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Ownership structure, corporate governance and investment efficiency of Chinese listed firms

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Abstract

Purpose – This paper aims to examine whether and how ownership structure and corporate governance have bearings on the investment efficiency of Chinese listed firms.

Design/methodology/approach – The authors measure the investment efficiency by following the work of Richardson (2006) and classify listed firms into two categories: state-owned enterprises (SOEs) and private firms. OLS regressions with both industry and year fixed effects are used to investigate the effect of ownership structure and governance mechanisms on the listed firms' investment efficiency.

Findings – The authors find that ownership concentration has a negative impact on investment efficiency, and this effect is more pronounced in SOEs than in private firms. In addition, adoption of incentive-based compensation helps improve investment efficiency. Compared with other types of institutional investors, mutual funds are more likely to exert a positive effect on the investment efficiency of investee companies.

Originality/value – This paper examines the monitoring effect of governance mechanisms in China from a new perspective, which is the investment efficiency. Furthermore, previous studies provide minimal evidence indicating any effect of incentive-based compensation on firm performance in China. This study provides empirical evidence on this effect by using incentive-based compensation (whether CEOs have been granted stock options) as an explanatory variable in the regression models.

Keywords China, Investment efficiency, Corporate governance, Ownership structure, Institutional investor, Incentive-based compensation

Paper type Research paper

1. Introduction

This study investigates whether and how ownership structure (i.e. ownership concentration, managerial ownership and incentive-based compensation) and both internal (i.e. boardroom characteristics) and external governance mechanisms (i.e. institutional investors, auditor reputation) influence the investment efficiency of Chinese listed firms. This topic has remained unexplored. Investment efficiency deals with how well firms invest their assets. It can be used



JEL classification – G23, G30, G32

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as a measure of firm performance in the sense that higher investment efficiency signifies more effective use of assets and, in turn, better firm performance. Investment efficiency is a fundamental concern in corporate finance, especially for Chinese listed firms, because most of them are ultimately controlled by the government. To date, state-owned enterprises (SOEs) still dominate the Chinese stock markets. Top executives of SOEs are appointed under heavy influence of the respective government, and their career changes are dominated by parent SOEs or controlling state entities (Huang *et al.*, 2011). As such, top executives of SOEs are more likely to pursue politically motivated goals for their own interests rather than higher investment efficiency (Huang *et al.*, 2011). Chen *et al.* (2011) also find that political connections have a negative impact on the investment efficiency of Chinese listed firms. Therefore, it is worthwhile to investigate whether any improvement in corporate governance mechanisms increases investment efficiency for SOEs as opposed to private firms.

The Chinese Government has embarked upon various reforms to improve corporate governance and protect the interests of minority shareholders of listed firms, and most reforms are based on best practices in the USA and other developed nations (Chen and Zhang, 2012; Ding *et al.*, 2007). For example, mutual funds were introduced to domestic stock markets in the late 1990s by the Chinese Securities Regulatory Commission (CSRC). In 2002, the CSRC further required all listed firms to have at least one-third of the board members be independent directors. Moreover, the CSRC have been encouraging publicly listed firms to provide incentive-based compensation to managers, and listed firms have started to grant stock options and restricted stock to their CEOs since 2005.

Can these corporate governance mechanisms effectively protect the interests of minority shareholders and enhance the performance of Chinese listed firms, most of which are still ultimately controlled by state? To date, there is no definite answer. For example, some studies suggest that independent directors can strengthen the linkage between firm performance and CEO turnover (Kato and Long, 2006) and deter earnings management activities (Chen and Zhang, 2012). In contrast, other studies suggest that outside directors are not really independent, and give evidence that independent directors are incapable of enhancing firm performance or value (Qiu and Yao, 2009; Yu and Zheng, 2014). Lin *et al.* (2009) report that the number of board meetings is positively associated with firm performance, whereas Chen *et al.* (2006) find that the greater the number of board meetings, the higher the likelihood of committing fraud. Li *et al.* (2007) find that managerial ownership has a positive effect on firm performance. However, Firth *et al.* (2007) argue that managerial ownership is unlikely to influence accounting quality in China, as their holdings are quite small. Moreover, existing studies also hold mixed opinions towards the impact of external monitoring on firm performance, such as whether mutual fund ownership can enhance firm performance. Yuan *et al.* (2008) report that mutual funds have a positive effect on firm performance, whereas Chen *et al.* (2006) suggest that the ownership of mutual funds in Chinese listed firms is too low to boost firm performance.

A review of Chinese-listed firms over the period from 2002 to 2012 reveals that ownership structure and corporate governance indeed matter in determining the investment efficiency of firms. More specifically, our study finds that ownership concentration affects investment efficiency negatively, and such a negative effect is more pronounced in SOEs than in private firms. The adoption of incentive-based compensation improves investment efficiency in both SOEs and private firms. The investment of listed firms is more efficient when CEOs are also shareholders in both SOEs and private firms. Compared with other types of institutional investors, mutual funds are more likely to exert a positive effect on investment efficiency of investee firms. Moreover, other internal governance mechanisms (i.e. independent directors, the

size of the board of directors and whether the board chair holds the position of CEO) are not associated with the investment efficiency of SOEs or private firms.

Our study contributes to existing literature in the following ways. First, we examine the monitoring effect of both internal and external governance mechanisms in China from the perspective of investment efficiency. Corporate investment efficiency is of great concern to publicly listed firms in China. This is because the state still holds large stakes in most listed firms, such that any government intervention may harm the investment efficiency of Chinese listed firms (Chen *et al.*, 2011). Our study casts new light on the effect of governance mechanisms on investment efficiency in China. Second, publicly listed firms in China have started to grant stock options and restricted stock to their CEOs since 2005. However, previous studies provide minimal evidence indicating any effect of incentive-based compensation on firm performance. Our study fills this gap in the literature by employing incentive-based compensation (whether CEOs have been granted stock options) as an explanatory variable in our regression models. Moreover, there is no consensus on the monitoring effect of institutional investors in China. The stake of institutional investors in listed firms has been growing, and the growth of their ownership offers us a good opportunity to provide new evidence on the monitoring effect of institutional investors in terms of enhancing corporate investment efficiency. Our empirical results provide inputs for the deliberation of policy makers and regulators when they review the privatization of SOEs and assess the effect of recent corporate governance reforms.

The paper proceeds as follows. Section 2 reviews the related literature and develops hypotheses. Section 3 describes the research design. Section 4 presents the empirical findings. Section 5 concludes the paper.

2. Literature review and hypotheses development

One major characteristic of Chinese listed firms is the concentrated ownership structure. As the government wants to retain control of listed firms, state shareholders usually hold large stakes in SOEs. Although ownership structure in private firms is less concentrated than in SOEs, most private companies are also controlled by a dominant shareholder[1]. Moreover, the shares held by individual investors are extremely diffused in China[2]. Because small investors fail to attend general shareholder meetings and exercise their voting rights, and the largest shareholder holds on average 84 per cent of the voting shares present at general shareholder meetings, the shareholdings of all block shareholders who attend the meetings constitute 93 per cent of the voting shares on average Chen *et al.* (2009).

According to the literature, there are two types of agency conflicts: principal-agent conflict (Jensen and Meckling, 1976) and agency conflict between controlling shareholders and minority shareholders (Shleifer and Vishny, 1997; La Porta *et al.*, 2000). The central agency problem under a concentrated ownership structure is the exploitation of minority interests by controlling block holders. Due to poor investor protection in China, expropriation by controlling shareholders has been argued to be a major problem of Chinese stock markets (Gao and Kling, 2008; Cheung *et al.*, 2009; Wang and Ye, 2014). Expropriation behavior by controlling shareholders harms investment efficiency, as those behaviors usually involve abusing company resources (Jiang *et al.*, 2010; Huyghebaert and Wang, 2012). A higher ownership concentration provides controlling shareholders with more power to expropriate minority shareholders, and in turn harm investment efficiency.

Qian *et al.* (2010) argue that expropriation by controlling shareholders can be more severe in politically connected firms than in non-politically connected firms due to the former having less concern with capital market punishment. Moreover, compared with privately controlled listed firms, state-controlled listed firms usually have more social and political

obligations (e.g. supporting social welfare and financing non-profitable divisions or public projects). This may further incentivize state shareholders to divert financial resources from SOEs. As such, we hypothesize below:

H1. Ownership concentration has a negative effect on investment efficiency, and such a negative effect is more pronounced in SOEs than in private firms.

Chen *et al.* (2009) report that management, foreign and employee shares represented less than 2 per cent of the listed firms' outstanding shares at the end of 2004. Previous studies hold mixed opinions on the governance effect of managerial ownership. On one hand, Chen (2001) suggests that managerial shareholdings have a positive effect on firm performance. Gao and Kling (2008) report that managerial shareholdings are likely to mitigate tunneling activities by controlling shareholders. On the other hand, Firth *et al.* (2007) also suggest that managerial ownership is unlikely to influence accounting quality. Hu and Zhou (2008) pay more attention to managerial ownership in SOEs, and argue that managerial ownership in SOEs may not be an effective incentive scheme because it is largely determined by government policy. In the past decade, many private firms launched their IPOs in China. Managerial ownership in private firms is significantly higher than that in SOEs. Given that managerial ownership has been able to mitigate the agency cost due to the separation of ownership and control (Jensen and Meckling, 1976; Meng *et al.*, 2011), and overall managerial ownership has been higher in private firms in China, we formulate the second hypothesis, as below:

H2. Managerial ownership has a positive effect on investment efficiency, and such a positive effect is more pronounced in private firms than in SOEs.

Publicly listed firms in China have begun to grant stock options and restrict stock to their CEOs since the enactment of new legal rules in 2005. Conyon and He (2012), using China's publicly listed firms from 2000 to 2010 as the study sample, show that only about 2 to 3 per cent of publicly listed firms granted stock options and restricted stock to their CEOs. It remains to be seen whether granting executive stock options as a reward mechanism in China can better align the interests of managers and shareholders and improve firm performance such as investment efficiency. Previous studies have examined the effect of stock option grants to top managers on firms' performance in developed markets. Mehran (1995), Hanlon *et al.* (2003) and Ittner *et al.* (2003) report that executives' stock option grants are associated with better firm performance in the USA. Ozkan (2011) also finds a similar effect in the UK, while Conyon *et al.* (2011) show that stock options have had positive impact on corporate governance in the USA since the late 1980s, and have become popular in Europe since the mid to late 1990s. With updated data from 2004 to 2012, we also expect executive stock option grants in both SOEs and private firms to enhance investment efficiency in China.

H3. Executive stock option grants have a positive impact on investment efficiency.

Recent studies have examined the impact of institutional investors on corporate governance. Using data from the USA, Chen *et al.* (2007) illustrate that mutual funds could have a monitoring effect on corporate governance. Aggarwal *et al.* (2011), using data from US and non-US firms (not including Chinese firms), find similar results. However, they argue that because grey institutions (i.e. insurance companies, pension funds and trusts) have business relationships with their portfolio firms, they may have conflict of interest with shareholders as well (Chen *et al.*, 2007; Aggarwal *et al.*, 2011). In Chinese capital markets, Aggarwal *et al.* (2015) and Yuan *et al.* (2008) also find that mutual funds serve as effective monitors.

The number and the net value of institutional investors in Chinese domestic markets (including mutual investors, insurance companies, trusts and pension funds) has been growing since their introduction in 1997. According to Yuan *et al.* (2008) and Aggarwal *et al.* (2015), mutual funds in China could be an effective governance mechanism because they are larger and have a longer history in capital markets relative to other institutional investors (insurance companies, trusts and pension funds). Hence, we expect mutual funds to have a positive impact on investment efficiency, but other institutional investors not to.

H4. Mutual funds' ownership has a positive effect on investment efficiency, but other institutional investors' ownership (insurance companies, trusts and pension funds) does not.

3. Research design

3.1 Model and tests

To test the hypotheses, we first follow the work of Richardson (2006) and measure investment efficiency. Such an approach is also adopted by other seminal papers such as Biddle *et al.* (2009) and Chen *et al.* (2011)[3]. Furthermore, Chen and Xie (2011) also use this model to examine the investment efficiency of Chinese listed firms, and focus on the effect of independent director governance on investment efficiency from a network location's view:

$$\begin{aligned} \text{INV}_{i,t} = & \alpha_0 + \alpha_1 \text{Q}_{i,t-1} + \alpha_2 \text{CASH}_{i,t-1} + \alpha_3 \text{LEV}_{i,t-1} + \alpha_4 \text{RET}_{i,t-1} + \alpha_5 \text{AGE}_{i,t-1} \\ & + \alpha_6 \text{SIZE}_{i,t-1} + \alpha_7 \text{INV}_{i,t-1} + \varepsilon \end{aligned} \quad (1)$$

$$\text{INV}_{i,t} = (\text{FA}_{i,t-1} + \text{CIP}_{i,t-1} + \text{IA}_{i,t-1} + \text{LI}_{i,t-1}) / \text{TA}_{i,t} \quad (2)$$

INV is defined as the sum of fixed assets (FA), construction in progress (CIP), intangible assets (IA) and long-term investment (LI) scaled by the book value of total assets (TA). Q measures the growth opportunities of any given listed firm and is defined as the sum of the market value of equity[4] and the book value of liabilities scaled by the book value of total assets. CASH is defined as the net cash flows scaled by the book value of total assets. LEV is defined as the debt to total assets ratio. RET is the annual market-adjusted return. AGE is defined as the difference between current year and the IPO year of any given listed firm. SIZE is the natural logarithm of total assets.

A positive (negative) sign of the residual (ε) indicates over- (under-)investment. We use the absolute value of ε to measure the investment efficiency (IE). On the basis of seminal investment literature (Richardson, 2006; Biddle *et al.*, 2011; Chen *et al.*, 2011), the investment expenditure expectation model across all firms implies that the average unexpected investment expenditure across firm-year observations as captured by residuals equals zero. That is, the unexpected investment level or deviation from the optimal investment can be expressed as the absolute value of residuals. As over- and under-investment, as indicated by positive and negative residuals both mean investment inefficiency, the focus of our study, absolute values of residuals, will serve our research purpose, nullifying the need for distinction between positive and negative residuals. On the basis of this, if some governance mechanism has a positive (negative) impact on investment efficiency, any deviation from the optimal investment level as captured by the

residual is expected to decrease (increase). As such, the smaller the value of IE, the higher is the investment efficiency. IE is then used as the dependent variable in the multivariate regression model shown as follows[5]:

$$\begin{aligned} IE_{i,t} = & \alpha_0 + \alpha_1 TOP_{i,t} + \alpha_2 Top2_10_{i,t} + \alpha_3 CEODUMMY_{i,t} + \alpha_4 INCTV_{i,t} + \alpha_5 MF_{i,t} \\ & + \alpha_6 GREY_{i,t} + \alpha_7 BOARD_{i,t} + \alpha_8 MEETING_{i,t} + \alpha_9 DUAL_{i,t} + \alpha_{10} IND_{i,t} \\ & + \alpha_{11} AUDITOR_{i,t} + \alpha_{12} CTR_{i,t} + \alpha_{13} OCF_{i,t} + \alpha_{14} LEV_{i,t} + \alpha_{15} GROWTH_{i,t} \\ & + \alpha_{16} SIZE_{i,t} + \sum INDUSTRY + \sum YEAR + \varepsilon_{i,t} \end{aligned} \quad (3)$$

TOP is defined as the percentage of shares held by the single largest shareholder. TOP2_10 is the sum of the percentage of shares held by the second to the tenth largest shareholders. CEODUMMY, a proxy for agency costs between a manager and shareholders, is a dummy variable that returns a value of one if the CEO is also a shareholder of the firm, and zero otherwise. INCTV is a dummy variable that returns a value of one if a given firm adopts executive incentive-based compensation schemes (i.e. option-based compensation) in any given year, and zero otherwise. MF is a dummy variable that returns a value of one if a mutual fund has holdings in the firm, and zero otherwise. GREY is a dummy variable that returns a value of one if grey institutional investors have holdings in a firm, and zero otherwise. Grey institutional investors include insurance companies, trusts and pension funds.

Following [Chen et al. \(2006\)](#), we include boardroom characteristics such as BOARD, MEETING, DUAL and IND in the regression model to investigate the effect of boardroom characteristics on investment efficiency. BOARD is the number of directors on the board. MEETING is the number of board meetings within a given year. DUAL is the dummy variable that returns a value of one if the board chair also holds the CEO position, and zero otherwise. IND represents the proportion of independent directors on the board.

AUDITOR is a dummy variable that returns a value of one if the financial statements are audited by one of the Big 4 international auditing firms or their joint ventures with local CPA firms, and zero otherwise. CTR is a dummy variable that returns a value of one if a firm is ultimately controlled by a private or foreign entity, and zero otherwise (e.g. government or SOEs). OCF[6] is defined as the operating cash flow scaled by total assets. LEV, GROWTH and SIZE are debt-to-equity ratio, sales growth ratio and the natural log of total assets, respectively. OCF, LEV, GROWTH and SIZE are included to control for the effect of financial status on investment efficiency. Both year and firm fixed effects are included in our regressions to control for macroeconomic conditions common to all firms for each year in the sample period and firm heterogeneity, respectively.

To investigate any differences in the effects of ownership structure and governance mechanisms on investment efficiency between SOEs and private firms, [equation \(3\)](#) is augmented with interaction terms of $TOP2 \times CTR$, $TOP2_10 \times CTR$, $CEODUMMY \times CTR$, $CEOH \times CTR$, $INCTV \times CTR$, $MF \times CTR$ and $GREY \times CTR$. The corresponding coefficients are then tested for significance to infer any difference in the aforementioned effects between these two types of firms. The following econometric model is estimated:

$$\begin{aligned}
IE_{i,t} = & \alpha_0 + \alpha_1 TOP_{i,t} + \alpha_2 TOP2_10_{i,t} + \alpha_3 CEODUMMY_{i,t} + \alpha_4 CEOH_{i,t} + \alpha_5 INCTV_{i,t} \\
& + \alpha_6 MF_{i,t} + \alpha_7 GREY_{i,t} + \alpha_8 TOP2 \times CTR_{i,t} + \alpha_9 TOP2_10 \times CTR_{i,t} \\
& + \alpha_{10} CEODUMMY \times CTR_{i,t} + \alpha_{11} CEOH \times CTR_{i,t} + \alpha_{12} INCTV \times CTR_{i,t} \\
& + \alpha_{13} MF \times CTR_{i,t} + \alpha_{14} GREY \times CTR_{i,t} + \alpha_{15} BOARD_{i,t} + \alpha_{16} MEETING_{i,t} \\
& + \alpha_{17} DUAL_{i,t} + \alpha_{18} IND_{i,t} + \alpha_{19} AUDITOR_{i,t} + \alpha_{20} CTR_{i,t} + \alpha_{21} OCF_{i,t} + \alpha_{22} LEV_{i,t} \\
& + \alpha_{23} GROWTH_{i,t} + \alpha_{24} SIZE_{i,t} + \sum INDUSTRY + \sum YEAR + \varepsilon_{i,t}. \quad (4)
\end{aligned}$$

In robustness tests, we use the Herfindahl indexes^[7] of TOP5 and TOP10 as the alternative variables to measure the ownership concentration of listed firms. TOP5 is the sum of the squared percentage of shares held by each of the top five shareholders; TOP10 is the sum of the squared percentage of shares held by each of the top ten shareholders. Moreover, CEOH, which is defined as the percentage of shares held by the CEO, is used to replace CEODUMMY.

3.2 Sample and data

The data of institutional ownership and stock options granted to CEOs are collected from the Resset database. All other data are collected from the Chinese Economic Financial database (CCER). The sample period is from 2004 to 2012. The sample includes all non-financial companies listed on both the main board and the small and medium-sized enterprise board established in 2004. As the regressions [Equations (1) and (2)] used to obtain investment efficiency require a two-year lagged value of corporate investment, the sample period of the data effectively used in estimation spans from 2006 to 2012. The finalized sample consists of 5912 firm-year observations for SOEs and 3312 firm-year observations for private firms.

4. Empirical results

4.1 Descriptive statistics

Table I presents the descriptive statistics of all variables used in this study, with those for the entire sample presented in Panel A, and those for SOEs and private firms as well as the differences between these two types of firms in Panel B. Private firms account for only 35.9 per cent (3312 out of 9,224) of all sampled firms. On average, the largest shareholder holds 35.9 per cent of shares in all sample firms. In Panel B, firms are divided into SOEs and private firms. A *t*-test and Wilcoxon test are used to examine the mean differences and median differences in firm characteristics between SOEs and private firms respectively. The average ownership of the largest shareholder of SOEs (38.4 per cent) is significantly higher than that of private firms (31.6 per cent). The CEO is also a shareholder in 24 per cent of SOEs and in 34.1 per cent of private firms. The shareholding of the CEO in SOEs is significantly lower than that in private firms. Although the board chair also holds the position of CEO in 15.7 per cent of listed firms, there is a significant difference between private firms and SOEs, with CEO duality found among 24.3 per cent of private firms and 10.9 per cent of SOEs. As for the adoption of incentive-based compensation, only 1.9 per cent of SOEs have granted stock options to CEOs, whereas 8.5 per cent of private firms have done so. The institutional ownership in SOEs is significantly higher than that in private firms. Interestingly, 6.5 per cent of all SOEs have employed the Big 4 international auditing firms or their joint ventures with local CPA firms, but only 2.1 per cent of private firms have done so.

Panel A: whole sample

Variable	No. of observations	Mean	Median	SD	Minimum	Maximum
IE	9,224	0.075	0.041	0.113	0	1.677
TOP	9,224	0.359	0.338	0.154	0.035	0.894
TOP2_10	9,224	0.178	0.157	0.121	0.006	0.656
TOP5	9,224	0.168	0.137	0.124	0.001	0.902
TOP10	9,224	0.168	0.137	0.124	0.001	0.902
CEODUMMY	9,224	0.277	0	0.447	0	1
CEOH	9,224	0.01	0	0.051	0	0.664
INCTV	9,224	0.044	0	0.204	0	1
MFD	9,224	0.708	1	0.455	0	1
GREYD	9,224	0.349	0	0.477	0	1
DUAL	9,224	0.157	0	0.364	0	1
IND	9,224	0.363	0.333	0.052	0.091	0.714
BOARD	9,224	9.177	9	1.858	3	19
MEETING	9,224	9.236	9	3.772	3	57
AUDITOR	9,224	0.05	0	0.217	0	1
CTR	9,224	0.359	0	0.48	0	1
OCF	9,224	0.048	0.047	0.088	-1.08	0.892
LEV	9,224	0.518	0.521	0.211	0.05	1.798
GROWTH	9,224	0.332	0.131	2.315	-0.984	81.895
SIZE	9,224	21.763	21.649	1.234	17.663	28.405

Panel B

Variable	SOE		Private firms		Mean Diff	t-value	Median diff	z-value
	Mean	Median	Mean	Median				
IE	0.077	0.041	0.075	0.041	0.002	0.89	0	0.644
TOP	0.384	0.377	0.316	0.288	0.068***	21.13	0.089***	21.318
TOP2_10	0.162	0.131	0.209	0.199	-0.047***	-18.59	-0.068***	-19.711
TOP5	0.186	0.161	0.138	0.103	0.048***	18.86	0.058***	19.987
TOP10	0.186	0.162	0.138	0.104	0.048***	18.77	0.058***	19.880
CEODUMMY	0.24	0	0.341	0	-0.101***	-10.27	N/A	N/A
CEOH	0.001	0	0.025	0	-0.024***	-17.28	0***	-15.725
INCTV	0.019	0	0.085	0	-0.066***	-12.8	N/A	N/A
MFD	0.743	1	0.646	1	0.096	9.65	N/A	N/A
GREYD	0.376	0	0.302	0	0.302	7.29	N/A	N/A
DUAL	0.109	0	0.243	0	-0.134***	-15.96	N/A	N/A
IND	0.36	0.333	0.368	0.333	-0.008***	-6.39	0***	-6.406
BOARD	9.474	9	8.639	9	0.835***	22.35	0***	20.522
MEETING	9.081	8	9.485	9	-0.404***	-5.02	-1***	-6.372
AUDITOR	0.065	0	0.021	0	0.044***	10.75	N/A	N/A
OCF	0.051	0.048	0.044	0.045	0.007***	3.34	0.003***	2.911
LEV	0.535	0.544	0.49	0.489	0.045***	9.64	0.055***	11.563
GROWTH	0.295	0.132	0.424	0.129	-0.129**	-2.27	0.003	0.539
SIZE	22.004	21.849	21.321	21.238	0.683***	27.75	0.611***	25.003
No. of Obs.	5912	3312						

Notes: Table reports the descriptive statistics of all variables used in regressions. Panel A reports the descriptive statistics of variables for all sample firms. Panel B reports the differences in firm characteristics between SOEs and private firms. Variable definitions can be found in the [Appendix](#); N/A means not applicable; *, ** and *** represent the statistical significance at the 0.1, 0.05 and 0.01 levels, respectively (two-sided)

Table I.
Descriptive statistics

4.2 The impact of ownership structure and corporate governance on investment efficiency

Model 1 in Table II presents the test results for the entire sample. The coefficients on TOP and TOP2_10[8] are significantly positive, indicating that ownership concentration generally has a negative effect on investment efficiency of firms. The coefficients on CEODUMMY and INCTV are significantly negative, indicating that both managerial ownership and executive stock option grants have a positive effect on investment efficiency. As such, the hypotheses H1, H2 and H3 are supported so far. The coefficients of MF are significantly negative at both the 1 and 5 per cent level, but the coefficients of GREY are not. Therefore, compared with other types of institutional investors, mutual funds are more likely to have a positive impact on investment

Variable	Model 1		Model 2	
	Coefficient	p-value	Coefficient	p-value
Intercept	0.063**	0.011	0.043	0.104
TOP	0.047***	0.001	0.046***	0.001
TOP2_10	0.054***	0.001	0.060***	0.001
CEODUMMY	-0.010***	0.001	-0.006**	0.044
INCTV	-0.019**	0.001	-0.016**	0.012
MF	-0.012***	0.001	-0.006**	0.037
GREY	0.002	0.417	0.002	0.493
DUAL	-0.004	0.203	-0.006*	0.098
IND	0.017	0.476	-0.004	0.888
MEETING	0.001***	0.001	0.001**	0.011
BOARD	0.001	0.720	0.001	0.658
AUDITOR	-0.002	0.708	-0.012*	0.051
CTR	-0.002	0.547	0.001	0.929
OCF	0.044***	0.001	0.059***	0.001
LEV	0.016***	0.006	0.007	0.271
GROWTH	0.007***	0.001	0.010***	0.001
SIZE	-0.002	0.194	-0.001	0.474
LAG_IE			0.113***	0.001
Industry fixed effect	YES		YES	
Year fixed effect	YES		YES	
R-square		0.039		0.069
F-value		23.46		30.53
Number of observations		9,224		7,451

Notes:

$$\begin{aligned}
 IE_{i,t} = & \alpha_0 + \alpha_1 TOP_{i,t} + \alpha_2 TOP2_{10,i,t} + \alpha_3 CEODUMMY_{i,t} + \alpha_4 INCTV_{i,t} + \alpha_5 MF_{i,t} \\
 & + \alpha_6 GREY_{i,t} + \alpha_7 BOARD_{i,t} + \alpha_8 METING_{i,t} + \alpha_9 DUAL_{i,t} + \alpha_{10} IND_{i,t} \\
 & + \alpha_{11} AUDITOR_{i,t} + \alpha_{12} CTR_{i,t} + \alpha_{13} OCF_{i,t} + \alpha_{14} LEV_{i,t} + \alpha_{15} GROWTH_{i,t} \\
 & + \alpha_{16} SIZE_{i,t} + \alpha_{17} LAG_IE_{i,t} + \sum INDUSTRY + \sum YEAR + \varepsilon_{i,t}
 \end{aligned}$$

Table II. Regression results on the effect of ownership structure and corporate governance on investment efficiency (all sample firms)

The table reports the results of regressions that examine the effect of ownership structure and corporate governance mechanisms on investment efficiency of all non-financial listed firms in China from 2006 to 2012. Variable definitions can be found in the Appendix; *, ** and *** represent the statistical significance at the 0.1, 0.05 and 0.01 levels, respectively (two-sided)

efficiency, which supports *H4*. As for all boardroom characteristics, only the coefficient on MEETING is significant, and the positive coefficient on MEETING suggests that the more frequent the board meetings, the lower the investment efficiency. Some of the results for the control variables are also interesting. The coefficients of OCF, LEV and GROWTH are significantly positive, implying that higher operating cash flow, debt ratio and sales growth lead to lower investment efficiency. Larger firms have higher investment efficiency as indicated by the significantly negative coefficient on SIZE.

Model 2 in Table II re-examines the test for the entire sample by including the lag of investment efficiency as an independent variable (the sample size is reduced from 9,224 to 7,451). Results in Model 2 are similar to those in Model 1. Moreover, we find that investment efficiency is positively auto-correlated. Given that the empirical results on major variables are not affected after controlling for the lag value of investment efficiency, we do not include LAG_IE in the rest of the regression models.

4.3 Differential impacts in state-owned enterprises and private firms

Table III presents the results regarding the difference in the impacts of CEO incentive scheme, ownership structure and corporate governance on investment efficiency. The coefficients of TOP \times CTR and TOP2_10 \times CTR are significantly negative at the 1 per cent level. This indicates that firms ultimately controlled by private or foreign firms see a weaker negative impact of ownership concentration on investment efficiency. As such, hypothesis *H1* is fully supported. The coefficients of CEODUMMY \times CTR and INCTV \times CTR are not statistically significant, which suggests that the effects of managerial ownership and CEO incentive plans on investment efficiency are not more pronounced in private firms than in SOEs. Therefore, *H2* is partially supported. One interesting result is that the coefficient of MF \times CTR is significantly negative at the 10 per cent level. This suggests that the positive impact of mutual fund holdings on investment efficiency is reinforced when firms are ultimately controlled by private or foreign firms.

4.4 Robustness tests

In Table III, ownership concentration is measured as the shares held by the single largest shareholder and the sum of shares held by the second to the tenth largest shareholders. Additionally, a dummy variable is used to measure managerial ownership. In this subsection, alternative measurements for these variables are used to check the robustness of the results in Table III. Ownership concentration is proxied by the Herfindahl index, which is the sum of the squared percentage of shares held by each of the top five shareholders (TOP5) or the sum of the squared percentage of shares held by each of the top ten shareholders (TOP10). Managerial ownership is measured as the percentage of shares held by the CEO (CEOH). The results are reported in Table IV. All of our previous results remain the same with these alternative measurements: the coefficient of TOP5 and TOP10 are significantly positive at the 1 per cent level in Columns 1 and 2 of Table IV, respectively; the effect of managerial ownership on investment efficiency remains negative in both Columns 1 and 2 of Table IV.

We further use TOP5, TOP10 and CEOH to test the robustness of the results for the differences in the effects of ownership concentration and CEO holdings on investment efficiency between SOEs and private firms. The results are presented in Table V. Results in Table V indicate that the coefficients of TOP5 \times CTR and TOP10 \times CTR remain significantly negative at the 1 per cent level and the coefficient of CEOH \times CTR is insignificant, consistent with the findings reported in Table III.

Variable	Coefficient	<i>p</i> -value
Intercept	0.053**	0.037
TOP	0.075***	0.001
TOP2_10	0.074***	0.001
CEODUMMY	-0.006*	0.082
INCTV	-0.018*	0.093
MF	-0.008**	0.034
GREY	0.002	0.523
TOP × CTR	-0.076***	0.001
TOP2_10 × CTR	-0.043**	0.048
CEODUMMY × CTR	-0.008	0.169
INCTV × CTR	0.002	0.878
MF × CTR	-0.009*	0.079
GREY × CTR	0.001	0.956
CTR	0.040***	0.001
DUAL	-0.004	0.227
IND	0.014	0.545
MEETING	0.001***	0.001
BOARD	0.001	0.813
AUDITOR	-0.004	0.467
OCF	0.042***	0.002
LEV	0.016***	0.006
GROWTH	0.008***	0.001
SIZE	-0.002	0.127
Industry fixed effect		YES
Year fixed effect		YES
<i>R</i> -square		0.042
<i>F</i> -value		19.16
Number of observations		9,224

Notes:

$$\begin{aligned}
 IE_{i,t} = & \alpha_0 + \alpha_1 TOP_{i,t} + \alpha_2 TOP2_10_{i,t} + \alpha_3 CEODUMMY_{i,t} + \alpha_4 INCTV_{i,t} + \alpha_5 MF_{i,t} \\
 & + \alpha_6 GREY_{i,t} + \alpha_7 TOP2 \times CTR_{i,t} + \alpha_8 TOP2_10 \times CTR_{i,t} + \alpha_9 CEODUMMY \\
 & \times CTR_{i,t} + \alpha_{10} INCTV \times CTR_{i,t} + \alpha_{11} MF \times CTR_{i,t} + \alpha_{12} GREY \times CTR_{i,t} \\
 & + \alpha_{13} BOARD_{i,t} + \alpha_{14} MEETING_{i,t} + \alpha_{15} DUAL_{i,t} + \alpha_{16} IND_{i,t} + \alpha_{17} AUDITOR_{i,t} \\
 & + \alpha_{18} CTR_{i,t} + \alpha_{19} OCF_{i,t} + \alpha_{20} LEV_{i,t} + \alpha_{21} GROWTH_{i,t} + \alpha_{22} SIZE_{i,t} \\
 & + \sum INDUSTRY + \sum YEAR + \varepsilon_{i,t}
 \end{aligned}$$

Table III.

Regression results on the effect of ownership structure and corporate governance on investment efficiency (SOEs and private firms)

The table reports the results of regressions that examine the effect of ownership structure and corporate governance mechanisms on the investment efficiency of state-controlled and non-state-controlled listed firms in China from 2006 to 2012. The definition of variables can be found in the [Appendix](#); *, ** and *** represent the statistical significance at the 0.1, 0.05 and 0.01 levels, respectively (two-sided)

Variable	Model 1		Model 2	
	Coefficient	<i>p</i> -value	Coefficient	<i>p</i> -value
Intercept	0.098***	0.001	0.098***	0.001
TOP5	0.065***	0.001		
TOP10			0.065***	0.001
CEOH	-0.001*	0.091	-0.001*	0.090
INCTV	-0.019***	0.001	-0.019***	0.001
MF	-0.011***	0.001	-0.011***	0.001
GREY	0.003	0.262	0.003	0.264
DUAL	-0.003	0.308	-0.003	0.309
IND	0.019	0.414	0.019	0.413
MEETING	0.001***	0.001	0.001***	0.001
BOARD	0.001	0.331	0.001	0.331
AUDITOR	0.001	0.973	0.001	0.974
CTR	0.001	0.866	0.001	0.868
OCF	0.045***	0.001	0.045***	0.001
LEV	0.017***	0.004	0.017***	0.004
GROWTH	0.008***	0.001	0.008***	0.001
SIZE	-0.003**	0.018	-0.003**	0.017
Industry fixed effect	YES		YES	
Year fixed effect	YES		YES	
<i>R</i> -square	0.038		0.038	
<i>F</i> -value	24.02		24.05	
Number of observations	9,224		9,224	

Notes:

$$\begin{aligned}
 IE_{i,t} = & \alpha_0 + \alpha_1 TOP5_{i,t} + \alpha_2 TOP10_{i,t} + \alpha_3 CEOH_{i,t} + \alpha_4 INCTV_{i,t} + \alpha_5 MF_{i,t} + \alpha_6 GREY_{i,t} \\
 & + \alpha_7 BOARD_{i,t} + \alpha_8 MEETING_{i,t} + \alpha_9 DUAL_{i,t} + \alpha_{10} IND_{i,t} + \alpha_{11} AUDITOR_{i,t} \\
 & + \alpha_{12} CTR_{i,t} + \alpha_{13} OCF_{i,t} + \alpha_{14} LEV_{i,t} + \alpha_{15} GROWTH_{i,t} + \alpha_{16} SIZE_{i,t} \\
 & + \sum INDUSTRY + \sum YEAR + \varepsilon_{i,t}
 \end{aligned}$$

The table reports the results of regressions that examine the effect of ownership structure and corporate governance mechanisms on the investment efficiency of all non-financial listed firms in China from 2006 to 2012. Different from [Table III](#), we use TOP5 and TOP10 to replace TOP and TOP2_10, and use CEOH to replace CEODUMMY in the regressions. The definition of variables can be found in the [Appendix](#); *, **, *** represent the statistical significance at the 0.1, 0.05 and 0.01 levels, respectively (two-sided)

Table IV.
Regression results on
the effect of
ownership structure
and corporate
governance on
investment efficiency
using alternative
variables (full
sample)

5. Conclusion

Investment efficiency has received increasingly high attention in corporate finance in recent years. This issue particularly concerns investors in China because the majority of listed firms in China are controlled by the government, such that managers are likely to pursue interests at the cost of outside shareholders ([Huang et al., 2011](#)), resulting in investment inefficiency. This study aims to investigate the effects of internal and external governance mechanisms on the investment efficiency of Chinese listed firms. To the authors' knowledge, this topic has remained unexplored in the existing literature. Our empirical results indicate that investment efficiency is higher when ownership concentration is lower, especially for SOEs. In addition,

Variable	Model 1		Model 2	
	Coefficient	<i>p</i> -value	Coefficient	<i>p</i> -value
Intercept	0.094***	0.001	0.094***	0.001
TOP5	0.089***	0.001		
TOP10			0.090***	0.001
CEOH	0.001	0.952	0.001	0.953
INCTV	-0.017	0.999	-0.017	0.999
MF	-0.007*	0.064	-0.007*	0.063
GREY	0.003	0.323	0.003	0.324
TOP5 × CTR	-0.080***	0.001		
TOP10 × CTR			-0.080***	0.001
CEOH × CTR	-0.001	0.605	-0.001	0.606
INCTV × CTR	0.001	0.999	0.001	0.999
MF × CTR	-0.011**	0.042	-0.011**	0.042
GREY × CTR	0.005	0.350	0.005	0.349
CTR	0.020***	0.001	0.020***	0.001
DUAL	-0.003	0.322	-0.003	0.323
IND	0.016	0.494	0.016	0.494
MEETING	0.001***	0.001	0.001***	0.001
BOARD	0.001	0.421	0.001	0.420
AUDITOR	-0.001	0.823	-0.001	0.822
OCF	0.044***	0.001	0.043***	0.001
LEV	0.018***	0.003	0.018***	0.003
GROWTH	0.008***	0.001	0.008***	0.001
SIZE	-0.003**	0.013	-0.003**	0.012
Industry fixed effect		YES		YES
Year fixed effect		YES		YES
<i>R</i> -square		0.040		0.040
<i>F</i> -value		20.08		20.10
Number of observations		9,224		9,224

Notes:

$$\begin{aligned}
 IE_{i,t} = & \alpha_0 + \alpha_1 TOP5_{i,t} + \alpha_2 TOP10_{i,t} + \alpha_3 CEOH_{i,t} + \alpha_4 INCTV_{i,t} + \alpha_5 MF_{i,t} + \alpha_6 GREY_{i,t} \\
 & + \alpha_7 TOP5 \times CTR_{i,t} + \alpha_8 TOP10 \times CTR_{i,t} + \alpha_9 CEOH \times CTR_{i,t} + \alpha_{10} INCTV \\
 & \times CTR_{i,t} + \alpha_{11} MF \times CTR_{i,t} + \alpha_{12} GREY \times CTR_{i,t} + \alpha_{13} BOARD_{i,t} \\
 & + \alpha_{14} MEETING_{i,t} + \alpha_{15} DUAL_{i,t} + \alpha_{16} IND_{i,t} + \alpha_{17} AUDITOR_{i,t} + \alpha_{18} CTR_{i,t} \\
 & + \alpha_{19} OCF_{i,t} + \alpha_{20} LEV_{i,t} + \alpha_{21} GROWTH_{i,t} + \alpha_{22} SIZE_{i,t} + \sum INDUSTRY \\
 & + \sum YEAR + \varepsilon_{i,t}
 \end{aligned}$$

Table V.
Regression results on the effect of ownership structure and corporate governance on investment efficiency (SOEs and private firms)

The table reports the results of regressions that examine the effect of ownership structure and corporate governance mechanisms on the investment efficiency of listed firms in China from 2006 to 2012. Unlike in Table IV, we use TOP5 and TOP10 to replace TOP and TOP2_10, and use CEOH to replace CEODUMMY in the regressions. The definition of variables can be found in the Appendix; *, ** and *** represent the statistical significance at the 0.1, 0.05 and 0.01 levels, respectively (two-sided)

investment efficiency is higher with the adoption of incentive-based compensation. Moreover, investment efficiency is higher when CEOs own shares. Furthermore, compared with other types of institutional investors, mutual funds have a positive impact on investment efficiency, and this is more pronounced in private firms than in SOEs. Finally, other internal governance mechanisms (i.e. independent directors, the size of the board of directors and whether the board chair holds the position of CEO) play no role in determining investment efficiency.

Implications are provided for researchers, practitioners and policy makers. For researchers, future studies on investment efficiency should concentrate on variables that we find capable of explaining investment efficiency, including ownership concentration, any event regarding corporate governance improvement, whether CEOs own shares and cash flow. For practitioners, to achieve higher investment efficiency, investors are advised to pay attention to variables used in this study prior to investing. More specifically, it is generally recommended that they invest in firms with CEOs holding shares. In addition, when investing in SOEs, they should choose SOEs with lower ownership concentration. As for policy makers, given that results strongly indicate that investment efficiency improves with the adoption of incentive-based compensation schemes, further corporate governance reform that helps align the interests of managers and outside shareholders is needed to promote investment efficiency.

Notes

1. The average of the shareholdings of the largest shareholders in private firms is above 30 per cent during the sample period of this study.
2. According to the report of Chinese Security Depository and Clearing Corporation Limited, there were approximately 13.1 million A-share accounts by the end of 2012. More than 40 per cent of them were active in investing in secondary markets.
3. [Biddle et al. \(2009\)](#) examine the effect of financial reporting quality on investment efficiency for US listed firms. [Chen et al. \(2010\)](#) further investigate this effect for privately-held companies in emerging markets.
4. The shares of Chinese listed firms consist of tradable and non-tradable shares. For firms without non-tradable shares, the market value of equity is defined as the total number of shares multiplied by the year-end share price. For firms with non-tradable shares, the market value of equity is defined as the sum of the number of tradable shares multiplied by the year-end share price and the number of non-tradable shares multiplied by the net asset value per share.
5. To avoid multicollinearity, some variables (i.e. TOP2_10, TOP5 and TOP10; CEODUMMY and CEOH) are included in different regressions. We have confirmed that the correlations among all variables are not high enough to cause a multicollinearity problem. Due to space limitations, the result of correlations is not reported, but is available upon request.
6. We include operating cash flow rather than free cash flow in the regressions. This is because free cash flow of Chinese listed firms is negative for most years, and may not be a good proxy of agency cost, unlike firms in other countries ([Chen and Yuan, 2004](#); [Huang et al., 2011](#)). [Huang et al. \(2011\)](#) find that free cash flow is not even significantly associated with the dividend payout ratios of Chinese listed firms.
7. Herfindahl index has been widely used as a proxy for the ownership of large shareholders in the corporate finance literature ([Chen et al., 2006](#)).
8. Some large shareholders other than the largest shareholder in state-controlled listed firms may also be the state or SOEs. As such, it is more appropriate to test the effect of the holdings held by state vs non-state shareholders within the top 10 shareholders on investment efficiency. However, due to data limitations, we are not able to further test this effect in our study.

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Further reading

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Variable	Definition
<i>Dependent variable</i>	
IE	Investment efficiency
<i>Ownership structure</i>	
TOP	Percentage of shares held by the single largest shareholder
TOP2_10	The sum of the percentage of shares held by the second to the tenth largest shareholders
CEODUMMY	A dummy variable which takes the value of one if CEO is also a shareholder of the firm, and is zero otherwise
TOP5	A Herfindahl index calculated as the sum of squared percentage of shares held by each of the top five shareholders
TOP10	A Herfindahl index calculated as the sum of squared percentage of shares held by each of the top ten shareholders
CEOH	The percentage of shares held by CEO
INCTV	A dummy variable which takes the value of one if any given firm adopts incentive-based (i.e. stock- or option-based) compensation schemes in any given year, and takes the value of zero otherwise
<i>Internal governance</i>	
DUAL	Whether the board chair is also the CEO
IND	The proportion of independent directors
BOARD	The number of people on the board of directors
MEETING	The number of board meetings in a year
<i>External governance</i>	
MF	A dummy variable which takes the value of one if a mutual fund has holdings in the firm, and is zero otherwise
GREY	A dummy variable which takes the value of one if grey institutional investors have holdings in the firm, and is zero otherwise. Grey institutions include insurance companies, trusts and pension funds
AUDITOR	A dummy variable which takes the value of one if the firm's financial statements are audited by one of the Big 4 international auditing firms or their joint ventures with local CPA firms, and is zero otherwise
<i>Other variables</i>	
CTR	A dummy variable which takes the value of one if a firm is ultimately controlled by a private, or foreign entity, and is zero otherwise (e.g. government or SOEs)
OCF	Operating cash flow scaled by total assets
LEV	Debt to equity ratio
GROWTH	Sales growth ratio
SIZE	The natural log of total assets

Table A1.
Definition of
variables

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