private interest decisions and thus executive compensation is not always adequate, as found in some practical studies. China’s shareholding reform has been ongoing, but the gap in executive compensation between state-owned and non-state-owned companies is significant. This gap can affect firm performance, such as investment financing, corporate innovativeness and corporate social responsibility. Agency theory suggests that there should be a positive relationship between executive compensation and financial performance. However, in recent years, many studies have indicated that not all types of companies with executive compensation generate explicit or implicit incentives. For example, the incentive effect of executive compensation differs under different attributes of a firm’s property rights [37]. Kristina [38] also finds that pay incentives improve performance when corporate governance is weak, in examining the hidden compensation of executives in listed companies. Consequently, we believe that the motivational effect of executive compensation varies depending on the company’s level of development.

The internal supervision includes the Board of Directors and the Supervisory Board, which perform monitoring duties to regulate the management’s behavior, coordinate the bad relations between stakeholders, and ensure the scientific decision-making of the company. In China, there is a dual supervision system of the supervisory board and the directors. On the one hand, under the condition that other existing elements remain unchanged, strengthening the supervisory board size, increasing the salaries of supervisory board members and establishing independent directors can effectively strengthen the restraining effect of significant shareholders on managers while acting as a disincentive to the agency risk and moral hazard of managers. On the other hand, this inhibition is not always practical, depending on the level of governance of the company itself. When the company’s supervision model is not fully constructed, the responsibilities of the board of directors and the supervisory board are vague and unable to work. Alternatively, in companies where “one share is dominant” for a long time, the shareholders have too much power, which makes the supervision mechanism no longer helpful and becomes a formality [39]. Therefore, the impact of monitoring mechanisms on corporate governance under different circumstances needs further discussion.

There are inevitably variations in management decisions, governance levels and equity adjustments at different stages of a firm’s life. In conjunction with these variations, the role of governance mechanisms also varies. In the growth stage, pursuing greater profits in order to grow is the primary task of the enterprise. In this stage, the degree of separation of ownership and management is generally lower and the interests of shareholders and managers tend to be aligned, so the type I and type II agency costs do not rise and there are no intense conflicts between shareholders and managers. Compared with the oversight from the supervisory board or appointing independent directors, the purpose of improving the company’s benefits can be better achieved through compensation incentives for executives. In the maturity stage, the company’s primary task transforms into coordinating interests and maintaining stable development. In this stage, the company grows to a specific scale, ownership and control are separate and the role of internal monitoring mechanisms gradually emerges. The board of directors focuses on monitoring to supervise the managers and maintain a balance of interests between large and small shareholders [40], so this period is more suitable for monitoring mechanisms in order to play a valuable role. We discuss corporate governance mechanisms in the context of life cycle theory and propose the hypothesis:

**Hypothesis 2 (H2).** Corporate governance varies in its effect on firm performance at different stages of the firm’s life cycle.
3. Research Methods and Data

3.1. Semiparametric Quantile Regression Model

We employ semiparametric quantile regression models to examine the hypothesized relationships proposed above. According to the hypotheses of this paper, there are not only linearly affected indicators but also those that are nonlinearly affected. The semiparametric model combines the advantages of parametric and nonparametric methods. It is less restrictive on the data, avoids the dimensional trap and can be well-suited to test these issues.

Meanwhile, we invoke the quantile regression method for calculations to explain more information beyond the results given by the mean regression. Quantile regression enables a more comprehensive discussion of the relationship between the dependent and independent variables from different quantile points, which leads to a more profound explanation of economic phenomena, obtaining estimates of the parameters by solving the optimal solution of the test function, so we consider a partially linear single indicator model as follows:

\[ Y_{it} = X'_{it} \beta + g_i(Z_{it}) + \varepsilon_{it} \] (1)

In Equation (1), \( Y_{it} \) is the observed value of the \( i \)th observation at time \( t \), as the response variable. \( X_{it} = (X_{1it}, X_{2it}, X_{3it}, \ldots, X_{pit}) \) and \( Z_{it} \) denote the independent variables that affect \( Y \). \( \beta \) is a \( p \)-dimensional unknown parameter that characterizes the linear relationship between \( X \) and \( Y \), \( g_i(Z_{it}) \) denotes the unknown link function that characterizes the nonlinear relationship between \( Y \) and \( Z \), and \( \varepsilon_{it} \) denotes the model error.

We fit the single index model \( g(Z_{it}) \) by the B-spline function, partition the sample interval into \( K \) subintervals, and then construct the B-spline basis functions \( B_1(x), B_2(x), \ldots, B_k(x) \); finally, we have a single indicator model as follows:

\[ g_i(Z_{it}) = \gamma_{i1}B_1(Z_{it}) + \gamma_{i2}B_2(Z_{it}) + \cdots + \gamma_{ik}B_k(Z_{it}) \]

According to Equation (1), its conditional quantile function can be obtained as:

\[ Q_\tau(Y_{it}|X_{it}, Z_{it}) = X'_{it} \beta + g_i(Z_{it}) \]

As a result, the parameter estimate of \( \beta \) can be obtained, by minimizing Equation (2):

\[ \sum_{i=1}^{n} \sum_{t=1}^{T} \rho_\tau(Y_{it} - Q_\tau(Y_{it}|X_{it}, Z_{it})) \] (2)

where \( \rho_\tau(u) = \tau u I(u \geq 0) + (\tau - 1) u I(u < 0) \) is the test function, \( I(\cdot) \) is the indicator function and quantile \( \tau \) affects the value of the test function.

3.2. Sample Selected and Processing

3.2.1. Data Sources

Our sample mainly comes from the IFIND database and companies listed in the SSE A-share market before 2013 were selected as sample subjects to obtain their panel data for an entire nine years from 2013 to 2021, among which the excluded sample subjects include:

1. Companies belonging to the industry of finance and securities, because their primary business and products are different from those of ordinary companies, and their financial indicators are not consistent with those of other sample subjects.
2. Companies with risk symbols such as ST* and ST are close to delisting, with no reference significance.
3. Companies with long-term deficiencies in the sample indicators.

Finally, we obtained data from 810 listed companies.
3.2.2. Variable Definition

Regarding the current research on equity and performance of companies in China [41], we select indicators as dependent and independent variables.

The return on total assets (ROA) and Agency costs (Agency) are selected as the dependent variables. The return on total assets reflects the basic profitability level of the company. At the same time, the agency cost is introduced as a negative indicator to describe the effect of corporate governance together with ROA. We consider ownership concentration and balance of equity for proxy variables reflecting the company’s equity structure. For this, we selected the equity ownership of the top ten (Big10) and the equity ownership of the top one (Big1), as the indicators to measure ownership concentration, and the shareholding of the second and largest shareholders (Balance) as the corresponding indicator of equity checks and balances.

Meanwhile, according to Sun [42], we take the size of the supervisory board (S-SIZE), the salary of supervisory board members (S-SAL) and the percentage of independent directors in the board of directors (INDR) to reflect the characteristics of the supervisory board’s motivation and board independence as proxy variables for the supervision mechanism in corporate governance. For the incentive mechanism, because of the weak effect of executive shareholding in Chinese listed companies, its influence is measured through the top three executives’ compensation (ECI). The specific calculations and definitions of all indicators are shown in Table 1.

Table 1. Variables definition.

<table>
<thead>
<tr>
<th>Definition</th>
<th>Variable</th>
<th>Method of Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm performance</td>
<td>ROA</td>
<td>Net Assets/Average Total Assets</td>
</tr>
<tr>
<td></td>
<td>Agency</td>
<td>Management expenses/Main business income</td>
</tr>
<tr>
<td>Ownership structure</td>
<td>Big1, Big10</td>
<td>The shareholding ratio of the top shareholder</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The shareholding ratio of the top ten shareholders</td>
</tr>
<tr>
<td></td>
<td>Balance</td>
<td>The shareholding ratio of the second largest shareholder/Shareholding ratio of the top shareholder</td>
</tr>
<tr>
<td>Executives Compensation incentive</td>
<td>ECI</td>
<td>Log of the total compensation of the top three executives</td>
</tr>
<tr>
<td>Supervisory mechanism</td>
<td>S-SIZE</td>
<td>Number of supervisory board members/ Number of statutory supervisory board minimums</td>
</tr>
<tr>
<td></td>
<td>S-SAL</td>
<td>Log of the total remuneration of the top three supervisory board members</td>
</tr>
<tr>
<td></td>
<td>INDR</td>
<td>Number of independent directors/Number of the board of directors</td>
</tr>
</tbody>
</table>

3.2.3. Descriptive Statistics of the Sample

Due to the enormous amount of data, in this paper, we divide all listed companies into state-owned holding companies and non-state-owned holding companies for separate discussion. The results of descriptive statistics of their variables are shown in Appendix A (Tables A1 and A2). In terms of dependent variables, the maximum and minimum values of ROA and Agency are similar for both groups of companies, with the mean value of ROA being 0.057 for non-state-controlled companies, which is higher than that of state-controlled companies. Indicating that non-state-controlled companies have better utilization of assets and higher corporate income, the average value of Agency is 0.08 for state-owned companies and 0.082 for non-state-owned companies. The management costs of both companies account for more than 8% of operating income and both are higher than the average management expense ratio level. This indicates that they both have agency problems, resulting in excessive conflict problems and supervision costs, thus raising agency costs.

In independent variables, the mean value of the balance of non-state holding companies is higher than that of state-controlled. At the same time, the concentration of equity (measured by big 1 and big 10) is lower within state-controlled, indicating that the governance structure of non-state companies is more reasonable given the equity structure.
However, the mean value of the big 10 exceeds 50%, which is a highly concentrated level of equity. At the same time, the average ECI in state-owned companies is lower than in non-state-owned, indicating a more remarkable lack of adequate incentives, which tends to cause short-sighted behavior of managers. The proportion of independent directors is closer in both types of companies, showing that listed companies attach more importance to independent directors. The mean value of S-SIZE exceeds 1, which means they exceed the legal supervisory board size. The maximum value of S-SAL, which reflects motivation, is more than 16 and the minimum value is 0, indicating that the motivation of supervisory boards varies widely among companies.

3.2.4. Distribution of Dependent Variables

The results of the kurtosis and skewness tests for ROA and Agency are shown in Table 2. A kurtosis of 3 indicates a normal distribution and greater than 3 implies a thick-tailed distribution. The kurtosis of ROA and Agency in state-owned and non-state-owned holding companies reaches 11 or more, with a 1% level, rejecting the original hypothesis of a normal distribution, indicating that they are spiky. This distribution with kurtosis means that the data of the dependent variable, although concentrated around the mean with higher probability, at the same time have a high probability of appearing in the tail. That is, the distribution is thick-tailed. In addition, The results of the skewness test in the table show that the ROA is significantly negative and left-skewed and the Agency is significantly positive and right-skewed.

Table 2. Skewness and kurtosis detection.

<table>
<thead>
<tr>
<th></th>
<th>SOEs</th>
<th>Non-SOEs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kurtosis</td>
<td>Skewness</td>
</tr>
<tr>
<td>ROA</td>
<td>12.113 ***</td>
<td>−0.181 ***</td>
</tr>
<tr>
<td>Agency</td>
<td>13.208 ***</td>
<td>2.563 ***</td>
</tr>
</tbody>
</table>

Note: "***" means Significant at 1%, level respectively.

We discuss the distribution of the dependent variables and conclude that both the return on assets and agency costs are consistent with the “spikes and tails” characteristic of financial data with significant skewness. In this case, the traditional linear regression model would give a preliminary result and deviate from reality. Therefore, we consider a semiparametric quantile regression model to explain the effects of the independent variables from multiple quantile points, which can reveal the impact of governance mechanisms on firm performance in a more comprehensive way.

4. Empirical Analysis
4.1. Model Building

The correlation analysis of the explanatory variables other than the Ownership structure variable show a maximum correlation coefficient of 0.38, indicating that the correlation between the variables is weak and directly introduced into the same model. However, the correlation between the variables of equity structure is vital, so they are considered as being introduced within the model separately and the semiparametric quantile regression models with the dependent variables of ROA and Agency are constructed as follows:

\[ Q_{\tau}(Y_{it}) = ECI_{it}\beta_1 + INDR_{it}\beta_2 + SSIVE_{it}\beta_3 + SSAL_{it}\beta_4 + g_i(Z_{it}) + \epsilon_{it} \]  \hspace{1cm} (3)

where \( Y_{it} \) is taken as one of ROA, Agency and \( Z_{it} \) is taken as one of Balance, big 1 and big 10, respectively, calculated by referring to the algorithm detailed by Koenker and d’Orey [43].

4.2. Nonparametric Part Analysis

Figures 1 and 2 show the relationship between ROA and ownership structure when the Z variables take as Balance, big 1 and big 10, respectively, for holding company data of
different natures, and the quantile takes 0.5. The solid line is the estimation result of the nonparametric function and the shaded part is the 95% confidence interval.

Figure 1. The relationship between ownership structure and ROA of SOEs. (a) Balance; (b) big 1; (c) big 10.

As shown in Figure 1a, there is an apparent nonlinear relationship between the ROA and the equity balance, with an M-shaped curve and inflection points at 10%, 45% and 70% of the Balance, and the positive effect of Balance on ROA has shifted several times. This result explains, to a certain extent, the inconsistent empirical results of many studies on the relationship between the two. The relationship curve between the big 10 and ROA in Figure 1c shows an upward trend, with the curve’s inflection point at around 90%. This shows that, as the concentration of equity increases, the positive effect of return on assets by the degree of concentration of equity gradually flattens out, and the positive effect starts to weaken when it reaches about 60% of the concentration and starts to decline when it exceeds 90%. It can be seen that the concentration of equity can promote the company’s performance to a certain degree, but when the equity is too concentrated, it will harm the interests of other small and medium-sized shareholders to cause adverse effects.

Figure 2. The relationship between ownership structure and ROA of Non-SOEs. (a) Balance; (b) big 1; (c) big 10.

As shown in Figure 1a, there is an apparent nonlinear relationship between the ROA and the equity balance, with an M-shaped curve and inflection points at 10%, 45% and 70% of the Balance, and the positive effect of Balance on ROA has shifted several times. This result explains, to a certain extent, the inconsistent empirical results of many studies on the relationship between the two. The relationship curve between the big 10 and ROA in Figure 1c shows an upward trend, with the curve’s inflection point at around 90%. This shows that, as the concentration of equity increases, the positive effect of return on assets by the degree of concentration of equity gradually flattens out, and the positive effect starts to weaken when it reaches about 60% of the concentration and starts to decline when it exceeds 90%. It can be seen that the concentration of equity can promote the company’s performance to a certain degree, but when the equity is too concentrated, it will harm the interests of other small and medium-sized shareholders to cause adverse effects.

Correspondingly, in the non-state holding companies, the relationship between Balance and ROA in Figure 2a tends to rise and then fall, showing an inverted “U” shape, with the inflection point at about 37%. This indicates that as the degree of equity balance increases, it has a positive effect on the return on assets and then turns to an adverse effect after reaching a certain level. The possible reason for this phenomenon is that, when the equity balance reaches a certain level, it becomes more difficult for multiple major shareholders to form a consensus, thus hindering rational decision-making and resulting in corporate losses. Figure 2b,c demonstrate the overall upward trend of ownership concentration (big 1, big 10) and ROA, with more volatility and a clear nonlinear relationship than...
state-owned holding companies. However, the results are similar whether state-owned or not. That is, the overall effect of ownership concentration is positive. It indicates that, although the situation of “one company is the only one” is quite common among listed companies in China, the higher the degree of ownership concentration, the greater the benefits to the company.

Under the same conditions, Figures 3 and 4 show the fitted plots of Agency versus ownership structure variables in holding companies of different natures.

![Figure 3](image1.png)

**Figure 3.** The relationship between ownership structure and Agency of SOEs. (a) Balance; (b) big 1; (c) big 10.

![Figure 4](image2.png)

**Figure 4.** The relationship between ownership structure and Agency of Non-SOEs. (a) Balance; (b) big 1; (c) big 10.

As shown in Figure 3a, the relationship curve between Agency and Balance in state-owned holding companies shows a trend of rising, then falling, and rising again, which is due to the low degree of equity balance in the early stage of the company. With conflicts between major shareholders, they will supervise and intervene at the same time, which leads to an increase in the cost of expenses incurred, also known as agency costs. When the company grows to a specific scale, it needs to balance the equity to restrain the emptying behavior of the major shareholders, which in turn can moderate the agency problem and reduce the agency cost to a certain extent. The relationship between Agency and the two indicators of ownership concentration is fluctuating and decreasing, respectively, as can be seen in Figure 3b,c. This result validates the view of some scholars [44, 45] that an increase in ownership concentration within a reasonable range can effectively reduce agency costs.

As shown in Figure 4 for the non-state holding results, the trend of the relationship between Agency and the three indicator curves is clear, with more moderate fluctuations. Figure 4a shows that the effect of Agency is more pronounced in the early stage when the equity balance is low, as can be seen from the steeper relationship curve, while the effect
diminishes as the balance increases. Figure 4b Agency has a linear relationship with the big 1, decreasing with increasing shareholding. Figure 4c also shows that an increase in the equity ownership of the top ten can reduce agency costs. This result is generally consistent with the findings of He Fei [46]. In contrast to the state-owned data, the linear characteristics of the non-state-owned data are more pronounced, and the principal-agent relationship is relatively straightforward. The above analysis results effectively verify hypothesis H1 that a nonlinear relationship exists and there is a difference in results between state and non-state companies.

4.3. Parametric Part Analysis

In order to analyze the impact of other corporate governance variables on firm performance in depth, we consider the impact at different quantiles separately and explain this concerning corporate life cycle theory.

Since companies in different life cycle stages differ in the scale of development, level of earnings, Agency costs of management oversight inputs, manifesting as a low-profit, low-cost mode in growth stage companies and a high-profit, high-cost mode in the maturity stage [47]. As a result, the extent to which governance mechanisms work is also significantly inconsistent. For this reason, we consider the 0.1–0.25 quantiles as the level of low-revenue, low-agency-cost firms, the 0.75–0.9 quantiles as the level of high-revenue, high-agency-cost firms and the middle part as that of the average level firms. According to the study of O’Connor [48] on the factors affecting the definition of the life cycle, the increase of earnings scale and cost reduction are the essential features of life cycle change. This interpretation of the company’s state at different quantile levels is closer to the characteristics of the enterprise development cycle, so we regard the low and high quantile levels as corresponding to the growth and maturity stages of the enterprise development cycle, respectively.

In contrast to the common interpretation of linear regression models, the results obtained from the quantile approach express the marginal effect of each influencing factor on the explanatory variable at a particular quantile. We choose five quartiles such as $\tau = (0.1, 0.25, 0.5, 0.75, 0.9)$ in combination with model 3 and the resulting linear parameter estimates are presented in Tables 3 and 4. Due to space constraints, the parameter results change in a similar pattern when $Z$ is taken for the three variables corresponding to the equity structure, so the tables only show the estimation results when $Z$ is taken for the Balance.

Table 3. Estimation results of the coefficients of each quantile of the ROA.

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>SOEs</th>
<th>Non-SOEs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tau = 0.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECI</td>
<td>0.0156 ***</td>
<td>0.0096 ***</td>
</tr>
<tr>
<td>INDR</td>
<td>−0.0136</td>
<td>−0.0984</td>
</tr>
<tr>
<td>S-SIZE</td>
<td>−0.0030</td>
<td>−0.0003</td>
</tr>
<tr>
<td>S-SAL</td>
<td>−0.0003</td>
<td>−0.0003</td>
</tr>
<tr>
<td>Tau = 0.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECI</td>
<td>0.0056 ***</td>
<td>0.0041 ***</td>
</tr>
<tr>
<td>INDR</td>
<td>−0.0078</td>
<td>−0.0257</td>
</tr>
<tr>
<td>S-SIZE</td>
<td>−0.0006</td>
<td>−0.0004</td>
</tr>
<tr>
<td>S-SAL</td>
<td>−0.0005 *</td>
<td>−0.0004</td>
</tr>
<tr>
<td>Tau = 0.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECI</td>
<td>0.0052 ***</td>
<td>0.0056 ***</td>
</tr>
<tr>
<td>INDR</td>
<td>−0.0294 ***</td>
<td>−0.0183</td>
</tr>
<tr>
<td>S-SIZE</td>
<td>0.0001</td>
<td>−0.0004</td>
</tr>
<tr>
<td>S-SAL</td>
<td>−0.0006</td>
<td>−0.0004</td>
</tr>
<tr>
<td>Tau = 0.75</td>
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<td></td>
</tr>
<tr>
<td>ECI</td>
<td>0.0042 ***</td>
<td>0.0072 ***</td>
</tr>
<tr>
<td>INDR</td>
<td>−0.0570 ***</td>
<td>−0.0183</td>
</tr>
<tr>
<td>S-SIZE</td>
<td>−0.0032</td>
<td>−0.0004</td>
</tr>
<tr>
<td>S-SAL</td>
<td>−0.0009 *</td>
<td>−0.0004</td>
</tr>
<tr>
<td>Tau = 0.90</td>
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<td></td>
</tr>
<tr>
<td>ECI</td>
<td>0.0031 *</td>
<td>0.0074 ***</td>
</tr>
<tr>
<td>INDR</td>
<td>−0.0469 *</td>
<td>0.1880 **</td>
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<tr>
<td>S-SIZE</td>
<td>−0.0030</td>
<td>−0.0111 *</td>
</tr>
<tr>
<td>S-SAL</td>
<td>−0.0019 **</td>
<td>0.0000</td>
</tr>
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Note: "***", "**", "+" means Significant at 1%, 5%, 10% level respectively.
Table 4. Estimation results of the coefficients of each quantile of the Agency.

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Tau = 0.10</th>
<th>Tau = 0.25</th>
<th>Tau = 0.50</th>
<th>Tau = 0.75</th>
<th>Tau = 0.90</th>
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<td>SOEs</td>
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<td></td>
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<td></td>
</tr>
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<td>ECI</td>
<td>-0.0064 ***</td>
<td>-0.0080 ***</td>
<td>-0.0105 ***</td>
<td>-0.0149 ***</td>
<td>-0.0203 ***</td>
</tr>
<tr>
<td>INDR</td>
<td>0.0044</td>
<td>-0.0127 *</td>
<td>-0.0468 ***</td>
<td>-0.0849 ***</td>
<td>-0.0356 *</td>
</tr>
<tr>
<td>S-SIZE</td>
<td>-0.0018 **</td>
<td>-0.0055 ***</td>
<td>-0.0069 ***</td>
<td>-0.0056 ***</td>
<td>-0.0107 ***</td>
</tr>
<tr>
<td>S-SAL</td>
<td>0.0001</td>
<td>0.0000</td>
<td>-0.0003</td>
<td>-0.0022 ***</td>
<td>-0.0031 **</td>
</tr>
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<td>Non-SOEs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECI</td>
<td>-0.0003 *</td>
<td>-0.0019 **</td>
<td>-0.0039 **</td>
<td>-0.0082 ***</td>
<td>-0.0169 ***</td>
</tr>
<tr>
<td>INDR</td>
<td>-0.0618 ***</td>
<td>-0.0472 ***</td>
<td>-0.0428 **</td>
<td>0.0886 **</td>
<td>0.2649 ***</td>
</tr>
<tr>
<td>S-SIZE</td>
<td>0.0009</td>
<td>0.0020</td>
<td>-0.0062 **</td>
<td>-0.0088 *</td>
<td>-0.0163</td>
</tr>
<tr>
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<td>-0.0006 *</td>
<td>-0.0003</td>
<td>-0.0012 *</td>
<td>-0.0037 ***</td>
<td>-0.0026</td>
</tr>
</tbody>
</table>

Note: "***", "**", "*" means Significant at 1%, 5%, 10% level respectively.

Table 3 shows that within holding companies of different natures, the effect of corporate governance on ROA shows some commonalities.

Firstly, the effect of ECI is generally positive and significant, indicating a noticeable positive effect of compensation incentives on the improvement of ROA.

Second, the significance of the effect of the monitoring mechanism variables is inconsistent across quartiles. In state-owned holding companies, the S-SIZE fails the significance test at all quantile points, so it has little effect on the ROA. Another factor of supervisory board S-SAL is not significant only at the 0.1 quantile but at all other quantiles, shows a weak effect for mature firms, indicating that the influence of the supervisory board is more significant for mature firms. In contrast, the opposite is true for growing firms. In non-state holding companies, S-SAL fails the test at all quantiles, with the difference that the coefficient on the S-SIZE passes the test after the 0.5 quantile, which also confirms the claim that the role of the supervisory mechanism more significantly influences mature companies, corresponding to the higher quantile points.

The results in Table 4 show a commonality in the effect of ECI on Agency within companies of different natures. At the same time, the significance of the coefficients of the other influencing factors at the quantile points varies dramatically.

First, the commonality is shown by the fact that ECI is significant in both companies, always showing a negative relationship with the increase in Agency, which means that executive compensation incentive can suppress the increase in agency costs. This negative relationship is consistent with the optimal compensation contract theory [49].

Second, the variability is shown by the fact that, in state-owned holding companies, the variable of supervisory board oversight mainly affects the higher part of the Agency distribution, with the effect concentrated near the 0.75 quantile and above. Among them, S-SAL does not pass the significance test until the 0.5 quantile, indicating a weak effect only in the lower quantile and a significant effect in the other cases. In the case of non-state holding companies, the variable related to the supervisory board only passes the significance test at the 0.5 and 0.75 quartiles, with a negative effect at the middle and low quartiles, implying that the effect of the supervisory board is more significant for state-owned holding companies and more favorable for mature companies at the high quartiles. At the same time, it has little effect on non-state holding companies.

In order to show more intuitively the changes in the coefficients of the different quantile points, Figures 5 and 6 show the comparative graphs of the changes of each specific influencing factor for each of the two properties of the company, respectively.
The results in Figure 5 show that coefficient of INDR, which describes the board of directors’ characteristics, shows a change from negative to positive, given the different nature of the holding. In non-state holding companies, INDR switches from a negative effect in the low quantile to a positive effect in the high quantile of 0.9 and is significant, so the increase in the proportion of sole directors in non-state holding companies that are in the mature stage can effectively improve the asset compensation ratio. In the graph of the changes in the coefficient of ECI, with the change from low to high quantile points, the coefficient of executive compensation generally has a decreasing trend and the highest positive impact at the 0.1 quantile point. This indicates that the executive salary incentive mechanism is more influential on the data of the lower quantile distribution. That is, compared to the companies in the maturity stage, the companies in the growth stage are more able to bring benefits through the governance of executive incentives. This conclusion is consistent with the findings of Yan [50].

Moreover, the change in the variables related to the supervisory board fluctuates less and is almost parallel to the 0 scale line, which shows that the monitoring role of the supervisory board presents a weak influence on the growth of ROA. The chart combined with the information derived reflects some problems in China’s corporate governance: there is weak influence of the supervisory board in listed companies with high supervision expenses, but the supervisory board is often unable to play a role. There are also problems, such as the ambiguity of the role of independent directors and the supervisory board, which can easily lead to unclear positioning of responsibilities. From the results of this paper, the supervisory role of independent directors in non-state holdings is more noticeable compared to the supervisory board.
Figure 6. Coefficient estimation of Agency. (X-axis indicates the regression results when taken different quantiles). (a) Coefficient change of ECI; (b) Coefficient change of INDR; (c) Coefficient change of S−SIVE; (b) Coefficient change of S−SAL.

Figure 6 show the coefficient variations of each corporate governance variable on Agency. As the quantiles increase, the coefficient distributions of executive compensation (ECI), supervisory board size (S-SIVE), and supervisory board compensation (S-SAL) all decline gradually from the 0 scales. This indicates that the inhibitory effect of influences such as executive compensation incentives and supervisory board supervision on the increase of agency costs gradually strengthens and reaches its most potent at the high quantile, which also confirms the conclusion that the role of supervision mechanism is more effective in the mature stage of the firm.

What is notable is that there is a positive and negative shift in the coefficient of INDR in the comparison chart, where the INDR in non-state holding companies changes from a negative effect to a positive effect on the increase of Agency at the 0.9 quantile. This suggests that the increase in the proportion of sole directors in the mature period will lead to an increase in agency costs, which is contrary to the traditional research that the proportion of sole directors will reduce agency costs. The reason for the above phenomenon may be that Chinese listed companies generally have a concentrated shareholding, resulting in a pattern of majority shareholder control of the board of directors, and the power of independent directors is almost in the hands of “key people”, making their “independence” doubtful, thus leading to empirical results that do not conform to theoretical expectations.

The analysis of the results in the above chart confirms hypothesis H2, that there is variability in the impact of mechanisms on firm performance at different life cycle stages. When the company is in the growth stage, although the principal-agent problem has emerged, the company focuses more on product development, with small boards of directors and supervisory boards, so the monitoring mechanism does not constitute a vital element of the corporate governance structure at this stage. However, executive
compensation incentives are more effective at this stage because company earnings and share prices correlate more with management effort [51] and executive compensation links to company performance. When the company develops to the mature stage, the governance mechanism is relatively systematic and standardized, while the number of related stakeholders increases, causing the contradiction of the principal agent and the implementation process of corporate strategy hinders. At this stage, there is a greater need for monitoring mechanisms to play a governance role, so the functional effects of the board of directors and the supervisory board gradually reflect and emphasize this. At the same time, the correlation between the company’s earnings and the degree of management effort becomes weaker, and the incentive effect of executive compensation becomes weak.

4.4. Empirical Findings

1. There is a non-linear effect of shareholding structure on firm performance, while this differs depending on the nature of the firm. The relationship between them shows a significant non-linear characteristic in state-owned holding companies but not non-state-owned ones. Based on the results, increasing the degree of concentration can effectively improve the return on assets and reduce the Agency costs while ensuring the equity balance appropriately.

2. The effectiveness of governance mechanisms on firm performance varies at different stages of the firm’s life cycle. According to the results of the linear part of the semiparametric quantile regression, there are significant differences in governance mechanisms across quantile points, variations in the magnitude of the coefficients of the effects and even positive and negative variations in the coefficients of the variables. In terms of incentives, executive compensation is considered the most effective in the growth period. In terms of monitoring, independent directors significantly increase the return on assets at the 0.9 quantile but also diminish the effect of reducing agency costs, with a weak effect at the other quartiles. Similarly, the supervisory board shows a weak effect, with weak coefficients at several quartiles, passing the test only at the higher quartiles. The effect on reducing agency costs gradually increases with the growth of the quantiles. Thus it is concluded that the role of internal oversight in corporate governance is limited and the impact begins to show up in the maturity period.

4.5. Recommendations

1. Companies should adjust their ownership concentration to a moderate degree within an appropriate range and strengthen the power of their largest shareholder. The above analysis indicates that despite a complex non-linear relationship between the ownership structure and corporate performance, a moderate ownership concentration and a high shareholding ratio of the largest shareholder were positively correlated with the performance improvement and agency cost reduction of both state-owned and non-state-owned holding companies. Therefore, it is necessary to establish and improve the balance mechanism for significant shareholders, and the control power of the largest shareholder can appropriately increase while ensuring a specific power concentration of significant shareholders. As such, corporate governance can improve with the joint effort of the balance mechanism for significant shareholders and the benefits coordination mechanism dominated by managers and the largest shareholder.

2. Appropriate governance measures should be taken following the current life cycle of a company. As supervision costs, incentive costs, and ownership structure have different effects on corporate performance at different levels, different measures rather than a single one should be taken to solve contradictions in the long run. The equity in growing companies with weaker profitability and lower agency costs tends to be more concentrated, so the consensus is more easily reached, and communication with managers is smoother. As a result, fewer contradictions emerge as a result of information asymmetry. In this case, supervisory mechanisms have little effect but to increase the regulatory cost, and it is more effective to increase executive compensation incentives.
In the knowledge-driven economy and information age, practical and direct communication between shareholders and managers is encouraged and equal attention should be paid to compensation and incentive mechanisms to deepen managers’ recognition of the interested objective of shareholders. A mature company with solid profitability and a large scale involves many stakeholders who disperse its equity, so it is more difficult to reach a consensus, and contradictions among managers increase its agency costs. Therefore, improving its supervisory mechanism is a better choice. It is suggested in this paper to improve the supervisory mechanism and ensure its effectiveness based on corporate ownership structure and the governance status of Chinese companies in combination with excellent experience in supervision and governance.

4.6. Implications and Limitations

In this paper, we examine recent developments and new trends in corporate governance within the principal-agent framework and justify the hypothesis of a non-linear impact of the shareholding structure. The existence of variation in the coefficients of influence of variables is explained from the quantile perspective so that this study can serve as a valuable addition to the empirical aspects of corporate governance. This paper can also provide additional information on the performance growth of listed companies in China, including an explanation of the many other factors that these companies face in their operations and development and the focus on corporate governance over different life cycles. It can help corporate executives, external agencies, investors, and market regulators gain a deeper understanding of the leading corporate governance issues and provide an informed opinion.

The limitations of this paper are as follows: 1. The sample data is unbalanced, with approximately three times as many SOEs as non-SOEs, and the comprehensiveness and accuracy of the non-SOE data are limited, which may ultimately affect the final empirical results. 2. Many factors influence corporate performance and this paper only considers variables within the framework of the principal-agent problem. Other factors, such as the degree of market development, laws and policies, need to be defined through qualitative analysis. Future research can address these two limitations by expanding the sample and variables to enhance the generalizability of the study. At the same time, this research could be combined with more specific issues such as corporate social responsibility, environmental sustainability and China’s “carbon neutral” policy, which are issues that need attention in the future.

5. Conclusions

In this paper, we model the impact of equity structure and corporate governance on firm performance by selecting 810 Chinese SSE A-share companies as a data sample for 2013–2021. First, we hypothesize that there is a possibility of nonlinear effects of equity structure and the dynamics of linear effects of other governance mechanism variables based on theory. Then, we analyze the sample data with descriptive statistics and discuss the premise that the distribution of the dependent variable does not conform to the normal distribution, propose that the semi-parametric quantile regression model can be a better fit argument for the research contents of this paper, and analyze the impact of corporate performance from both linear and nonlinear components.

The results of this paper argue that the particularities of China’s ownership structure are pronounced and that its non-linear effects differ significantly between state-owned and non-state-owned companies. At the same time, we explain the role of corporate governance instruments specifically from several perspectives to help the various stakeholders in the company adapt their respective roles and governance styles to the actual situation. In particular, it is not reasonable to rigidly adopt a uniformly prescribed governance mechanism for growth and mature companies, each with a different level of development and background environment. They need to find the optimal combination of mechanisms to im-
prove governance efficiency in different situations, enhancing the company’s performance and ensuring sustainability.

**Author Contributions:** Conceptualization, J.N. and S.Y.; methodology, J.N.; software, J.N.; validation, J.N., S.Y.; formal analysis, J.N.; investigation, J.N.; resources, S.Y.; data curation, J.N.; writing—original draft preparation, J.N.; writing—review and editing, J.N.; visualization, S.Y.; supervision, S.Y.; project administration, J.N.; All authors have read and agreed to the published version of the manuscript.

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**Data Availability Statement:** Not applicable.

**Conflicts of Interest:** The authors declare no conflict of interest.

**Appendix A**

**Table A1.** Descriptive analysis of SOEs.

<table>
<thead>
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<th>Variable</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Sd</th>
</tr>
</thead>
<tbody>
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<td>ROA</td>
<td>-0.430</td>
<td>0.498</td>
<td>0.047</td>
<td>0.058</td>
</tr>
<tr>
<td>Agency</td>
<td>0.001</td>
<td>0.489</td>
<td>0.080</td>
<td>0.059</td>
</tr>
<tr>
<td>Balance</td>
<td>0.001</td>
<td>1.000</td>
<td>0.271</td>
<td>0.270</td>
</tr>
<tr>
<td>big 1</td>
<td>0.057</td>
<td>0.891</td>
<td>0.401</td>
<td>0.149</td>
</tr>
<tr>
<td>big 10</td>
<td>0.182</td>
<td>1.012</td>
<td>0.587</td>
<td>0.156</td>
</tr>
<tr>
<td>ECI</td>
<td>0.000</td>
<td>8.390</td>
<td>5.250</td>
<td>0.705</td>
</tr>
<tr>
<td>INDR</td>
<td>0.222</td>
<td>0.800</td>
<td>0.375</td>
<td>0.058</td>
</tr>
<tr>
<td>S-SIZE</td>
<td>0.333</td>
<td>4.000</td>
<td>1.389</td>
<td>0.465</td>
</tr>
<tr>
<td>S-SAL</td>
<td>0.000</td>
<td>16.881</td>
<td>13.118</td>
<td>1.977</td>
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**Table A2.** Descriptive analysis of Non-SOEs.

<table>
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<th>Max</th>
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<tr>
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<tr>
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<td>0.375</td>
<td>0.058</td>
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<tr>
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<td>0.465</td>
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<tr>
<td>S-SAL</td>
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<td>16.881</td>
<td>13.118</td>
<td>1.977</td>
</tr>
</tbody>
</table>

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