State Ownership, Corporate Performance, and Parameter Heterogeneity: A Quantile Analysis on China's Listed Companies*

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(This version: 30 November 2005)

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* We are grateful to Kevin C.W. Chen and Jiwei Wang for generously providing us their hand-collected data on state shares held by government agencies. We have benefited from the comments of the seminar participants at SOAS, University of London; Judge Institute of Management, Cambridge University; and the participants at the UNU/WIDER Jubilee Conference in Helsinki, June 17-18, 2005.

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Abstract

Assessing the effect of government shareholding on corporate performance in the context of China has been a hot topic. Documented results are mainly empirical, and the findings are diverse. In this paper we present a formal model that establishes a theoretical link between government shareholding and corporate performance, where firms receive private signals about their potential profitability and make private effort. Predicting a negative impact of government shareholding on corporate performance, our model further shows that this impact is more significant when the firms' perceived profitability is high. Using a panel dataset of China's listed companies during 1994-2000, we find that the estimations of conditional quantile regression models are indeed consistent with these predictions.

Journal of Economic Literature Classification Numbers: D82, G32, G34, P31.

1. Introduction

Ever since Berle and Means (1932), assessing the impact of ownership and control structures on corporate performance has been a leading topic in the economics literature. This topic is more current as well as relevant for the transition economies, where economic growth and structural changes call for a better understanding of the related issues. In these economies, large corporations are typically characterized by a mixed ownership structure with a significant proportion of equity shares held by the government – either directly or indirectly (Megginson and Netter, 2001). Consequently, understanding the impact of government shareholding[1] on firms' performance is of both theoretical and policy importance.

In China, mixed ownership structures are quite ubiquitous in large corporations as a result of the ownership reform started in the early 1990s. While small and medium-sized state-owned enterprises (SOEs) have been privatized by one way or another, the larger ones are typically "equitized" or "corporatized" through the establishment of a shareholding structure aiming to a public listing and many have succeeded to list on stock exchanges (see, e.g., Tenev *et al.*, 2002; Sun and Tong, 2003). Among listed firms in China, typically the government withholds more than one-third of the total outstanding shares; with another third identified as the legal-person shares and the rest consists of tradable A shares held by Chinese citizens and domestic institutions, tradable B shares held by and traded amongst foreigners and overseas Chinese,[2] and employee shares. Since the establishment of Shanghai Stock Exchange (SHSE) in December 1990 and Shenzhen Stock Exchange (SZSE) in April 1991, the number of listed firms as well as their market capitalization has experienced a rapid growth. Up to the year 2000, over 1,000 companies had been listed, raising equity capital of RMB 600 billion in total. Their market capitalization reached 54% of the country's GDP.

The growing importance of listed companies, combined with the fact that they are still under strong influences of the central and local governments, has spurred huge amount of academic and policy research. One of the focal points in the literature is empirical assessments of the relation between government shareholding and corporate performance. Analytical perspectives employed in the assessments include the estimation of possible increases in political interference costs due to state ownership, the evaluation of possible reductions in agency costs due to the concentrated monitoring role of the government, and the comparison between the interference costs and monitoring benefits (e.g., Bai *et al*., 2000; Li, 2000; Qian, 2001; Stiglitz, 1997). The assessment techniques have been dominated by the estimations of the conditional mean function of alternative performance variables. The empirical findings are diverse and virtually point to all possible directions. For instance, Xu and Wang (1999), Qi *et al*. (2000), Sun and Tong (2003), and Bai *et al*. (2004b) find negative correlations between government shareholding stakes and corporate performance. But Chen (1998) finds a positive correlation. Tian and Estrin (2005) argue that there might be a U-shaped relation between government ownership stakes and a firm's performance. Sun *et al*. (2002), however, report an inversed U-shaped relation, exactly opposite to Tian and Estrin's (2005) finding.

The contribution of the present paper is to first develop a theoretical model, incorporating the intuitive idea that decision makers of a firm make private effort decisions upon their private knowledge about the firm's future profit potentials. Consequently, the firm's sub-optimal effort choice resulted from information asymmetry is not a static moral hazard problem; rather, it varies with the firm's profit potential as well as the government's equity stake. We show that although effort rises in general with perceived profitability, it rises slower when the government equity ownership is high. This suggests that the negative impact of government shareholding will be more significant among firms that are more profitable.

In order to investigate the above hypothesis empirically, which constitutes the second contribution of this paper, we deviate from the conditional mean focused approaches and employ the conditional quantile regression estimator (Koenker and Basset, 1978; Buchinsky, 1995, 1998). Quantile regressions allow us to portrait the relation between government shareholding stakes and corporate performance separately for more successful and less successful firms. The results we find seem to be consistent with our theory.

The major intuition underlying our theoretical model can be presented as follows. For a listed company with significant government shareholding stake, the government will cover part of the losses if the company is in financial trouble.[3] Such potential aid from the government could be perceived as a sort of "solvency insurance", whereby the government insures the company against insolvency. In fact, such insurance often extends to cover the wages and salaries of the company's employees (Green, 2003). The practice of solvency insurance makes China's listed SOEs different from those limited liability companies in a market economy and seems to entitle the government to some profit sharing in good times. In a transitional economy where contractual laws are imperfect, however, all these could be done but tacitly and without a formal contract. Therefore, the government owner could actively engage in revenue management, resource tunneling and so on, in order to serve other political and social purposes (Shleifer and Vishny, 1994; Bai *et al*., 2000; Green, 2003). Managers and employees of the company also would participate in profit sharing in order to get sufficient incentives to exert effort. If the government owner holds a high proportion of total shares, the expected payoff to the managers and employees becomes smaller. This will in turn lower management incentives and lead to lower effort, which in turn will lead to lower level of performance.

This perspective indicates that while in general higher proportion of government shareholding will correspond to lower effort, the sensitivity of the company's effort choice to the level of government shareholding may differ depending on the perceived level of profitability. Given the information advantage of the managers and employees, once they perceive a low level of profitability their choice of effort will become less sensitive to the shareholding position of the government. This is because profit sharing by the government becomes less likely in bad times whereas basic salaries and wages are guaranteed by solvency insurance. In sharp contrast, in good times where perceived profitability is high, a firm's performance could be more sensitive to the shareholding position of the government – the more is the government's stake, the more likely a larger profit would be tunneled away.

To test the above difference-in-sensitivity hypothesis, the best available technique might be the conditional quantile regression estimator. Generally speaking, quantile regression enables us to examine the whole distribution of the performance variables rather than a single measure of the central tendency of their distribution. Consequently, we are able to evaluate the relative importance of explanatory variables at different points of the distribution of corporate performance. Specific to the concern of this paper, quantile regression method allows us to make more conceivable distinction between the perceived level and realized value of performance variables. Taking profitability as an example, while it is generally troublesome to assume that the managers can have a precise *ex ante* estimation of expected profitability figure for year t+1, the typical proxy of which in the literature is the average of realized profits over years t - 2, t -1, and t, it is more plausible to assume that managers are only able to locate the expected profitability figure of their firm into a certain range or interval, using the terminology of quantile regression method, a quantile of all possible profitability distribution.

Our theoretical perspective can be re-interpreted in the quantile regression framework as follows. Once the quantile location of expected performance level is set, the sensitivity of the firm's effort choice to the proportion of the government's shareholding becomes defined. In the lower 20th, 30th or 40th quantile, the impact of government shareholding stake on the firm's effort choice is insignificant and consequently there is no significant correlation between government shareholding stakes in year t - 1 and the realized performance in year t, which is regarded as the outcome of the firm's effort choice in year t - 1. In the 60th, 70th or 80th quantiles, however, the impact of government shareholding on the firm's effort choice becomes significantly negative and consequently there appears a significant negative correlation between government ownership stake in year t - 1 and the realized performance in year t. Our empirical findings based on conditional quantile regression are fully consistent with the above theoretical prediction and are robust with respect to a number of accounting performance and market valuation measurements. Furthermore, the estimated coefficients before the government shareholding variable are significantly different across major lower and upper quantiles, most importantly in terms of the 20th and 30th versus the 60th, 70th and 80th, and the 20th, 30th and 40th versus the 70th and 80th.

The key contribution of this paper to the literature is methodological, while it brings in new empirical findings and insights as well. The theoretical perspective we suggest and its organic connection with the conditional quantile regression method make it possible to empirically test heterogeneous sensitivities of firms' effort choice to their ownership and control structures, depending on the perceived level of profitability. Our approach is not only applicable to the cases of listed SOEs, it could be also applied to the examination of the relationship between the controlling shareholders and management in large limited liability companies.

A constraint to our empirical application is the limitation of the dataset, in which the shareholding classification is based on Chinese official definition. The official definition has been criticized for its underreporting of the real magnitude of state shareholding and control and for its ambiguity in the definition of legal person shares (Liu and Sun, 2005). To overcome this limitation, our empirical investigation also pays attention to state shares held by the largest shareholders who are government-agencies, thus excluding those state shares held by SOEs and other legal persons (Chen and Wang, 2004), and controls for multiple large shareholders, which may prevent the expropriation behavior of the largest shareholders to some extent.

The rest of the paper is organized as follows. Section 2 discusses the major features of Chinese equity market and listed companies. Section 3 presents our theoretical perspectives and agency model with private effort choice. Section 4 describes variables and data and presents quantile distribution graphs and summary statistics. The conditional quantile regression method is presented in Section 5. Section 6 discusses the empirical results and Section 7 summarizes the findings and concludes.

2. Background

Chinese equity market was regarded by the government as a vehicle for the listed SOEs to mainly raise capital (Green, 2004, p.35). A listed company in China may issue five different types of shares: state shares, legal person shares, foreign shares, tradable A shares and employee shares. Although it is a debatable issue on the exact definitions of state shares and legal person shares (Liu and Sun, 2005), we first adopted the official and also the traditional ones in the literature (Sun and Tong, 2003) and later on consider a plausible correction. State shares are owned by the central government, local government, or solely government-owned enterprises, while legal person shares designate holdings by domestic institutions, most of which are partially owned by the central or local government. Among all outstanding shares of listed companies in China, state shares, in general, account for the most important share type, its fraction still amounting to 38.87% in 2000 despite of a declining trend since 1992.

[Table 1 is about here]

2.1. Solvency insurance by State Shareholders

Why have the government shareholders had willingness to provide solvency insurance to listed SOEs? Several reasons have been reported in both media and academic publications. The most cited reasons include the “too-important-to-fail” view, which argues that the instability caused by the fall of local government’s flagship SOEs is unaffordable for the local government; and the “huge sunk cost” view, which indicates that a huge amount of cost has sunk into the long and costly process of IPO application and preparation, local governments or ministerial agents will not allow this cost being simply washed away by the fall of their listed companies. More recently, another important reason has been added into the list, that is, to avoid being de-listed.

A special delisting mechanism was introduced by China Securities Regulatory Commission (CSRC) in 1998. Under this mechanism, a firm could be designated first as a special treatment (ST) firm if its financial status or other aspects display certain abnormalities. Among the detailed criteria for ST arrangement, incurring negative net profits for two consecutive years is a major one. Upon being designated as a ST firm, it will further be designated as a particular transfer (PT) firm, meaning that the stock can only be traded in the stock exchange on Fridays, if this ST firm continues to make loss for one more year. Finally, this PT firm will be de-listed from any stock exchange in China if its net profits cannot become positive within one year.

Being de-listed will lead to the loss of the valuable "shell" resources of listed companies (Bai, *et al*., 2004a). In addition, the de-listing of a single firm could result in lower quotas allocated to that region in future periods (Pistor and Xu, 2005). To avoid being de-listed, regional governments or entities under their control can bail out those firms, or "re-tunnel" assets back into them (Bai, *et al*., 2004a).

A case in point is Sichuan Changjiang Packaging Company (listing code 600137). According to its 2003 annual report, the company received a lump-sum financial subsidy of RMB 59 million from local finance bureau in Yibing city in Sichuan in 2003, in addition to the salary coverage of RMB 2.56 million funded by the government. These financial injections helped the company get rid of real business losses. In this case, the government shareholder holds an absolute control position of 57.11 per cent of the total outstanding shares.

2.2. Revenue Management and Profit Sharing by State Shareholders

There are three ways for government shareholders to participate in the revenue management in listed companies, which include dividends distribution, profit sharing, and resource tunneling. It would be obvious that a higher proportion of shareholding by the government owner will grant a stronger position to the government owner in terms of dividends distributed to, profit shares obtained by, and resources tunneled by the government owner.

First, China's listed companies are able to pay dividends in the forms of either stock (stock dividends) or cash (cash dividends) or a combination of the both if they decide to pay dividends (Wei *et al*., 2003). It is unattractive for government shareholders to get stock dividends because state shares are not tradable in the market. In contrast, cash dividends are much more preferred by government shareholders, because it could directly increase total cash revenue of government owners. According to Wei *et al*. (2003), cash dividends payout ratio is positively correlated with the government shareholding stakes. It suggests that a higher shareholding stake by the government owner leads to a higher frequency of paying cash dividends and also a higher proportion paid to the state owner in the total paid cash dividends. Lee and Xiao (2002) provide evidence that cash dividends payout ratio is positively correlated with accounting performance. The combination of the above two findings suggest that both the frequency of paying cash dividends and the proportion paid to the government owner in the total paid cash dividends are positively correlated with government ownership stakes and corporate performance.

Second, profit sharing by dominant shareholders (often the parent companies controlled by the government) takes the form of loan. A listed SOE may be forced by the dominant shareholder to lend its own funds to the parent or affiliates of the group and the lending usually carries a zero interest rate. The listed SOE must not only cover the real interest rate but also set large provisions for possible loan losses. According to a survey conducted by CSRC in 2002, the sum of interest coverage and bad-loan provisions accounted for almost one-third of the net profit on average among the surveyed companies during the period of 1998-2002 (*Shanghai Securities Daily*, April 2, 2004).

Third, in addition to the direct lending to its parent, a listed SOE may have to guarantee a bank loan to the parent. When the parent defaults, the listed SOE has to assume liability for the repayment (Green, 2003, pp. 133-135).

The dominant shareholder tends to extract more funds from its listed SOE when the listed company performs well. Lianhua Gourmet Powder Company (listing code 600186) provides an instructive example. The parent of this company is a fully state-owned firm. By August 2003, the parent had held 65.73 per cent of total outstanding shares of the company and extracted RMB 858 million. Most of these fund extractions occurred during 1998-2000, a period when the company performed very well, and was in the forms of both direct lending to the parent and the liability caused by guaranteeing bank loan to the parent. The default of these loans by the parent put the company into cash-flow crisis and the attention of CSRC and other monitoring agents was consequently drawn in. Once the source of its financial trouble was revealed, a rescuing and restructuring plan was set and put into implementation by the provincial government (*Shanghai Securities Daily*, July 29, 2004).

3. The Model

3.1. Technology and Production

We consider a three-date model. At date 0, the firm makes a capital investment $I > 0$ which is partially financed by debt with a face value of D (principle plus interests), and partially financed by equity. The state is assumed to own 100% of the firm's debt (e.g., through the state bank) as well as a percentage α of the firm's equity. The rest $1 - \alpha$ of the firm's equity is held by private investors whose shares are publicly traded at a stock exchange.

At date 1, the firm observes a signal θ about the potential profitability of its investment. Immediately thereafter, the firm makes an effort choice $e \geq 0$ at a private cost $C(e)$, which yields a random monetary outcome $x \in (a, b) \subseteq \Re$ at date 2. The outcome x is interpreted as the total sales minus operational costs before repayment of debt, the operational costs including costs of labor that are paid before date 2. Both θ and e are the firm's private information, and they are not observable by outsiders.

The expected revenue at date 1, conditional on θ, is assumed to be equal to $E_1(x|\theta) = \theta + e \equiv v$. The expected revenue at date 0 is thus given by $E_0(x) = E_0(\theta + e)$. We assume $E_0(\theta + e) > I + E_0(C(e))$, so that the firm is potentially profitable at date 0.

About the cost function we make the following assumption.

Assumption 1. (*i*) *For all* $e > 0$, $C'(e) > 0$ *and* $C''(e) > 0$, *with* $C'(0) = 0$ *and* $C'(b) > 1$. (*ii*) $C''(e)/C'(e)$ *is non-increasing in e*.

In Assumption 1, (*i*) is made to ensure the existence of an interior solution of optimal effort choice. The ratio in (*ii*) is akin to the Arrow-Pratt measure of absolute risk aversion. But since C is a cost measure and the firm knows e, there is no need to relate this assumption to the risk attitude of the firm. Examples satisfying this assumption are easy to construct. For instance, $C(e) = \lambda e^2/2$ has $C''/C' = 1/e$, decreasing in e, and $C(e) = exp(\lambda e)$ has a constant ratio $C''/C' = \lambda$.

Now suppose the initial investment *I* has been made. Let $F(x|v)$ denote the date-1 cumulative distribution function of *x* conditional on its mean *v*. We restrict our analysis to the class of distribution functions that are twice continuously differentiable in *x* and *v* and satisfy the following assumption.

Assumption 2. (*i*) *For all x, v*∈(a, b),

$$F_v(x \mid v) < 0. \quad (1)$$

(*ii*) *For all v*∈(a, b), *there exists some* μ∈(*a*, *b*) *such that*

$$F_{vv}(x \mid v) \begin{cases} > 0 & for \;\; x < \mu \\ < 0 & for \;\; x > \mu \end{cases} . \quad (2)$$

(iii) *Let any* $v_1 > v_2$ *be given. Then for all* $A \in (a, b)$

$$\frac{\int_A^b F_{vv}(x \mid v_1)dx}{\int_A^b F_v(x \mid v_1)dx} < \frac{\int_A^b F_{vv}(x \mid v_2)dx}{\int_A^b F_v(x \mid v_2)dx} . \quad (3)$$

In Assumption 2, condition (*i*) says that *v* shifts the distribution of *x* to the right in the sense of first-order stochastic dominance. Condition (*ii*) is a "single-crossing" property that is satisfied by most of the popular distribution functions (Diamond and Stiglits, 1974). Condition (iii) is closely related to the monotone likelihood ratio property (MLRP) of the distribution functions (see, e.g., Milgrom, 1981, p.383). Consider the normal distributions as an example.

Example: Assume that *x* is normally distributed with density function $f(x|v)$ and standard deviation σ, we have

$$F_v = -f(x \mid v) < 0 \;\; and \;\; F_{vv} = -f(x \mid v)\frac{x-v}{\sigma^2} \begin{cases} > 0 & for \;\; x < v \\ < 0 & for \;\; x > v. \end{cases}$$

Integrating over (A, ∞) yields

$$\int_A^\infty F_v \, dx = -\int_A^\infty f(x \mid v)dx = F(A \mid v) - 1,$$

$$\int_A^\infty F_{vv} \, dx = -\int_A^\infty f(x \mid v)\frac{x-v}{\sigma^2}dx = \int_A^\infty \frac{1}{\sqrt{2\pi}\sigma}\exp\left(-\frac{(x-v)^2}{2\sigma^2}\right)d\frac{(x-v)^2}{2\sigma^2} = -f(A \mid v).$$

Thus for the normal distribution we have

$$\frac{\int_A^\infty F_{vv}dx}{\int_A^\infty F_v dx} = \frac{f(A \mid v)}{1 - F(A \mid v)}.$$

It is well-known that normal distributions satisfy the MLRP, i.e., that $f(x|v_1)/f(x|v_2)$ increases in x for all $v_1 > v_2$. This implies that for all $x > y$,

$$f(x|v_1)\, f(y|v_2) > f(y|v_1)\, f(x|v_2).$$

Choosing $y = A$ and integrating over $x \in (A, b)$ yields

$$(1 - F(A|\, v_1)\, f(A|\, v_2) > f(A|\, v_1)(1 - F(A|\, v_2).$$

In other words, the normal distributions satisfy all the three conditions of Assumption 2.

3.2. Profit Sharing between State and the Firm

In order to focus on the financial incentives of the firm, we assume that the firm's objective is to maximize its expected net payoff, defined as the distributable profits, minus the private cost of effort.

In the absence of agency costs, for given θ the first-best effort level, e^*, can be found by maximizing $\theta + e - C(e)$, yielding

$$C'(e^*) = 1, \tag{5}$$

which is independent of θ.

Let $S(x, \alpha)$ denote the profit payoff to the firm, given by

$$S(x,\alpha) = \begin{cases} 0 & \text{if} \quad x \le D \\ (1-k(\alpha))(x-D) & \text{if} \quad x > D \end{cases} \tag{6}$$

where $k(\alpha) \in [0, 1]$ with $k'(\alpha) > 0$ that reflects the tendency of the state to share more profits of the firm when the state's shareholding is high. Thus $(x - D) - S(x, \alpha)$ is the profit to the state. The magnitude of k may also include the tax rate on corporate profits. Denoting the firm's objective function by π, we have

$$\begin{aligned} \pi &= \int_D^b (1-k(\alpha))(x-D)dF(x \mid v) - C(e) \\ &= (1-k(\alpha))\left[\int_D^b (1-F(x \mid v))dx\right] - C(e) \quad . \end{aligned} \tag{7}$$

where in the last equation we use integration by parts.

3.3. The Firm's Choice of Effort

Assumption 1 ensures that an interior solution for optimal effort exists. In other words, π is quasi-concave in e. Recalling that $v = \theta + e$, the optimal effort that maximizes π is characterized by the first-order condition

$$\pi_e = -(1-k(\alpha))\int_D^b F_v dx - C'(e) = 0 \ \ and \ \ \pi_{ee} < 0, \ \forall\alpha, \ \forall\theta. \quad (8)$$

PROPOSITION 1. *Let* $e(\alpha, \theta)$ *denote the firm's effort choice satisfying Eq.* (*8*). *Then* (*i*) $e(\alpha, \theta) < e^*$ *and* (*ii*) $e(\alpha, \theta)$ *is a declining function of* α *and increasing function of* θ.

Proof: Because $-(1-k(\alpha))\int_D^b F_v dx < -\int_D^b F_v dx = 1$ in Eq. (8), it is clear that $C'(e(\alpha,\theta)) < C'(e^*)$. Thus (i) must hold.

Partially differentiating Eq. (8) with respect to α and θ yields

$$\pi_{ee}e_\alpha + \pi_{e\alpha} = \pi_{ee}e_\alpha + k'(\alpha)\int_D^b F_v dx = 0, \quad (9)$$

$$\pi_{ee}e_\theta + \pi_{e\theta} = \pi_{ee}e_\theta - (1-k(\alpha)\int_D^b F_{vv} dx = 0. \quad (10)$$

Noting that $F_v < 0$ we have $\int_D^b F_v dx < 0$. It follows from $k'(\alpha) > 0$ and $\pi_{ee} < 0$ that

$$e_\alpha = -\frac{k'(\alpha)\int_D^b F_v dx}{\pi_{ee}} < 0,$$

Since $\int_a^b x dF(x \mid v) = b - \int_a^b F(x \mid v)dx = v,$ we have $-\int_a^b F_v(x \mid v)dx = 1$ and $\int_a^b F_{vv}(x \mid v)dx = 0.$ From Eq. (2) it follows that $\int_D^b F_{vv}(x \mid v)dx < 0$ and that

$$e_\theta = \frac{(1-k'(\alpha))\int_D^b F_{vv} dx}{\pi_{ee}} \geq 0$$

with strict inequality for $k(\alpha) < 1$. Q.E.D.

The results derived so far are fairly standard. Since effort is unobservable, there are moral hazard problems resulting from the fact that the slope of the firm's expected profit ($E_1(S(x, \alpha))$) at time-1 is less than one. Incentives are directly related to 1 - $k(\alpha)$, hence the firm's effort declines in $k(\alpha)$. The result that effort increases in signal θ comes from the convexity of the firm's expected profit payoff, where higher θ implies a higher slope of $E_1(S(x, \alpha))$. The next proposition is somewhat new.

PROPOSITION 2. *Let* $e(\alpha, \theta)$ *denote the firm's effort choice satisfying Eq.* (*8*). *Then for all* $\alpha_1 < \alpha_2$, $\Delta e = e(\alpha_1, \theta) - e(\alpha_2, \theta)$ *is a strictly positive and increasing function of* θ.

Proof: Given $\alpha_1 < \alpha_2$, let $e_i = e(\alpha_i, \theta)$ and $v_i = \theta + e_i$ for $i = 1, 2$. Since $e_\alpha < 0$, $\Delta e = e_1 - e_2 > 0$. Consequently, from $C'' > 0$ we have $C'(e_1) > C'(e_2)$. We also know from $\int_D^b F_{vv} dx < 0$ and $e_\theta > 0$ that

$$\int_D^b F_v(x \mid v_1)dx - \int_D^b F_v(x \mid v_2)dx = (e_1 - e_2)\int_D^b F_{vv}(x \mid \xi)dx < 0.$$

We want to show that $e_\theta(\alpha_1, \theta) > e_\theta(\alpha_2, \theta)$. By Eq. (8) we have

$$(k(\alpha_i) - 1)\int_D^b F_v(x \mid (\theta + e(\alpha_i, \theta)))dx = C'(e(\alpha_i, \theta)), \quad i = 1, 2.$$

Dividing yields

$$\frac{(k(\alpha_1) - 1)\int_D^b F_v(x \mid (\theta + e(\alpha_1, \theta)))dx}{(k(\alpha_2) - 1)\int_D^b F_v(x \mid (\theta + e(\alpha_2, \theta)))dx} = \frac{C'(e(\alpha_1, \theta))}{C'(e(\alpha_2, \theta))} = h(\theta), \tag{11}$$

for some function $h(\theta)$. Differentiating $C'(e(\alpha_1, \theta)) = h(\theta)C'(e(\alpha_2, \theta))$ leads to

$$C''(e_1)e_\theta(\alpha_1, \theta) = h(\theta)C''(e_2)e_\theta(\alpha_2, \theta)) + h'(\theta)C'(e_2)$$

or equivalently,

$$\frac{C''(e_1)}{C'(e_1)}e_\theta(\alpha_1, \theta)C'(e_1) = h(\theta)C'(e_2)\frac{C''(e_2)}{C'(e_2)}e_\theta(\alpha_2, \theta) + \frac{h'(\theta)}{h(\theta)}h(\theta)C'(e_2).$$

Using $C'(e_1) = h(\theta)C'(e_2)$ and the Assumption 1 (ii) we derive

$$\frac{C''(e_1)}{C'(e_1)}e_\theta(\alpha_1, \theta) = \frac{C''(e_2)}{C'(e_2)}e_\theta(\alpha_2, \theta) + \frac{h'(\theta)}{h(\theta)} \geq \frac{C''(e_1)}{C'(e_1)}e_\theta(\alpha_1, \theta) + \frac{h'(\theta)}{h(\theta)}.$$

It indicates that

$$h'(\theta) > 0 \Rightarrow e_\theta(\alpha_1, \theta) > e_\theta(\alpha_2, \theta) \tag{12}$$

Now suppose on the contrary to what we want to prove, $e_\theta(\alpha_1, \theta) \leq e_\theta(\alpha_2, \theta)$, or equivalently, $v_1 \leq v_2$. Let

$$A(\theta) \equiv \frac{\int_D^b F_v(x \mid (\theta + e(\alpha_1, \theta)))dx}{\int_D^b F_v(x \mid (\theta + e(\alpha_2, \theta)))dx} = \frac{\int_D^b F_v(x \mid v_1)dx}{\int_D^b F_v(x \mid v_2)dx}.$$

$$A'(\theta) = \frac{(1+e_\theta(\alpha_1,\theta)) \int_D^b F_{vv}(x \mid v_1)dx \int_D^b F_v(x \mid v_2)dx - (1+e_\theta(\alpha_2,\theta)) \int_D^b F_{vv}(x \mid v_2)dx \int_D^b F_v(x \mid v1)dx}{\left[\int_D^b F_v(x \mid v_2)dx \right]^2}$$

$$\geq (1+e_\theta(\alpha_1,\theta)) \frac{\int_D^b F_{vv}(x \mid v_1)dx \int_D^b F_v(x \mid v_2)dx - \int_D^b F_{vv}(x \mid v_2)dx \int_D^b F_v(x \mid v1)dx}{\left[\int_D^b F_v(x \mid v_2)dx \right]^2} > 0.$$

The last strict inequality follows from the Assumption 2 (iii). Since $A'(\theta)$ and $h'(\theta)$ have the same sign (cf Eq. (11)), this result indicates a contradiction to Eq. (12). Therefore we must have $e_\theta(\alpha_1, \theta) > e_\theta(\alpha_2, \theta)$. Q.E.D.

While Proposition 1 indicates that in general higher proportion of state shareholding will correspond to lower effort, Proposition 2 highlights that the sensitivity of the firm's effort choice, *e*, to the level of the state's shareholding stake, α, varies with the perceived level of profitability, θ. As we have presented in Introduction, given the information advantage of the firm's insiders, once they perceive a low level of θ, their choice of effort *e* will become less sensitive to α thanks to the decreasing possibility of profit sharing and resource taking by the state owner and increasing chance of financial help from the government. In contrast, if they perceive a high level of θ, their effort choice *e* will become highly sensitive to α due to the increasing probability of profit sharing and resource taking by the state owner and the diminishing chance of receiving solvency insurance.

4. Variables, Data, and Statistical Summary

4.1. Variables

Two broad types of performance measurements, accounting performance and market valuations, are investigated to warrant the comprehensiveness and robustness of our analysis. For the accounting performance variables, following the reasoning in Sun and Tong (2003) and Chang and Wong (2004), we consider return on sales (*ROS*) and return on assets (*ROA*) respectively. We also consider earnings before interest and tax over sales (*EBITS*) but do not report the corresponding results, because the results on *EBITS* and *ROS* are similar, partly owing to the high correlation between them (0.9848).[4] For the market valuation variables, following the arguments in Bai *et al.*

(2004b), we mainly consider Tobin's *q*, denoted as *Tq*. The common critics on market valuation variables is that both state and legal person shares can not be traded freely in China and therefore lack market prices. To address this illiquidity concern, Bai *et al*. (2004b) use both 70% and 80% illiquidity price discount to generate two possibly more meaningful variables. In line with their suggestions, we also create these two variables, named *Tq_70* and *Tq_80*, by applying price discount rates of 70% and 80% respectively to non-tradable shares. We will pay more attention to *Tq_70* and *Tq_80* because they highlight the non-liquidity nature of state and legal person shares in China. Similar to Bai et al. (2004b), we also employ market to book ratios (with the same price discounts of 70% or 80% respectively) as additional market valuation measures, and similar results are obtained though not reported here.

Two alternative main explanatory variables are employed. The first one is the state ownership fraction, calculated as the ratio of state shares over total outstanding shares and denoted as *state_ratio*. The other one is the state ownership fraction held by state agencies as the largest shareholder, which is the ratio of state shares held by government agencies as the largest shareholder over total outstanding shares and denoted as ga*statetop1_ratio*. Going a step further from the official definition of state shares, i.e., shares to designate holdings in listed companies by central government, local government, or solely government-owned enterprises (Sun and Tong, 2003), Chen and Wang (2004) classify the state's shareholding into two different forms according to the shareholders' identity: state shares held by government agencies and by state-owned enterprises. Government agencies include central government ministries and commissions, national industrial companies, local government bureaus, local branches of the State Assets Management Bureau, and local state assets operating companies. They find that SOEs as shareholders are better able than government agencies to monitor top executives. Borrowing their insight on this distinction, we further examine the effect of government agency's shareholding on corporate performance. In addition, foreign ownership fraction is also considered since foreign shareholders might improve market valuations for listed companies (Sun and Tong, 2003), which is the ratio of foreign shares over total outstanding shares and denoted as *foreign_ratio.*

While the firm's effort input is undoubtedly the most important determinants of its performance, a number of other factors also play important roles in determining the levels of performance. To take into account the effects of those factors beyond effort, we introduce a large set of control variables based on a thorough literature survey and statistical justifications.[5] First, in line with the selections in Bai et al. (2004b), we employ ownership concentration ratio, size, the leverage ratio, the capital-sales ratio, the operation profit to total sales ratio, and industry dummies. In addition, we also consider listing place dummies (Sun and Tong, 2003), listing age (Wang *et al.*, 2004), time dummies (Joh, 2003), industry dummies, and annual sale growth rate (Caves, 1992). Thanks to this set of control variables, which is the most comprehensive one so far in comparison with the literature, a testable link between the state ownership variable and firm performance is established. Our theory on the firm's choice of effort input provides a behavior-based bridge for this testable link.

Ownership concentration ratio is defined as the ratio of those shares held by the second to the tenth largest shareholders over the total shares not held by the largest shareholder, and denoted by *cstr2_10*. The effect of this variable on firm performance is complex. More stakes held by large shareholders other than the largest one could restrict the expropriation behavior of the controlling shareholder (Johnson *et al.*, 2000) and avoid excessive monitoring by the largest shareholder (Burkart *et al.*, 1997). This would lead to better performance. On the other hand, some negative effect might coexist due to less monitoring by the largest shareholder and the free-rider problem in governance (Shleifer and Vishny, 1986).

We employ the natural logarithm of total assets (i.e., sales revenue) to measure firm size and denote it as *size*. Large firms could enjoy economies of scale and market power, but suffer from loss of managerial control over strategic and operational activities (Williamson, 1967), hence no clear prediction is derived. We also introduce the ratio of long term debt to total equity, *LLE* (and the ratio of total debt to total asset, *LA*), as a proxy for the leverage ratio. A high leverage ratio could alleviate free cash flow agency cost (Grossman and Hart, 1980), but also induce managers to forego positive net value projects (Myers, 1977), indicating that the theoretical prediction is ambiguous. The capital-sales ratio, *K_S*, calculated as the ratio of total tangible assets to total sales, is employed to control for variations in firm's input structure. The operating profit to total sales ratio, *Y_S*, is used to control for earning management practices such as gaining rights-issue approval through excess non-operating income (Chen and Yuan, 2004). More details on definitions of variables are presented in Table 2.

In the literature dealing with the effect of ownership structure on corporate performance, a common concern is the endogeneity problem of ownership structure

(Sun and Tong, 2003). To partly overcome this problem, a common strategy is to utilize one-year-lagged independent variables rather than current ones except for dummies. In comparison, our setup establishes a natural action sequence to provide a further justification for such a one-year-lag. *Ex ante* (or say at the time t - 1), based on the existing state ownership fraction, effort decision is made by managers according to the expected ex post (say at time t) performance distribution range and hence expected payoffs. Effort input in turn places its significant impacts on the *ex post* performance.

[Tables 2-4 are about here]

4.2. Data

The dataset is a panel of all listed companies on the SHSE or SZSE. There are three sources for this dataset. The first one is China Stock Market & Accounting Research Database (CSMAR), from which we compose all variables except the state shares held by government agencies and ownership concentration ratio. CSMAR is compiled by The University of Hong Kong and GTA Information Technology Company Limited in Shenzhen according to the format of CRSP and Compustat. For the state shares held by government agencies, Chen and Wang (2004) generously provided their hand-collected data to us. The data on top ten shareholdings are from CCER Corporate Governance Database, which is compiled by China Center for Economic Research (CCER) of Peking University and SinoFin Company in Beijing according to the format of CRSP and Compustat.

The major accounting reform in 1993 makes it difficult to compare the accounting data before and after the reform, therefore we set the initial year for our sample as 1994. Up to 2000, a quota system was adopted for IPOs. With this system IPO candidates must seek a listing quota from the local government or/and its affiliated central government ministries, which received an IPO quota assigned by the CSRC. In early 2001, the listing quota is abolished in favor of an expert-review system (Bai *et al*., 2004a). Keeping the consistence of the listing system, our investigation focuses on the period of 1994-2000.

During 1994-2000, there were a total of 1005 listed firms in China. We drop financial companies due to their incomparable financial data to other firms (Sun and Tong, 2003). We further exclude those firms lacking most of the data we need. As a consequence, we finally have a sample of 643 firms. Considering that we employ one-year lagged independent variables including sales growth rate, the effect time span for our dependent variables becomes 1996-2000.

4.3. Summary Statistics

The performance of China's listed companies has varied significantly across firms and over time (Sun and Tong, 2003). As such, it might not be accurate to draw conclusions based on mean regressions. Table 3 presents a brief summary of the distributional properties of various performance measures and major explanatory variables. As can be seen from the table, three accounting performance measures are all highly significantly skewed to the left, meaning that they have long left tails. In contrast, all three market valuation measures are significantly skewed to the right. Departure from normality is also highly apparent in the kurtosis, which indicates a high degree of leptokurticity for all performance variables. Among major explanatory variables, while *state_ratio_lag*, *cstr2_10_lag* and *size_lag* show moderate left-skewness, all others are highly skewed. Leptokurticity is observable for all but *cstr2_10_lag*, which exhibits a moderate degree of platykurticity. As we know, distributional properties of the data tend to bear certain impact on the results of OLS estimation. While OLS is moderately robust to departures from normality in the presence of kurtosis, it often does not perform well in the presence of skewness. This indicates that using OLS on highly skewed variables may lead to potential problems.

Pearson correlation results are presented in Table 4. Panel A of Table 4 provides the correlation results among different performance measures. Accounting performance variables are significantly and negatively correlated with market valuations, although the absolute values of the correlation coefficients are small. *Tq*, *Tq_70* and *Tq_80* are highly and positively correlated (≥ 0.9186), we still consider all of them to address the illiquidity concern in Chinese stock market (Bai *et al*., 2004b). Panel B presents the correlation results among main regressors. Taking 0.4 as the correlation threshold, we find no abnormally high correlation which supports the choice of independent variables used in our regression framework.

5. The Econometric Model

The quantile regression method is first proposed by Koenker and Basset (1978). It is an extension of the classical least squares estimation of the conditional mean (OLS) to a collection of models for different quantile functions, which permits the effect of a regressor to differ at different points of the conditional dependent variable distribution. This method provides a suitable tool to test the validity of our theoretical model because it is capable of detecting the variation in the sensitivity of the firm's effort choice and consequently performance to the proportion of state ownership across the major quantiles of the performance distribution. Furthermore, two additional features of quantile regression fit our data better than traditional OLS or fixed-effect estimations. First, the classical properties of efficiency and minimum variance of the OLS estimator are obtained under the restrictive assumption of independently, identically and normally distributed error terms. When the distribution of errors deviates from the normality, the quantile regression estimator may be more efficient than the OLS (Buchinsky, 1998). Second, because the quantile regression estimator is derived from the minimization of a weighted sum of absolute deviations, the parameter estimates are less sensitive to outliers and long tails in the distribution of the data. This makes the quantile regression estimator relatively robust to heteroskedasticity of the residuals. The quantile regression method has been widely used in the past decade in many areas of applied econometrics (Koenker and Hallock, 2001). However, to our best knowledge, there has been no application of quantile regression method to the assessment of the impact of state ownership to firm performance before this research.

According to Buchinsky (1998), the general quantile regression model is:

$$y_i = x_i^{'}\beta_\theta + u_{\theta i}, \ \text{quant}_\theta\left(y_i \mid x_i\right) = x_i^{'}\beta_\theta \ \text{and} \ \text{quant}_\theta\left(u_{\theta i} \mid x_i\right) = 0 \tag{13}$$

where (y_i, x_i), i = 1, …, n, is a sample from some population, y_i is the dependent variable of interest, x_i is a $(m \times 1)$ vector of independent variables, β_θ is an unknown $(m \times 1)$ vector of regression parameters to be estimated and is associated with the θ_{th} percentile, and $u_{\theta i}$ is an unknown error term. The θ_{th} conditional quantile of y_i given x_i is denoted by $\text{quant}_\theta\left(y_i \mid x_i\right)$, which is equal to $x_i^{'}\beta_\theta$. By continuously increasing the value of θ from 0 to 1, we trace out the entire conditional distribution of y given x. For an individual coefficient $\beta_{\theta j}$ associated with the j_{th} independent variable in the vector x_i, called x_{ij}, it could be interpreted as the marginal impact on the θ_{th} conditional quantile of y_i due to a marginal change in the j_{th} independent variable. Thus, the quantile regression technique allows us to identify the effects of the covariates at different locations in the conditional distribution of the dependent variable.

The estimator of true parameter vector β_θ is defined as a solution to the problem:

$$\min_{\beta} \frac{1}{n}\left(\sum_{i:y_i \geq x_i^{'}\beta} \theta \left| y_i - x_i^{'}\beta \right| + \sum_{i:y_i < x_i^{'}\beta} (1-\theta) \left| y_i - x_i^{'}\beta \right| \right), \tag{14}$$

which is a weighted sum of absolute deviations, and can be interpreted as an asymmetric linear penalty function. And it is usually written as:

$$\min_{\beta} \frac{1}{n} \sum_{i=1}^{n} \rho_\theta \left(u_{\theta i} \right), \tag{15}$$

where $\rho_\theta \left(u_{\theta i} \right)$ is the check function, defined as $\rho_\theta \left(u_{\theta i} \right) = \theta u_{\theta i}$ if $u_{\theta i} \geq 0$ or $\rho_\theta \left(u_{\theta i} \right) = (\theta - 1) u_{\theta i}$ if $u_{\theta i} < 0$.

The problem does not have an explicit form, but can be solved by linear programming methods (Koenker and Basset, 1978). As pointed out by Koenker and Hallock (2001), both asymptotic standard error and bootstrap methods could be used to estimate the covariance matrix of the regression parameter matrix, and hence to derive standard errors. Comparing both methods, they note that the difference between the two sets of estimated results is quite small in practice and both estimators are more robust than other forms of inference in econometrics. We use the bootstrap method to calculate the standard errors for the regression coefficients, which is recommended by Buchinsky (1995) due to its better performance in small samples. 1000 bootstrap replications are set to guarantee a small sample variability of the covariance matrix. Moreover, simultaneous estimations of multiple quantile regressions using the bootstrap technique facilitate the statistical comparison (F-test) of regression coefficients on state ownership across different performance quantiles (Koenker and Hallock, 2001).

In summary, our regression model is: [6]

$$\text{quant}_\theta \left(y_{it} \mid x_{it} \right) = \beta_0 + x'_{it} \beta_\theta + z_t ' \gamma \tag{16}$$

in which y_{it} is the dependent variable measuring performance, running through *ROS*, *EBITS*, *ROA*, *Tq_70*, *Tq_80* and *Tq* one by one. z_t denotes those firm-invariant variables, such as *year97*, *year98*, *year99*, and *year00*. x_{it} includes other independent variables, such as *state_ratio_lag* (or alternatively, *gastatetop1_ratio_lag*), *cstr2_10_lag*, *foreign_ratio_lag*, *sizea_lag*, *LLE_lag* (or *LA_lag*), *K_S_lag*, *Y_S_lag*, *list_age_lag*, *SHSE*, *Estate*, *Conglomerate*, *Industrial*, and *Commercial*.

6. Empirical Results

Empirical investigation is conducted by estimating Eq. (16) for different values of θ (the 20th, 30th, 40th, 60th, 70th and 80th quantiles).[7] This allows us to examine the impact of explanatory variables at different points of the distribution of corporate performance. As explained before, we use one-year-lagged independent variables with the exception of dummies to accommodate the action sequence suggested by our theory and to partly overcome the endogeneity problem of ownership structure. Tables 5-10 report the results where *ROS*, *ROA*, *Tq_70* and *Tq_80* are used as dependent variable, respectively. For comparison purposes, we also provide OLS, fixed-effect estimates. F-test is employed to check significance of the differences with regard to the coefficients before the state ownership variable across different performance quantiles. Shapiro-Wilk and Shapiro-Francia tests are employed to check the normality of residuals and White and Breusch-Pagan tests are adopted to investigate the heteroskedasticity of residuals in OLS regressions.

[Tables 5-10 are about here]

As Table 5 indicates, while the coefficients before the state ownership stakes are not significantly different from zero in the three low quantiles of the 20th, 30th and 40th, they are negative and significantly different from zero in the three upper quantiles of the 60th, 70th and 80th, regardless of which leverage ratio is used. The *F*-tests reported in the second panel further confirm the above findings. The second panel shows that the coefficient differences in terms of the lower 20th, 30th and 40th versus the upper 60th, 70th and 80th quantiles, respectively, are statistically significant. These findings are consistent with our theoretical prediction, which suggests that the sensitivity of the company's effort choice to the level of state shareholding differ, depending on the perceived quantile location of the firm's performance level.

The coefficients before foreign ownership ratio show a similar pattern to the state ownership ratio. This might be a simple reflection of the high passiveness and illiquidity of foreign shareholding in Chinese equity market, and is also in line with the declining of the B-share market. The contributions of firm size are not clear cut but mainly negative in the upper quantiles. This in combination with the negative effect of state ownership ratio might suggest that larger size is more likely associated with higher ratio of state ownership. The coefficients before the leverage ratio are significantly negative in the 20th to 70th, but are indifferent from zero in the 80th quantiles, and show a declining in absolute value. This may simply reflect the fact that poorer performers typically receive more government-instructed or guaranteed bank loans, which leads to a negative correlation between leverage ratios and corporate performance. In the 70th and 80th quantiles, the disappearing correlation may suggest a balance between the possible losses caused by the forgoing of positive net value project and the gain of reducing free cash flow agency cost. As expected, operational profit-sale ratio make the most important positive contribution to *ROS* in all quantiles. Moreover, the effects of multiple large shareholders are insignificant.

For comparison purposes, the last two columns of Table 5 report the estimates of OLS and fixed-effect models. These estimates indicate that there is no significant correlation between state ownership stakes and corporate performance levels in the data we use. This finding is consistent with that of Sun and Tong (2003). The regression residuals, however, significantly depart from normal distribution as Shapiro-Wilk and Shapiro-Francia test results both reject the null hypothesis of normality distribution at 1% level. In addition, both White and Breusch-Pagan test results indicate residual heteroskedasticity in the OLS regressions. These non-normality and heteroskedasticity support our application of quantile regression and cast doubt on OLS and fixed-effect estimations.

When using *ROA* as performance measure, similar results are obtained for state ownership variables, although coefficient in the 80th quantile become insignificant and the F-test suggest less significant difference across lower and upper quantiles, except for the 90th. This might reflect in part the measurement errors inherent in the asset accounting in China. As suggested by Sun and Tong (2003), in recognizing the weakness of *ROA*, more attention should be paid to the results associated with *ROS* and *EBITS*.

Given the significant negative correlation between accounting performance measures and market valuations as presented in Table 4, we should not expect that the results reported in Tables 5 and 6 could be statistically replicated when market valuation measures are employed. Surprisingly, when *Tq*_70 and *Tq*_80 are employed as the performance variables respectively, the relationship between state ownership stakes and these new performance variables continue to hold as in the cases of using *ROS* and *ROA*. In the case of *Tq_70*, while the quantile regression suggests a significant negative correlation between the state ownership ratio and *Tq_70* at the 80th quantile only, the *F*-tests suggest that the significant negative correlation could hold for all upper quantiles of the 60th to 80th (Table 7). Employing *Tq_80* as performance measure, Table 8 reports the strongest support to our theoretical prediction. The statistically significant negative correlation between state ownership variable and *Tq*_80 hold at the 60th, 70th, and 80th quantiles, which are confirmed by both *t*-tests and *F*-tests. An interesting contrast is that the effects of multiple large shareholders are positive and highly significant in the market-valuation-based regressions, while they are not significant in the accounting-measure-based regressions. This positive effect of multiple large shareholders on market valuation needs more focused investigation.

Similar to the findings of Table 5, all the OLS, and fixed-effect regressions in Tables 6-8 focus on central tendency of performance, and are unable to differentiate the varying effects of state ownership stakes. To further check the robustness of the above results, we also use the natural logarithm of total assets as firm size variable to run all the above regressions, and the corresponding statistical results are unchanged.

To overcome the limitation inherent in the official definition of state shares, we use the proportion of state shares held by the largest shareholder which is a government-agency to replace the state share ratio. Tables 9 and 10 report the corresponding regression results for the accounting performance measures of *ROS* and *ROA*. It can be seen that results in Table 9 are highly consistent with those presented in Tables 5 and that Table 10 provides stronger support to our theoretical prediction than Table 6.

7. Concluding Remarks

In this paper, we have analyzed both theoretically and empirically the relationship between state ownership and corporate performance in the presence of moral hazard in exerting effort by listed SOEs in China. We have stressed the importance of recognizing listed SOEs as incentive systems and established a behavior-based link between government shareholding stakes and performance of listed SOEs. For a listed SOE with significant state shareholding stakes, it has little to worry when it is in financial trouble because the state owner provides solvency insurance. On the other hand, the provision of solvency insurance in combination with other socioeconomic and political factors entitles the government shareholder participates actively in revenue management for profit sharing and even for resources tunneling when the company's profitability is high. The asymmetrical payoff structure yields a payoff pattern to a listed SOE with significant state ownership that is a decreasing function of government shareholding stake and an increasing function of realized revenue. We model explicitly the effort choice of listed SOE's. Under two plausible assumptions, we show that the sensitivity of a listed SOE's effort choice to the proportions of state shareholding is not linear across different levels of perceived profitability. The choice will become highly sensitive to the government shareholding stakes when a listed SOE perceives a high level of profitability, while becoming insensitive when the perceived level is sufficiently low.

The behavior-based link between state ownership stakes and corporate performance suggested by our theory is undoubtedly a prominent one but not the sole one. To isolate this link from other influential factors, we select a large set of control variables based on a thorough literature review and statistical justifications. This set of control variables is the most comprehensive one so far in comparison with the existing researches in the field. Utilizing a panel data set of China's listed companies during 1994 and 2000, we estimate conditional quantile regression models where corporate performance is measured by both accounting measurements and market valuations. Consistent with our theoretical predictions, it is found that there is an insignificant relationship between state ownership ratio in year t - 1 and realized performance of listed SOEs in year t due to the insensitivity of the firms' effort choices to the government shareholding stakes when the *ex ante* perceived performance level is low. A significantly negative relationship, however, exists between state ownership proportion in year t - 1 and realized performance in year t owing to the high sensitivity of the firms' effort choices to the proportion of government shareholding when the *ex* *ante* perceived performance level is high. Our findings are robust to various measures of firm performance, to two alternative measures of state ownership stakes, and to different measurements of several major control variables.

Our approach could be applicable to the examination of the relationship between controlling shareholders and management in large limited liability companies as we mentioned in the introduction. In addition, our findings may also be useful for policy design with respect to marketization of state-owned shares and improving the quality of listed companies. Our analysis suggests that a gradual and orderly selling of state shares in those well-performed companies would further enhance their performance; and that more rigorous rules on delisting and parent-company-related transactions and their stricter enforcement would eliminate the worst performers and harden budget constraint faced by poor-performers. The orderly selling should start from the best performers and can be implemented by both private placements and auctions. The other key elements in the "orderly" would include a cap on proportion of state shares which will be on sale in each selling attempt (say, no more than 15 per cent of the total state holdings in the company), a lock-up period after each sale (say, six months), and a credible placement or bidding procedure. With the help of these key elements, the orderly selling would be able to avoid the phenomenon of investors fearing the worst – a sudden tidal wave of equity that would destroy the value of their holdings, as indicated by the failed experiments of selling state shares in December 1999 and July 2001 (Green, 2003, pp. 195-198).

Note

[1] More precisely, by "government shareholding" we mean "the proportion of state-shares in the company held by the government".

[2] Since June 2001, the B-share market has opened up to Chinese domestic investors who have foreign currency accounts in the brokerage firms.

[3] To simplify the terminology, we call these listed companies "listed SOEs", hereafter, as popularly used in China.

[4] All unreported results can be obtained from authors upon request.

[5] Section 4.3 discusses the statistical justification issues in terms of variable selection.

[6] We applied a pooled quantile regression method in the paper. As Koenker (2004) discusses, it is much more technically complicated when fixed- or random-effect is also considered in the quantile regressions, while no guaranteed efficiency gains will be obtained in comparison with the pooled quantile regressions. In addition, consistency will be always achieved by the pooled quantile regression method.

[7] We also tried more detailed quantile regressions with 10 percentile increment each time and no additional insight was found. The results with more detailed quantiles are available upon request.

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Table 1. Development of China's Listed Companies, 1990-2000

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
State share fraction (as % total outstanding shares)	N.A.	N.A.	41.38	49.06	43.31	38.74	35.42	31.52	34.25	36.11	38.87
Number of listed companies	10	14	53	183	291	323	530	745	851	949	1088
Total market capitalization[a] (RMB billion)	N.A.	N.A.	104.81	353.10	369.06	347.43	984.24	1752.92	1950.56	2647.12	4809.09
Total market capitalization/GDP (%)	N.A.	N.A.	3.93	10.20	7.89	5.94	14.50	23.44	24.90	32.32	53.79
Capital raised (RMB billion)	N.A.	0.500	9.409	37.547	32.678	15.032	42.508	129.382	84.152	94.456	210.308

Source: *China Statistical Yearbook*, and *Almanac of China's Finance and Banking* for different years.

Note: [a] including IPO and rights issued of A and B shares.

Table 2. Definitions of Variables

Variable Name	Definition
ROS	Return on sales = the ratio of net income to sales.
EBITS	Ratio of earning before interest and tax over sales.
ROA	Return on assets = the ratio of net income to total asset.
Tq	Tobin's q = [(sum of the market value of common stock shares, the book value of the preferred stocks, the book value of the long-term debt, the book value of the inventories, and the book value of the current liabilities) – (the book value of current assets)]/(the book value of total assets).
Tq_70	70%-illiquity-discounted Tobin's q = [(sum of the market value of tradable shares, 70%-price-discounted market value of non-tradable shares, the book value of the preferred stocks, the book value of the long-term debt, the book value of the inventories, and the book value of the current liabilities) – (the book value of current assets)]/(the book value of total assets).
Tq_80	80%-illiquity-discounted Tobin's q = [(sum of the market value of tradable shares, 80%-price-discounted market value of non-tradable shares, the book value of the preferred stocks, the book value of the long-term debt, the book value of the inventories, and the book value of the current liabilities) – (the book value of current assets)]/(the book value of total assets).
state_ratio	State share fraction = the ratio of state shares over total outstanding shares.
gastatetop1_ratio	State share fraction held by government agencies as the largest shareholder = the ratio of state shares held by government agencies as the largest shareholder over total outstanding shares.
foreign_ratio	Foreign share fraction = the ratio of foreign shares (including B-share,H-share, and N-share) over total outstanding shares.
cstr2_10	Ownership concentration ratio = (total shares held by the 2nd to the 10th largest shareholders)/(the total shares not held by the largest shareholder)
size_a	The natural logarithm of annual sales revenue.
size_b	The natural logarithm of total assets.
LLE	Ratio of long term debt to total equity.
LA	Ratio of total debt to total assets.
K_S	Capital-sales ratio = the ratio of the book value of total tangible assets over sales.
Y_S	Operating profit-sales ratio = the ratio of operating profit over sales.
Estate	Equal to 1 if in the real estate industry, and 0 otherwise.
Conglomerate	Equal to 1 if in the conglomerate industry, and 0 otherwise.
Industrial	Equal to 1 if in the industrial industry, and 0 otherwise.
Commercial	Equal to 1 if in the commercial industry, and 0 otherwise.
SHSE	Equal to 1 if listed in Shanghai Stock Exchange, and 0 otherwise.
list_age	The age of being listed.
Sales_growth	Annual growth rate of sales.
year96	Equal to 1 for year 1996, and 0 otherwise.
year97	Equal to 1 for year 1997, and 0 otherwise.
year98	Equal to 1 for year 1998, and 0 otherwise.
year99	Equal to 1 for year 1999, and 0 otherwise.
year00	Equal to 1 for year 2000, and 0 otherwise.

Note: In the text of this paper, “variable name”_lag denotes this variable with a one-year-lag.

Table 3. Summary Statistics of Main Variables (N=1722)

	Mean	Standard Deviation	Median	1st quantile	3rd quantile	Skewness	Kurtosis
ROS	0.019	6.320	0.088	0.034	0.167	-28.648	853.402
EBITS	0.074	5.795	0.132	0.065	0.227	-29.969	976.576
ROA	0.032	0.094	0.044	0.017	0.067	-6.127	69.578
Tq	2.854	1.798	2.385	1.712	3.465	2.682	15.376
Tq_70	1.5280	0.932	1.315	0.920	1.830	2.441	13.114
Tq_80	1.339	0.824	1.152	0.793	1.617	2.380	12.771
state_ratio_lag	0.296	0.267	0.300	0.000	0.532	0.200	1.545
gastatetop1_ratio_lag	0.1030	0.204	0.000	0.000	0.000	1.763	4.690
foreign_ratio_lag	0.0970	0.2960	0.000	0.000	0.000	2.724	8.419
cstr2_10_lag	0.296	0.198	0.273	0.127	0.442	0.545	2.537
size_lag	20.573	0.819	20.520	20.004	21.037	0.601	3.972
LLE_lag	0.155	0.343	0.053	0.006	0.177	12.149	275.841
K_S_lag	3.1270	9.289	2.215	1.450	3.268	32.610	1219.790
Y_S_lag	0.190	0.248	0.177	0.086	0.290	-11.081	288.383
salegrow_lag	0.212	0.828	0.084	-0.0730	0.301	10.555	172.570

Table 4a. Correlation Statistics for Dependent Variables (N=1722)

	1	2	3	4	5
1. ROS					
2. EBITS	0.9848***				
	(0.0000)				
3. ROA	0.1507***	0.1533***			
	(0.0000)	(0.0000)			
4. Tq	-0.1444***	-0.1433***	-0.0459***		
	(0.0000)	(0.0000)	(0.0571)		
5. Tq_70	-0.1557***	-0.1496***	-0.1026***	0.9521***	
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	
6. Tq_80	-0.1562***	-0.1486***	-0.1183***	0.9186***	0.9954***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Table 4b Correlation Statistics for Main Independent Variables (N=1722)

	1	2	3	4	5	6	7	8
1. gastatetop1_ratio_lag								
2. state_ratio_lag	0.406***							
	(0.000)							
3. foreign_ratio_lag	0.038	0.043*						
	(0.116)	(0.072)						
4. cstr2_10_lag	-0.146***	-0.253***	0.224***					
	(0.000)	(0.000)	(0.000)					
5. size_lag	-0.053**	0.057**	0.344***	-0.060**				
	(0.027)	(0.017)	(0.000)	(0.012)				
6. LLE_lag	0.032	0.048**	0.070***	0.046*	0.150***			
	(0.188)	(0.048)	(0.004)	(0.058)	(0.000)			
7. K_S_lag	-0.011	0.018	0.058**	0.011	-0.010	0.260***		
	(0.641)	(0.464)	(0.016)	(0.637)	(0.683)	(0.000)		
8. Y_S_lag	-0.075***	-0.061**	-0.065***	-0.021	-0.003	-0.230***	-0.157***	
	(0.002)	(0.012)	(0.007)	(0.383)	(0.909)	(0.000)	(0.000)	
9. salegrow_lag	-0.038	-0.041*	-0.049**	0.064***	0.034	0.000	-0.080***	0.078***
	(0.120)	(0.088)	(0.042)	(0.008)	(0.155)	(0.989)	(0.001)	(0.001)

Note: ***, **, and * represent correlations that are statistically significant at 1, 5 and 10 percent levels, respectively. The numbers in parentheses are *P*-values. Please note that *State_ratio_lag* and *gastatetop1_ratio_lag* are two alternative explanatory variables and therefore will not enter one regression together.

Table 5. Regression Results with ROS as the Performance Measure (N=1746)

	Quantile Regressions						OLS	Fixed effect
	20th Quant	30th Quant	40th Quant	60th Quant	70th Quant	80th Quant		
state_ratio_lag	0.0136	0.0065	0.0038	-0.0172**	-0.0214***	-0.0215*	-0.4071	0.4268
	(1.03)	(0.70)	(0.49)	(-2.34)	(-2.62)	(-1.86)	(-0.45)	(0.22)
foreign_ratio_lag	-0.0188	-0.0241	-0.0268	-0.0594**	-0.0694	-0.0673**	0.9157	3.7436
	(-0.38)	(-0.88)	(-1.14)	(-2.40)	(-2.44)	(-1.98)	(1.18)	(0.26)
cstr2_10_lag	-0.0142	-0.0082	-0.0006	0.0113	0.0083	-0.0043	-1.7915	0.6139
	(-0.68)	(-0.60)	(-0.05)	(0.93)	(0.62)	(-0.26)	(-1.23)	(0.26)
size_lag	0.0029	0.0016	-0.0033	-0.0061**	-0.0091***	-0.0097**	0.4628	0.6327
	(0.48)	(0.40)	(-0.95)	(-2.07)	(-3.01)	(-2.01)	(1.50)	(0.89)
LLE_lag	-0.0993*	-0.0494**	-0.0417***	-0.0487***	-0.0399*	-0.0429	-0.7674	-0.9556
	(-1.80)	(-2.19)	(-2.98)	(-3.39)	(-1.78)	(-1.01)	(-0.87)	(-1.40)
K_S_lag	-0.0256	-0.0099	-0.0022	0.0064	0.0085	0.0228**	-0.0701	-0.0609***
	(-1.14)	(-1.14)	(-0.33)	(2.30)	(1.61)	(2.16)	(-0.69)	(-3.02)
Y_S_lag	0.5779***	0.5511***	0.5146***	0.5081***	0.4977***	0.4514***	-0.3152	-1.2325
	(5.37)	(9.75)	(9.49)	(11.31)	(9.84)	(7.60)	(-0.31)	(-1.34)
list_age_lag	-0.0145***	-0.0110***	-0.0087***	-0.0082***	-0.0060***	-0.0049	-0.0881	-0.1182
	(-2.61)	(-3.48)	(-3.88)	(-4.64)	(-2.80)	(-1.65)	(-1.65)	(-0.56)
salegrow_lag	0.0031	0.0026	0.0035	0.0027	0.0013	0.0053	-0.0215	0.8192***
	(0.65)	(0.60)	(0.73)	(0.58)	(0.24)	(0.85)	(-0.10)	(4.15)
other control variables[a]	yes	yes	yes	yes	yes	yes	yes	yes
constant	-0.0023	-0.0045	0.0960	0.1873***	0.2673***	0.2732**	-7.9658	-13.2090
	(-0.02)	(-0.05)	(1.23)	(2.81)	(3.61)	(2.29)	(-1.48)	(-0.90)
Pseudo R^2	0.0375	0.0403	0.0497	0.0816	0.0983	0.1199	R^2=0.0245	Within R^2=0.0359
Interquantile Comparison of the Coefficient of state_ratio_lag								Between R^2=0.0007
20th Quant		0.54	0.75	6.29**	6.99***	5.15**	Shapiro-Wilk test: 17.378***	Overall R^2=0.0088
30th Quant			0.18	7.65***	8.38***	5.07**	Shapiro-Francia test: 10.040***	
40th Quant				10.03***	9.50***	4.87**	White test: 519.708***	Shapiro-Wilk test: 17.287***
60th Quant					0.59	0.22	Breusch-Pagan test: 662181.1***	Shapiro-Francia test: 10.014***
70th Quant						0.00		

Note: The number in parentheses are t-statistics. ***, **, and * indicate significance at the 10%, 5%, and 1% levels, respectively. 1000 bootstrap replications are used in the quantile regressions. [a] Other control variables include industry dummmies, time dummies, and stock exchange dummy.

Table 6**.** Regression Results with ROA as the Performance Measure (N=1746)

	Quantile Regressions							OLS	Fixed effect
	20th Quant	30th Quant	40th Quant	60th Quant	70th Quant	80th Quant	90th Quant		
state_ratio_lag	-0.0011	-0.001	-0.0065*	-0.0091**	-0.0087*	-0.0044	-0.0191***	0.0027	-0.0186
	(-0.21)	(-0.20)	(-1.68)	(-2.50)	(-1.87)	(-0.86)	(-2.77)	(0.34)	(-0.71)
foreign_ratio_lag	-0.0202	-0.0361**	-0.0315**	-0.0276***	-0.0355***	-0.0312**	-0.0848***	-0.0695***	0.0526
	(-1.04)	(-2.58)	(-2.39)	(-2.83)	(-3.10)	(-2.33)	(-3.90)	(-2.61)	(0.26)
cstr2_10_lag	-0.0058	0.0049	-0.0023	-0.0006	0.0009	0.0031	0.0107	0.0058	-0.0178
	(-0.69)	(0.70)	(-0.41)	(-0.11)	(0.14)	(0.42)	(1.03)	(0.46)	(-0.55)
size_lag	0.0040*	0.0005	-0.0020	-0.0011	-0.0003	-0.0013	0.0022	0.0061*	-0.0168*
	(1.70)	(0.23)	(-1.36)	(-0.68)	(-0.16)	(-0.62)	(-0.84)	(1.86)	(-1.72)
LLE_lag	-0.0338***	-0.0323***	-0.0252***	-0.0301***	-0.0266***	-0.0208	0.0230	-0.0108	0.0134
	(-3.14)	(-3.80)	(-3.38)	(-4.33)	(-2.89)	(-1.34)	(0.86)	(-0.48)	(1.42)
K_S_lag	-0.0052*	-0.0035	-0.0034	-0.00003	0.0003	0.0002	-0.00002	0.0002	0.0004
	(-1.71)	(-1.57)	(-1.62)	(-0.02)	(0.23)	(0.24)	(-0.02)	(0.77)	(1.54)
Y_S_lag	0.1176***	0.0967***	0.0809***	0.0646***	0.0630***	0.0555***	0.0566***	0.0877***	0.0611***
	(5.90)	(5.72)	(5.32)	(4.89)	(4.11)	(2.96)	(2.87)	(2.69)	(4.81)
list_age_lag	-0.0071***	-0.0054***	-0.0047***	-0.0049***	-0.0051***	-0.0054***	-0.0056***	-0.0115***	-0.0131***
	(-3.86)	(-3.81)	(-4.90)	(-5.23)	(-4.87)	(4.51)	(-3.32)	(-5.25)	(-4.48)
salegrow_lag	0.0018	0.0033	0.0028	0.0052**	0.0037	0.0046	0.0014	0.0094***	0.0031
	(0.68)	(1.12)	(1.00)	(2.01)	(1.38)	(1.47)	(0.32)	(2.88)	(1.13)
other control variables[a]	yes	yes	yes	yes	yes	yes	yes	yes	yes
constant	-0.0444	0.0273	0.0917***	0.0750**	0.0674*	0.1020**	0.0506	-0.0904	0.4001**
	(-0.87)	(0.62)	(2.76)	(2.13)	(1.65)	(2.21)	(0.89)	(-1.25)	(1.99)
Pseudo R^2	0.1014	0.1002	0.0941	0.0921	0.0880	0.0874	0.0808	R^2=0.0967	Within R^2=0.0710
									Between R^2=0.0225
Interquantile Comparison of the Coefficient of state_ratio_lag									
20th Quant		0.00	1.76	2.59	1.87	0.31	5.34**	Shapiro-Wilk test: 15.367***	Overall R^2=0.0408
30th Quant			2.76*	3.04*	2.09	0.33	5.42**	Shapiro-Francia test: 9.394***	
40th Quant				0.55	0.25	0.17	3.08*	White test: 199.0455**	Shapiro-Wilk test: 15.220***
60th Quant					0.01	1.18	2.33	Breusch-Pagan test: 32717.21***	Shapiro-Francia test: 9.345***
70th Quant						1.44	2.78*		
80th Quant							7.08**		

Note: Same as in Table 5.

Table 7. Regression Results with 70%-Illiquidity-Price-Discounted Tobin's q as the Performance Measure (N=1746)

	Quantile Regressions						OLS	Fixed effect
	20th Quant	30th Quant	40th Quant	60th Quant	70th Quant	80th Quant		
state_ratio_lag	0.0355	0.0014	-0.0233	-0.0838	-0.0812	-0.1676*	-0.1170*	0.0400
	(0.95)	(0.03)	(-0.43)	(-1.30)	(-0.92)	(-1.86)	(-1.80)	(0.20)
foreign_ratio_lag	-0.3260***	-0.3634***	-0.3661***	-0.4304***	-0.5743**	-0.5470**	-0.3123	-1.0747
	(-3.44)	(-4.23)	(-3.20)	(-2.66)	(-2.52)	(-2.08)	(-1.62)	(-0.71)
cstr2_10_lag	0.2501***	0.3045***	0.3158***	0.3526***	0.5013***	0.7329***	0.4317***	-0.2599
	(4.59)	(4.44)	(4.31)	(3.59)	(3.86)	(5.46)	(4.31)	(-1.06)
size_lag	-0.3462***	-0.3799***	-0.4126***	-0.4756***	-0.5113***	-0.5554***	-0.5695***	-0.8193***
	(-18.77)	(-19.24)	(-17.62)	(-17.93)	(-14.98)	(-16.19)	(-18.40)	(-11.11)
LLE_lag	0.1455***	0.1173**	0.0806	0.2113*	0.2610**	0.2104*	0.2388***	0.1713**
	(3.22)	(2.25)	(1.17)	(1.80)	(2.29)	(1.89)	(3.92)	(2.42)
K_S_lag	0.0013	0.0011	0.0009	0.0010	0.0087	0.0142	0.0034	-0.0005
	(0.20)	(0.15)	(0.12)	(0.09)	(0.67)	(0.99)	(0.79)	(-0.22)
Y_S_lag	0.4091***	0.3731***	0.2933**	0.2550*	0.1812	0.2193	0.2179**	0.1147
	(5.09)	(3.97)	(2.46)	(1.86)	(1.22)	(1.62)	(2.02)	(1.20)
list_age_lag	0.0100	0.0166	0.0165	0.0326*	0.0410*	0.0753***	0.0584***	0.3656***
	(0.97)	(1.46)	(1.21)	(1.94)	(1.75)	(2.98)	(3.11)	(16.60)
salegrow_lag	-0.0082	-0.0083	0.0129	-0.0003	0.0468	0.0260	-0.0150	-0.0151
	(-0.60)	(-0.42)	(0.58)	(-0.01)	(1.28)	(0.70)	(-0.68)	(-0.74)
other control variables[a]	yes	yes	yes	yes	yes	yes	yes	yes
constant	8.3238***	9.1279***	9.9287***	11.4552***	12.2223***	13.1917***	13.3522***	17.8546***
	(20.62)	(21.48)	(19.20)	(19.97)	(16.39)	(17.68)	(20.12)	(11.82)
Pseudo R^2	0.2855	0.2911	0.2904	0.2842	0.2831	0.2943	R^2=0.4372	Within R^2=0.4204
								Between R^2=0.2478
Interquantile Comparison of the Coefficient of state_ratio_lag								
20th Quant		1.08	1.57	3.93**	1.91	5.32**	Shapiro-Wilk test: 13.355***	Overall R^2=0.2970
30th Quant			0.51	2.50	1.09	3.85*	Shapiro-Francia test: 8.644***	
40th Quant				1.40	0.58	2.92*	White test: 419.3797***	Shapiro-Wilk test: 12.264***
60th Quant					0.00	1.31	Breusch-Pagan test: 6218.329***	Shapiro-Francia test: 8.204***
70th Quant						1.59		

Note: Same as in Table 5.

Table 8. Regression Results with 80%-Illiquidity-Price-Discounted Tobin's q as the Performance Measure (N=1746)

	Quantile Regressions						OLS	Fixed effect
	20th Quant	30th Quant	40th Quant	60th Quant	70th Quant	80th Quant		
state_ratio_lag	0.0087	-0.0201	-0.0342	-0.1214**	-0.1512**	-0.1790**	-0.1360**	0.0557
	(0.28)	(-0.53)	(-0.77)	(-2.01)	(-2.00)	(-2.08)	(-2.42)	(0.32)
foreign_ratio_lag	-0.5025***	-0.5687***	-0.6044***	-0.6319***	-0.6568***	-0.6764***	-0.5530***	-1.0028
	(-6.31)	(-6.93)	(-5.81)	(-3.56)	(-3.54)	(-3.27)	(-3.48)	(-0.75)
cstr2_10_lag	0.1892***	0.2107***	0.2255***	0.2652***	0.3245***	0.5151***	0.3032***	-0.2062
	(3.69)	(3.70)	(3.32)	(2.78)	(2.86)	(3.98)	(3.48)	(-0.96)
size_lag	-0.3095***	-0.3362***	-0.3609***	-0.4141***	-0.4457***	-0.4793***	-0.4925***	-0.6801***
	(-18.77)	(-19.63)	(-19.08)	(-16.89)	(-15.12)	(-14.55)	(-18.35)	(-10.45)
LLE_lag	0.1896***	0.1826***	0.1333**	0.2482***	0.2195**	0.1892	0.2340***	0.1309**
	(4.37)	(4.07)	(2.32)	(2.62)	(2.45)	(1.55)	(5.08)	(2.10)
K_S_lag	0.0005	0.0004	0.0003	0.0037	0.0069	0.0093	0.0028	-0.0005
	(0.09)	(0.06)	(0.04)	(0.33)	(0.55)	(0.70)	(0.72)	(-0.26)
Y_S_lag	0.2971***	0.2848***	0.2236**	0.1120	0.1119	0.1508	0.1697*	0.1005
	(4.21)	(3.04)	(2.21)	(0.94)	(0.84)	(1.25)	(1.92)	(1.19)
list_age_lag	0.0144	0.0156	0.0240*	0.0346**	0.0409**	0.0662***	0.0579***	0.3200***
	(1.52)	(1.53)	(1.94)	(2.22)	(2.02)	(2.70)	(3.57)	(16.47)
salegrow_lag	-0.0041	-0.0029	-0.0036	0.0080	0.0207	0.0134	-0.0149	-0.0153
	(-0.30)	(-0.17)	(-0.18)	(0.31)	(0.74)	(0.40)	(-0.78)	(-0.85)
other control variables[a]	yes	yes	yes	yes	yes	yes	yes	yes
constant	7.4123***	8.0811***	8.6693***	10.01667***	10.7641***	11.4965***	11.5859***	14.8694***
	(20.77)	(21.33)	(20.86)	(18.59)	(16.65)	(16.06)	(20.13)	(11.15)
Pseudo R^2	0.2902	0.2945	0.2939	0.2846	0.2846	0.2994	R^2= 0.4435	Within R^2=0.4268
								Between R^2= 0.2585
Interquantile Comparison of the Coefficient of state_ratio_lag								
20th Quant		0.99	1.26	5.17**	4.68**	5.00**	Shapiro-Wilk test: 13.252***	Overall R^2= 0.3099
30th Quant			0.23	3.62*	3.53*	3.81*	Shapiro-Francia test: 8.604***	
40th Quant				3.12*	3.10*	3.31*	White test: 372.9424***	Shapiro-Wilk test: 12.167***
60th Quant					0.36	0.70	Breusch-Pagan test: 5966.028***	Shapiro-Francia test: 8.163***
70th Quant						0.19		

Note: Same as in Table 5.

Table 9. Regression Results with ROS as the Performance Measure (N=1722)

	Quantile Regressions						OLS	Fixed effect
	20th Quant	30th Quant	40th Quant	60th Quant	70th Quant	80th Quant		
gastatetop1_ratio_lag	-0.0147	-0.0061	-0.0700	-0.0318***	-0.0321***	-0.0408***	0.2053	0.2074
	(-0.56)	(-0.54)	(-1.45)	(-3.48)	(-3.18)	(-2.92)	(1.05)	(0.10)
foreign_ratio_lag	-0.0099	-0.0135	-0.0185**	-0.0236***	-0.0268***	-0.0292***	0.2787	0.2160
	(-0.59)	(-1.56)	(-2.43)	(-3.48)	(-3.53)	(-3.13)	(1.06)	(0.03)
cstr2_10_lag	-0.0257	-0.0106	0.0058	0.0060	0.0091	0.0041	-1.6147	0.5647
	(-1.23)	(-0.78)	(0.48)	(0.45)	(0.70)	(0.26)	(-1.38)	(0.23)
size_lag	0.0051	0.0017	-0.0024	-0.0059**	-0.0083***	-0.0094**	0.4625	0.6308
	(0.81)	(0.43)	(-0.73)	(-2.11)	(-2.80)	(-2.07)	(1.51)	(0.89)
LLE_lag	-0.0936	-0.0455*	-0.0425***	-0.0467***	-0.0402*	-0.0349	-0.7845	-0.9501
	(-1.68)	(-1.96)	(-2.90)	(-2.95)	(-1.68)	(-0.80)	(-0.89)	(-1.39)
K_S_lag	-0.0269	-0.0103	-0.0013	0.0064**	0.0086	0.0212**	-0.0703	-0.0609***
	(-1.10)	(-1.08)	(-0.18)	(2.11)	(1.56)	(2.03)	(-0.69)	(-3.02)
Y_S_lag	0.5837***	0.5566***	0.5146***	0.4954***	0.5101***	0.4623***	-0.3052	-1.2278
	(5.16)	(9.72)	(9.62)	(11.53)	(10.25)	(8.31)	(-0.30)	(-1.33)
list_age_lag	-0.0150**	-0.0102***	-0.0081***	-0.0061***	-0.0040*	-0.0053*	-0.0955	-0.1136
	(-2.55)	(-3.17)	(-3.49)	(-3.29)	(-1.88)	(-1.75)	(-1.63)	(-0.53)
salegrow_lag	0.0033	0.0025	0.0022	0.0027	0.0015	0.0052	-0.0183	0.8156***
	(0.68)	(0.58)	(0.43)	(0.55)	(0.25)	(0.86)	(-0.09)	(4.13)
other control variables[a]	yes	yes	yes	yes	yes	yes	yes	yes
constant	-0.0383	-0.0068	0.0755	0.1782***	0.2339***	0.2736**	-8.1159	-12.9728
	(-0.26)	(-0.07)	(1.00)	(2.76)	(3.23)	(2.41)	(-1.45)	(-0.90)
Pseudo R2	0.0376	0.0404	0.0498	0.0821	0.0986	0.1208	R^2=0.0243	Within R^2=0.0358
Interquantile Comparison of the Coefficient of gastatetop1_ratio_lag								Between R^2=0.0009
20th Quant		0.19	0.00	0.47	0.46	0.89	Shapiro-Wilk test: 17.38***	Overall R^2=0.0098
30th Quant			0.66	5.29**	4.32**	4.61**	Shapiro-Francia test: 10.041***	Shapiro-Wilk test: 17.287***
40th Quant				5.18**	3.67*	4.08**	White test: 476.5271***	Shapiro-Francia test: 10.014***
60th Quant					0.00	0.57	Breusch-Pagan test: 663471.3***	
70th Quant						0.81		

Note: Same as in Table 5.

Table 10. Regression Results with ROA as the Performance Measure (N=1722)

	Quantile Regressions						OLS	Fixed effect
	20th Quant	30th Quant	40th Quant	60th Quant	70th Quant	80th Quant		
gastatetop1_ratio_lag	-0.0022	-0.0009	-0.0090*	-0.0106**	-0.0139***	-0.0179***	-0.0189	-0.0477
	(-0.31)	(-0.15)	(-1.96)	(-2.36)	(-2.65)	(-2.70)	(-1.64)	(-1.63)
foreign_ratio_lag	-0.0069	-0.0134***	-0.0096**	-0.0101***	-0.0118***	-0.0168***	-0.0264***	-0.0154
	(-1.03)	(-2.78)	(-2.23)	(-2.89)	(-3.23)	(-4.05)	(-2.64)	(-0.18)
cstr2_10_lag	-0.0045	0.0054	-0.0006	0.0009	0.0010	0.0020	0.0034	-0.0264
	(-0.57)	(0.78)	(-0.12)	(0.16)	(0.16)	(0.29)	(0.28)	(-0.80)
size_lag	0.0040	0.0006	-0.0025	-0.0014	-0.0003	0.0003	0.0065*	-0.0162*
	(1.59)	(0.29)	(-1.62)	(-0.83)	(-0.19)	(0.14)	(1.90)	(-1.66)
LLE_lag	-0.0342***	-0.0316***	-0.0236***	-0.0301***	-0.0323***	-0.0258*	-0.0105	0.0137
	(-3.18)	(-3.72)	(-2.95)	(-4.27)	(-3.76)	(-1.74)	(-0.47)	(1.45)
K_S_lag	-0.0052*	-0.0035*	-0.0033*	-0.00002	0.0003	0.0003	0.0002	0.0004
	(-1.82)	(-1.68)	(-1.65)	(-0.01)	(0.21)	(0.28)	(0.83)	(1.52)
Y_S_lag	0.1175***	0.0963***	0.0794***	0.0662***	0.0663***	0.0558***	0.0881***	0.0608***
	(6.08)	(6.06)	(5.56)	(5.29)	(4.44)	(2.96)	(2.71)	(4.79)
list_age_lag	-0.0070***	-0.0053***	-0.0046***	-0.0040***	-0.0044***	-0.0042***	-0.0107***	-0.0137***
	(-3.62)	(-3.73)	(-4.60)	(-4.05)	(-3.80)	(-3.60)	(-5.15)	(-4.65)
salegrow_lag	0.0019	0.0034	0.0036	0.0048*	0.0039	0.0050*	0.0092***	0.0027
	(0.72)	(1.21)	(1.30)	(1.75)	(1.36)	(1.68)	(2.85)	(0.98)
ather control variables[a]	yes	yes	yes	yes	yes	yes	yes	yes
constant	-0.0467	0.0238	0.0991***	0.0772**	0.0671	0.0685	-0.0973	0.3934**
	(-0.85)	(0.55)	(2.83)	(2.10)	(1.63)	(1.50)	(-1.31)	(1.98)
Pseudo R^2	0.1017	0.1010	0.0948	0.0927	0.0895	0.0899	R^2=0.1000	Within R^2=0.0728
Interquantile Comparison of the Coefficient of gastatetop1_ratio_lag								Between R^2=0.0344
20th Quant		0.06	1.20	1.38	2.28	3.30*	Shapiro-Wilk test: 15.365***	Overall R^2=0.0477
30th Quant			3.60*	2.89*	4.03**	5.18**	Shapiro-Francia test: 9.393***	
40th Quant				0.14	0.85	1.78	White test: 196.0738**	Shapiro-Wilk test: 15.218***
60th Quant					0.86	1.82	Breusch-Pagan test: 32787.71***	Shapiro-Francia test: 9.344***
70th Quant						0.78		

Note: Same as in Table 5.