

Dynamic study of corporate governance structure and firm performance in China

Evidence from 2001-2015

Dynamic
study

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Lin Shao
*College of Finance, Qilu University of Technology
(Shandong Academy of Sciences), Jinan, China*

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Abstract

Purpose – The paper aims to provide a comprehensive investigation of the relationship between corporate governance (CG) structure and firm performance in Chinese listed firms from 2001 to 2015. The authors' motivation derives from the fact that the CG system in China is different from those in the US, the UK, Germany, Japan and other countries.

Design/methodology/approach – A large unbalanced sample, covering more than 22,700 observations in Chinese listed firms, was used to explore, by means of a system-generalized method-of-moments (GMM) estimator, the relationship between CG structure and firm performance to remove potential sources of endogeneity.

Findings – Results show that Chinese CG structure is endogenously determined by the CG mechanisms investigated: there is no relationship between board size (including independent directors) and firm performance; CEO duality has a significantly negative effect on firm performance; concentration of ownership has a significantly positive influence on firm performance; managerial ownership is negatively correlated with firm performance; state ownership has a significantly positive effect on firm performance; and a supervisory board is positively correlated with firm performance.

Practical implications – The findings provide policymakers and firm managers with useful empirical guidance concerning CG in China.

Originality/value – Few integrative studies have examined the impact of CG structure on firm performance in China. This study adds new empirical evidence that the relation between CG structure and performance in China is endogenous and dynamic when controlling for unobserved heterogeneity, simultaneity, and dynamic endogeneity.

Keywords China, Firm performance, Endogeneity, Corporate governance, Generalized method of moments

Paper type Research paper

1. Introduction

Corporate governance (CG), and its effect on firm performance, continues to be an essential and dispute area of empirical and theoretical study in contemporary corporate finance. Many studies (Wintoki *et al.*, 2012; Nguyen *et al.*, 2014; Cheung and Wei, 2006; Hu and

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Izumida, 2008) have corroborated the potential dynamic endogeneity between CG structure and firm performance.

However, there is still no consensus on this issue in the literature because the relevant research suffers from endogeneity issues stemming from unobservable heterogeneity, simultaneity and dynamic endogeneity (Wintoki *et al.*, 2012). Prior research, utilizing traditional ordinary least squares (OLS) or fixed-effects method, has shown that ignoring this endogeneity issue can have serious outcomes for inference.

Earlier findings (Fahlenbrach and Stulz, 2009; Wintoki *et al.*, 2012; Chen, 2013; Nguyen *et al.*, 2014) have been sufficiently generalized in developed (e.g. US and UK) markets due to the effective operation of CG. This study, however, responds to these endogeneity concerns in the second largest economy on earth, China. Notably, the Chinese capital market is widely known for its special CG system, which is totally different from that of the US or other areas (Jiang and Kim, 2015) (see Section 2 for details). Western theories and concepts may be inappropriate for Chinese research. Unlike the mature US, Australian, Singaporean, or other capital markets, it is unclear whether the CG mechanism has an effect if dynamic endogeneity is considered in China because of the weak effective market and special governance mechanism.

The opinion that CG and performance may be endogenously interrelated is not new but empirical research is still rare regarding dynamic endogeneity. Cheung and Wei (2006), Hu and Izumida (2008), Yixiang (2011), Wintoki *et al.* (2012) and Nguyen *et al.* (2014) have empirically explored the endogeneity issue but results for dynamic endogeneity are still contradictory. This may be because: most studies have chosen samples from developed nations, in which the development of capital markets is mature; some empirical studies have used Tobin's Q to assess performance, whereas others use either return on assets (ROA) or return on equity (ROE); and different choices of governance-structure variables (ownership concentration, managerial ownership, board structure or others) have produced diversity in the empirical results.

This article aims to scrutinize the relationship between CG and firm performance again, using Chinese listed firms, to tackle the potential endogeneity issue. Chinese listed firms have adopted many CG mechanisms from Western developed economies. However, the efficiency of the Chinese capital market is low compared to mature capital markets, such as those of the US, the UK, Australia, Singapore and Japan. CG practices in China also have their own characteristics: special regulatory problems, particular financial, legal and institutional; and unique economic environment (Jiang and Kim, 2015). These unique characteristics facilitate a comparison of our findings with those from mature markets and an examination of how governance structure determines performance in the Chinese context.

This study is also motivated by recent literature on CG in China: the relationship between board independence, ownership concentration and corporate performance (Li *et al.*, 2015); the correlations between institution, board structure and corporate performance (Chen, 2015); the determinants of board size and independence (Chen and Al-Najjar, 2012); the relationship between board independence and firm performance (Liu *et al.*, 2015); and the correlation between board leadership structure and firm performance (Yu and Ashton, 2015). Our study extends range of investigations from the recent literature but differs in scope in the following aspects: our paper supports a comprehensive analysis and does not just focus narrowly on individual details, and we use board size, independent director, CEO duality, ownership concentration, state ownership, managerial ownership and supervisory board as the proxy for CG structure to gain a comprehensive understanding of Chinese CG and firm performance.

This study examines the correlation between CG and firm performance using a large amount of unbalanced data, covering more than 22,700 firm observations from 2001 to 2015,

under a dynamic framework, while dealing with potential origins of endogeneity. Up to now, this is the largest panel used to study this issue. Our findings show that CG structures do matter in China. Our work notably contributes to adding the non-Western literature on CG through the empirical study from an emerging Asian market characterized by the CG operations in China.

The rest of the article is arranged as follows: Section 2 introduces the evolution of CG in China; Section 3 reviews relevant literature and proposes hypothesis; Section 4 offers the data, key variables, and methodology; Section 5 reports the empirical results and robustness checks; and Section 6 presents the conclusion.

2. CG in China

China began market economic reforms in the early 1980s and also accepted many Western CG mechanisms in an attempt to increase firm performance. However, CG mechanisms in China, aimed at promoting a market-based economy, still had special characteristics and continued to develop steadily. During this economic reform, the old system and the new market-oriented system coexisted, which made the new market-oriented system stable and healthy (Peng *et al.*, 2007). The Shenzhen and Shanghai Exchanges were launched in 1990, and by the end of 2015, there were 2,809 public firms on the main Chinese exchanges; thus, adequate sample provides us an opportunity to research the efficiency of governance structure on firm performance.

Compared with the well-developed capital markets in Western nations (with a well-developed legal framework, low ownership concentration, an effective mechanism of independent board, etc.), such as the US, the UK, Japan and Singapore, the Chinese capital market is still weak and volatile. The Chinese market lacks a well-established legal environment (Jiang and Kim, 2015; Chen, 2015); there is a high concentration of ownership (Jiang and Kim, 2015; Li *et al.*, 2015; Chen and Al-Najjar, 2012); and state ownership dominates listed companies in China, with most of the listed firms being state-owned enterprises (SOEs) (Sun and Tong, 2003; Liu *et al.*, 2012); there is a two-tier board structure (the board mechanism including a board of directors and a supervisory board exists simultaneously) (Dahya *et al.*, 2003). The traditional agency problem created in Western countries is inappropriate for Chinese firms. Several CG reforms related to this study are discussed below.

In 2001, the Chinese Security Regulation Commission (CSRC) adopted a policy to emphasize the significance of hiring independent directors on company boards, whereby the percentage of independent directors on boards should be at least one-third by June 2003 (CSRC, 2001). It is often argued that boards with more independent directors are better at monitoring (Fama, 1980). For this reason, Chinese public firms are required to build boards institution, and there are legal requirements on board size and board composition. This reform has played a significant role in shaping board structure in listed firms.

Split-share reform was introduced in 2005. Shares in the Chinese exchange are divided into tradable shares and non-tradable shares. Non-tradable shares include state-owned shares and legal-owned person shares, most of which are controlled by either government or other institutions (Li *et al.*, 2011). Tradable shares are publicly traded in the two stock exchanges. Before this reform, state ownership gave the state absolute control over firms; the larger shareholders ignored, and even exploited, the benefits for minority shareholders; and managerial ownership had limited power to influence operating decisions. By the end of 2008, this reform had been basically accomplished. Most public companies have completed the transformation, changing their non-tradable shares into tradable shares, and the percentage of larger shareholders has declined significantly.

Chinese listed firms have had a dual board structure since 1993. Earlier supervisory boards merely played an advisory role and failed to monitor senior executives whose performance was poor (Ran *et al.*, 2015). In 2005, the CSRC required that at least one-third of the supervisory board membership should consist of elected labor representatives. In addition, the supervisory board should have the authority to dismiss senior executives and the right to file legal complaints against senior executives. The 2005 Company Law empowers and strengthens supervisory boards in China. This special CG found in Chinese listed companies provides an intriguing context for researchers attempting to investigate the impact of CG factors on firm performance.

Given the significant institutional differences between China and developed economies, recent scholars hold the opinion that China is a good research context in which a dynamic institution-based conception of CG can be investigated (Mutlu *et al.*, 2018). This institution-based conception holds that institutional alternation will shape firm performance over time (Meyer and Peng, 2016; Peng, 2003; Banalieva *et al.*, 2015; Kim *et al.*, 2010). In addition, the earlier conclusions regarding the relationship between CG mechanisms and firm performance remained confusing. The reason may be that these studies overlooked the impact of temporal changes in the institutional environment (Mutlu *et al.*, 2018). This static opinion ignores the dynamic reality in which firms operate. This study leverages a dynamic institution-based view to explore and extend the relationship between CG and performance to investigate how this relationship alters over time as Chinese market institutions improve, rather than reporting a static view or a snapshot.

3. Literature review and hypothesis development

We now endeavor to add to our understanding of the drivers of firm performance in China by extending, integrating and enriching several lines of work: board independence, board size, CEO duality, ownership concentration, state ownership, managerial ownership and supervisory board.

3.1 Board independence

Agency theory stresses that the board will monitor the managers' behavior to protect shareholders' interests (Fama and Jensen, 1983; Jensen and Meckling, 1976). The directors must, therefore, be independent. We define an independent director as an independent outside director, a director who has no operational relationship with the firm, other than a seat on the board. An inside director is defined as someone who is also a manager of the company (Clifford and Evans, 1997). A greater proportion of independent directors should have a positive influence on organizational performance. In line with agency theory, resource-dependence theory also suggests that board directors will provide essential resources for a company, and therefore, a higher proportion of independent directors will have a positive impact on corporate performance.

Empirically, in Chinese firms, independent directors tend to be a bridge between managers and stakeholders and to decrease agency problems (Tian and Lau, 2001). Liu *et al.* (2015) reported that independent directors have a positive effect on firm performance in China and that the impact of board independence on firm performance is correlated with ownership concentration in China, i.e. board independence has a positive relationship with firm performance if ownership concentration decreases. However, Liu *et al.* (2015) also noted that the system of independent directors in China is both perfunctory and ineffective at monitoring, merely meeting the regulatory requirements. The controlling shareholders usually have their listed firms maintain only the minimum number of independent directors (Jiang and Kim, 2015). Chen and Al-Najjar (2012) also asserted that board independence is

mainly driven by regulation. Independent directors fail to monitor and actively discipline the firm's management because the effect of government ownership on the relationship between independence and firm performance is ambiguous. We therefore propose the following hypothesis:

H1. Board independence has no effect on firm performance in Chinese listed firms.

3.2 Board size

The number of directors on the board is an essential element in improving the effectiveness of management in a firm (Dalton *et al.*, 1999). The resource-dependence theory posits that larger boards will improve firm performance, implying a positive relationship between board size and firm performance (Dalton *et al.*, 1999). Agency framework, however, holds the opposite view (Jensen, 1993). Some researchers (Larmou and Vafeas, 2010; Chen and Al-Najjar, 2012; Mak and Li, 2001) have found a positive relationship, others (Guest, 2009; Forai and Amedro, 2004; Eisenberg *et al.*, 1998; Mak and Kusnadi, 2005; Nguyen *et al.*, 2014; Haider and Fang, 2016) contend that the relationship is negative, while others have indicated that there is no relationship (Wintoki *et al.*, 2012). In China, based on different metrics of performance and time periods, board size has been both positively (Chen and Al-Najjar, 2012; Li *et al.*, 2015) and negatively (Yu and Ashton, 2015; Liu *et al.*, 2015) related to firm performance. Given that the development of CG in China is still immature, board structure in China largely appears to the outcome of regulations and not based on firm-specific characteristic (Jiang and Kim, 2015). We propose the following hypothesis:

H2. Board size has no effect on firm performance in Chinese listed firms.

3.3 CEO duality

Agency theory suggests that CEO duality could diminish the board's effectiveness of its monitoring function, leading to further agency problems and, ultimately, poor firm performance (Donaldson and Davis, 1991; Daily and Schwenk, 1996; Tian and Lau, 2001; Rechner and Dalton, 1991; Pi and Timme, 1993). However, stewardship theory (Davis *et al.*, 1997; Donaldson and Davis, 1991; Boyd, 1995) proposes that managerial actions (such as achievement and responsibility) could benefit a firm (Donaldson and Davis, 1991), with the result that CEO duality would promote, rather than hinder, firm performance (Boyd, 1995). In the Chinese context (Zhang, 1999; Peng *et al.*, 2007; You and Du, 2012; Chen *et al.*, 2011; Zhang *et al.*, 2017; Gao *et al.*, 2017), it is argued that CEO duality is generally seen as a barrier to effective CG by Chinese policymakers and researchers, but the efforts in correcting this situation, if any, have been limited. Hence, we propose the following hypothesis:

H3. CEO duality has a significantly negative effect on firm performance in Chinese listed firms.

3.4 Ownership concentration

It is widely acknowledged that ownership structure is the main determinant of CG mechanism, in addition to affecting the firm's performance (Li *et al.*, 2015). According to agency theory, concentrated shareholders can monitor corporate operating management effectively, alleviate agency costs and information problems and, consequently, improve firm performance (Blair, 1996; Shleifer and Vishny, 1997). There is also evidence that

concentrated shareholders can increase their own benefits at the expense of minority shareholders (Porta *et al.*, 2002; Claessens and Yurtoglu, 2013; Liu *et al.*, 2011; Du *et al.*, 2014).

A large body of empirical study has utilized ownership concentration (in the form of either institutional ownership or other block-holder ownership) as a proxy to explore its impact on firm performance (Yu, 2013; Hess *et al.*, 2010; Lin *et al.*, 2009; Gul *et al.*, 2010; Ma *et al.*, 2010; Kang and Kim, 2012; Yixiang, 2011). In this study, by controlling the endogenous nature of the ownership concentration variable, based on agency theory, we propose the following hypothesis:

- H4.* Ownership concentration has a significantly positive effect on firm performance in Chinese listed firms.

3.5 State ownership

A critical difference between China and Western developed nations is that China has a significant number of SOEs. Moreover, the state still holds a major share of ownership after the reform (Xu and Wang, 1999). Share split reform caused state ownership to decline significantly after 2006; however, state ownership remains high and the government retains its ownership control in strategically important industry sectors (Yu, 2013; Ng *et al.*, 2009).

Empirically, some studies have revealed that there is a negative correlation between firm performance and state shares (Xu and Wang, 1999; Wei *et al.*, 2005; Shleifer and Vishny, 1997; Li *et al.*, 2009). Others have asserted that the relationship between state ownership and firm performance is convex (Ng *et al.*, 2009). Furthermore, some literature has also pointed out that political connections have an important impact on firm performance in SOEs (Menzio *et al.*, 2011; Tian and Lau, 2001; Li *et al.*, 2008), which indicates that a higher level of state ownership is superior to a dispersed ownership structure due to the benefits of government support and political connections (Li *et al.*, 2009; Yu, 2013).

Given that the Chinese social institutions and government exert a huge influence on listed firms, one important question about the ownership structure of Chinese firms is whether the degree of state ownership is related to enterprise performance. Thus, the following hypothesis is presented:

- H5.* State ownership has a significantly positive effect on firm performance in Chinese listed firms.

3.6 Managerial ownership

Previous seminal studies have noted that a high level of managerial ownership contributes to integrating the interests of managers and shareholders and improving firm performance (Jensen and Meckling, 1976; Demsetz and Lehn, 1985). Specifically, there is an alignment of interest when managers are also shareholders (Jiang and Kim, 2015; Du *et al.*, 2014). However, managers also tend to maximize their own benefits, regardless of firm benefits (Fama and Jensen, 1983; Demsetz, 1983), leading to a negative relationship between managerial ownership and firm performance (the “managerial entrenchment” hypothesis). Theoretical divergence might not describe the appropriate correlation. The proportion of managerial ownership is only 0.015 per cent of the stock held by senior managers and directors in a Chinese sample of 5,284 listed firms from 1991 to 2001 (Wei *et al.*, 2005). In our sample, managerial ownership from 2001 to 2015 is extremely low (approximately 5 per cent), which is considerably lower than ownership concentration in the top5 (54 per cent). Jiang and Kim (2015) reported that managers of SOEs are not significant shareholders

(the real shareholder is state or government), and most of firms in China have a large controlling shareholder who can easily fire a manager no matter how many shares the manager owns. Therefore, it is impossible for a manager to become entrenched unless the manager is also a large controlling shareholder. Based on the argument above, we hypothesize:

- H6. Managerial ownership has a significantly negative effect on firm performance in Chinese listed firms.

3.7 Supervisory board

Dual board structure might enhance firm performance by allowing for more effective monitoring (Adams and Ferreira, 2009). Empirical studies of the relationship between the supervisory board and firm performance are, however, rare because US and UK supervisory boards are not involved in governance mechanisms: either independent directors or outside markets perform the main monitoring role. The results of an investigation of German firms indicated that a supervisory board will increase a firm's value if the founding-family is still active (Andres, 2008).

An essential characteristic of the supervisory board in Chinese listed firms is a two-tier board structure (a board of directors and a supervisory board) (Dahya *et al.*, 2003). In a Chinese setting, directors are appointed and dismissed via the general shareholders' meeting, rather than by the supervisory board (Xi, 2006). Previous empirical studies (Xi, 2006; Dahya *et al.*, 2003) have indicated that Chinese supervisory boards are ineffective, weak and unable to provide effective monitoring. The 2006 Corporate Law reform improved the monitoring capacity of supervisory boards, strengthening their right to supervise senior managers and directors (Ding *et al.*, 2010; Ran *et al.*, 2015). Additionally, China's Company Law requires that supervisory boards include elected labor representatives to strengthen the supervisory capacity of the firm's senior executives and improve firm performance (Jiang and Kim, 2015). We hypothesize:

- H7. A supervisory board has a significantly positive effect on firm performance in Chinese listed firms.

4. Data, variables and methodology

4.1 Sample and database sources

The data set is derived from the Shanghai and Shenzhen stock exchanges and covers all Chinese public listed firms from 2001 to 2015, excluding financial sector companies. To avoid sample selection issues, we used an unbalanced panel, rather than a balanced panel. We removed companies with unavailable information, indeterminable data (e.g. governance variables and firms with negative or zero net assets) or incomplete financial data. We also excluded any company with fewer than two consecutive years of data, because of lagged variables in the regression specification. Firms issuing B shares and H shares were not considered. To our knowledge, this is the largest panel to date that has been used to study the performance-governance relationship. The final sample comprises 2,545 individual firms, with complete information for 22,727 firm-year observations.

To alleviate the impact of extreme outliers, we winsorized all firm-level variables at the 1st and 99th percentile levels, rather than excluding data. Winsorization is commonly used in CG research (Erkens *et al.*, 2012; Liu *et al.*, 2014; Bebchuk *et al.*, 2011; Yu and Ashton, 2015). Compared with unwinsorized results, winsorized estimators are usually more robust

(Yang *et al.*, 2011); therefore, we can rule out the possibility that our results are driven by outlier values.

4.2 Variable definition

The variables used in this study are grouped into three categories: performance variables, governance variables and control variables. Summary statistics for these variables are presented.

4.2.1 Measure of firm performance. Following prior research (Wintoki *et al.*, 2012; Nguyen *et al.*, 2014; Li *et al.*, 2015), this study used Tobin's Q to measure performance. Tobin's Q is defined as the market value of equity plus the market value of total liabilities divided by the book value of total assets; the natural logarithmic form of Tobin's Q ratio is used (lnq).

4.2.2 Measure of corporate governance structure. CG variables comprised board independence, board size, CEO duality, ownership concentration, managerial ownership, state ownership and supervisory board. The independent-director variable (Indep) was a proxy for the percentage of independent directors on the board (Liu *et al.*, 2015; Chen and Al-Najjar, 2012). The board-size variable (Lnbsize) was measured by the natural log of the number of board directors (Chen and Al-Najjar, 2012; Li *et al.*, 2015). The CEO-duality dummy (Duality) was set to be 1 for firms in which the CEO also plays a chairman role, and 0 otherwise (Chen and Al-Najjar, 2012; Yu and Ashton, 2015). Ownership concentration was measured by the largest ten shareholding percentages (Top10) and the largest five shareholding percentages (Top5) (Hu and Izumida, 2008). State ownership (State) was proxy for the percentage of shares held by the state (Chen and Al-Najjar, 2012; Yu and Ashton, 2015; Liu *et al.*, 2015). Managerial ownership (Mo) was measured as the percentage of shares held by top managers (Chen and Al-Najjar, 2012). The supervisory board (Sup) was calculated as supervisory board size and was measured by the natural log of the number of supervisory board members (Chen and Al-Najjar, 2012).

4.2.3 Control variables. Control variables were used to isolate the effects of other factors that have a predictable influence on firm performance. Following previous literature (Nguyen *et al.*, 2014; Yu and Ashton, 2015; Li *et al.*, 2015), control variables in our paper were mainly leverage, firm size and firm age. The leverage variable (Lev) was the ratio of the firm's total debt to its total assets. Firm size (Lnsize) was measured by the logarithm of the book value of total assets. Firm age (Lnfage) was the logarithm of the firm's age, where age was calculated from the time that company first appeared on the Chinese exchange. Dummy variables were used to control the time effect and the industry effect. Year dummies mainly reflected macroeconomic conditions, such as the business cycle and market fluctuations. In this study, year dummies were used to control for year effects: 15 year dummies were used, one for each of the 15 years from 2001 to 2015. In our sample, we use the standard industry classification supported by the WIND financial terminal, which refers to the GICS (Global Industries Classification Standard) and captures industry-specific characteristics and shocks: energy, materials, industrials, consumer discretionary, consumer staples, health care, information technology, telecommunication services and utilities.

4.3 Model design

Most prior studies of the relationship between CG and performance have estimated static models of the form: performance = $f(\text{governance structure, firm characteristics, fixed effects})$. The model we present in this study is a dynamic model of the form: performance = $f(\text{past performance, governance structure, firm characteristics, fixed effects})$. This study shows how a dynamic model is well suited to deal with the dynamic nature of relation between

governance and performance. A dynamic model also promotes our understanding of the dynamic relation between governance structure and performance.

We utilized the dynamic generalized method-of-moments (GMM) method (Blundell and Bond, 1998) to address endogeneity concerns due to unobserved heterogeneity, simultaneity and reverse causality. The merits of dynamic GMM are: it can explore the fixed unobservable heterogeneity; it allows current governance to be influenced by previous realizations of, or shocks to, past performance; and it can rely on its own internal instruments (for example, past firm performance can be used as instruments for current ownership structure). This implies that this estimator eliminates the external instruments. In this regression model, firm age ($\ln fage$) and year dummy are exogenously determined (Wintoki *et al.*, 2012; Nguyen *et al.*, 2014).

It is important to understand how many lags of dependent variables in the panel GMM model are required to capture all the information. Too-long lags will lead to a loss of degrees of freedom and over-parameterization, while too-short lags might create biased results caused by omitting important variables and failing to capture the variable's dynamics. Previous studies have tended to use either one lag or two lags to capture the dynamic relationship between governance structure and firm performance (Wintoki *et al.*, 2012; Nguyen *et al.*, 2014; Liu *et al.*, 2015). The lag length in our model was empirically determined. Results suggest that the coefficient of the dependent variable including two lags was not statistically significant. Therefore, one-year-lagged dependent variables were used. Methodologically, referring to prior studies (Nguyen *et al.*, 2014; Wintoki *et al.*, 2012; Liu *et al.*, 2015), the following empirical model was constructed:

$$\begin{aligned} \ln q_{it} = & \alpha + \gamma \ln q_{i,t-1} + \beta_1 indep_{it} + \beta_2 \ln bsize_{it} + \beta_3 duality_{it} + \beta_4 top_{it} \\ & + \beta_5 state_{it} + \beta_6 mo_{it} + \beta_7 sup_{it} + \delta_1 \ln size_{it} + \delta_2 lev_{it} + \delta_3 \ln fage_{it} \\ & + year\ dummies + industry\ dummies + \eta_i + \varepsilon_{it} \end{aligned} \quad (1)$$

where the lowercase subscripts i and t represent firm i at time t , respectively, with the period t (2001-2015), η_i represents unobserved time-invariant firm effects and ε_{it} is a random error term.

5. Results

5.1 Descriptive statistics

Table I presents the descriptive summary statistics and supports our argument that Chinese listed firms have distinct firm characteristics. Tobin's Q value ranges from 0.91 to 13.47, with an average value of 2.71, showing that there was a higher variability of Q during the sampling period. On average, the value of Q was greater than one, which means that firms created wealth for shareholders. Top5 ownership concentration ranged from 19 to 85 per cent (mean, 54 per cent; median, 55 per cent), meaning ownership concentration in China was high. However, the mean (median) of managerial ownership was 5 per cent (0), meaning that managers were rarely significant shareholders. According to one explanation (Jiang and Kim, 2015), most listed firms are SOEs, the managers of which are often appointed by the state; however, the managers in non-SOEs are significant shareholders, because most non-SOEs are family firms. The mean number of board directors is approximately nine, which is consistent with the figures reported by Chen and Al-Najjar (2012), Jiang and Kim (2015) and Chen (2015). Approximately 19 per cent of chairpersons concurrently held CEO positions. The percentage of independent directors ranged from 0 to 80 per cent (mean, 35 per cent;

Table I.
Descriptive statistics

Variable	Observation	Mean	SD	Minimum	Median	Maximum
Tobin's Q	22,727	2.71	2.08	0.91	2.05	13.47
Lnq	22,727	0.81	0.57	-0.09	0.72	2.6
Ownership concentration (Top5) (%)	22,727	0.54	0.15	0.19	0.55	0.85
Ownership concentration (Top10) (%)	22,727	0.58	0.15	0.21	0.6	0.87
Supervisory	22,727	3.84	1.28	1	3	13
Duality	22,727	0.19	0.39	0	0	1
Board size	22,727	9.04	1.9	4	9	19
Independent director (%)	22,727	0.35	0.08	0	0.33	0.8
State ownership (%)	22,727	0.15	0.23	0	0	0.97
Managerial ownership (%)	22,727	0.05	0.12	0	0	0.84
Firm age (year)	22,727	8.58	5.54	1	8	26
Firm size (Lnsize)	22,727	21.49	1.17	10.84	21.37	27.70
Leverage (%)	22,727	0.45	0.22	0	0.45	1

median, 33 per cent), which is line with the findings of Liu *et al.* (2014, 2015). The mean number of supervisors was approximately four.

5.2 Correlations

Table II provides the correlation matrix among all key variables in the regression analysis. As a rudimentary check for multicollinearity, a correlation of 0.7 or higher in absolute value may indicate a multicollinearity issue. Table II reveals that the highest correlation coefficient of 0.972 (in italic) appeared between Top5 and Top10. The two variables cannot be used simultaneously in the regression model. No other correlation coefficient had an absolute value higher than 0.7, which implies that there is unlikely to be a multicollinearity issue. The diagnosis of multicollinearity implies that the estimated values of variance inflation factors (VIFs) for all explanatory variables (as showed in the last column of Table II) were also below the threshold of 10. This evidence shows that no multicollinearity issue exists.

5.3 Endogeneity

OLS and fixed-effects methods can obtain more efficient estimations if the independent variables are exogenous, otherwise a system GMM approach should be used. Therefore, we applied the Durbin–Wu–Hausman (DWH) to test the endogeneity of the regressors in the model. The result of the DWH test implied that the null hypothesis was rejected ($p = 0$), so there was an endogeneity problem between CG and performance. Therefore, OLS and fixed-effects approaches could not provide unbiased estimations, and system GMM was utilized in our study.

To compare the present study with past studies and highlight the possible endogeneity issue from unobserved heterogeneity, simultaneity and dynamic endogeneity (Wintoki *et al.*, 2012), we robustly examined the relationship between CG structure and firm performance through the following estimation techniques: a dynamic pooled OLS model, the fixed-effects model and system GMM.

Additionally, several formal tests, including an auto regression test (Arellano and Bond, 1991), a Hansen test of over-identification (Hansen and Singleton, 1982), and diff-in-Hansen tests of exogeneity of instruments (Wooldridge, 2002), were used to validate the system GMM estimator in our study. The results from these tests confirmed that the system GMM model in our study was valid.

Variable	Lnq	Top5	Top10	Sup	Duality	Lnbsize	Indep	State	Mo	Lnfage	Lnsize	Leverage	VIF(s)
Lnq	1												1.47
Top5	-0.0110	1											1.54
Top10	0.045***	0.972***	1										1.26
Sup	-0.044***	-0.021***	-0.045***	1									1.32
Duality	0.146***	0.014**	0.047***	-0.055***	1								1.38
Lnbsize	-0.201***	0.050***	0.042***	-0.355***	-0.174***	1							2.69
Indep	0.021***	-0.072***	-0.046***	0.029***	0.158***	-0.279***	1						1.78
State	-0.186***	0.298***	0.236***	0.127***	-0.205***	0.221***	-0.280***	1					1.66
Mo	0.187***	0.135***	0.204***	-0.113***	0.465***	-0.158***	0.156***	-0.240***	1				1.84
Lnfage	-0.126***	-0.441***	-0.499***	0.114***	-0.173***	0.036***	0.077***	-0.053***	-0.412***	1			1.55
Lnsize	-0.456***	0.071***	0.059***	0.041***	-0.089***	0.212***	0.111***	0.035***	-0.132***	0.263***	1		1.38
Leverage	-0.234***	-0.190***	-0.231***	0.086***	-0.146***	0.109***	-0.020***	0.083***	-0.297***	0.409***	0.237***	1	

Notes: Figure in italic represents the highest correlation coefficient; ***, $p < 0.01$; **, $p < 0.05$; *, $p < 0.10$; Variables are defined as in Table I

Table II. Correlation matrix among all key variables in the regression analysis

5.4 Main results

Table III shows the relationship between CG structure and firm performance in Chinese listed firms from 2001 to 2015 using Top5 as a proxy of ownership concentration. The coefficient of Tobin’s Q with lagged value was positive and significant at the 1 per cent level, which indicates that past performance had a significant impact on current performance in Chinese listed firms. This finding is in line with recent studies (Wintoki *et al.*, 2012; Nguyen *et al.*, 2014), implying that past performance should be treated as an important element when considering the dynamic nature of the governance–performance relationship.

As no significant relationship was found between independent director and firm performance, H2 is supported. This result is consistent with Li *et al.* (2015) but not with Liu *et al.* (2015). In addition, we found that there was no relationship between board size and firm performance, which supports H3. These findings suggest that the development of board structure is not mature and cannot play an effective monitoring role. Currently, board structure in China largely appears to be the outcome of regulations and is not based on firm-specific characteristics (Jiang and Kim, 2015). We also find evidence supporting our H5 that state ownership is positively correlated with firm performance in Chinese listed firms. There are many SOEs in China, and the state is their largest shareholder. Generally, SOEs will pursue wealth maximization and, in turn, improve firm performance (Jiang and Kim, 2015).

CEO duality was found to be significantly negatively correlated with firm performance, which is consistent with Liu *et al.* (2015), supporting H4. This finding is also in line with the prediction of agency theory, which implies that the separation of board chairperson and CEO may improve firm performance.

Ownership concentration was found to have no effect on firm performance; however, its direction with performance was positive. This finding is consistent with agency theory. This

Variable	Pooled OLS (1)	Fixed-effects (2)	GMM (3)
L.lnq	0.727*** (101.0)	0.483*** (77.29)	0.576*** (6.921)
Indep	0.142*** (3.461)	0.104* (2.177)	-0.748 (-0.820)
Lnbsize	0.010 (0.910)	0.018 (1.078)	-0.220 (-1.263)
Duality	0.010* (1.744)	0.014** (1.978)	-0.094** (-2.473)
Top5	0.101*** (6.544)	0.247*** (9.209)	0.152 (0.641)
State	0.036*** (3.320)	0.125*** (9.702)	0.222** (2.054)
Mo	0.083*** (3.509)	-0.003 (-0.062)	-0.511* (-1.785)
Sup	0.004*** (2.275)	0.002 (0.631)	0.064*** (2.949)
Lnsize	-0.116*** (-40.54)	-0.281*** (-64.58)	0.030 (0.298)
Leverage	0.004 (0.305)	0.083*** (5.327)	0.302** (2.204)
Lnfage	0.038*** (9.954)	0.181*** (17.49)	0.059 (0.698)
Constant	2.630*** (33.23)	6.247*** (61.86)	-3.95 (-0.723)
Industry dummies	YES	YES	YES
Year dummies	YES	YES	YES
Observations	20,182	20,182	20,182
R ²	0.790	0.673	
AR(1) test (p-value)			0.00
AR(2) test (p-value)			0.1
Hansen test of over-identification			0.85
Diff-in-Hansen tests of exogeneity			0.88

Table III.
Relationship between
CG structure and
firm performance
(Top5)

Notes: *t*-Statistics are presented in parentheses; ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively

supports the view that the shareholders who hold a large proportion of equity alleviate agency cost and enhance firm performance. Consistent with *H6*, we found a significant and negative relationship between managerial ownership and firm performance, which is line with the “managerial entrenchment” hypothesis (Morck *et al.*, 1988). In Western developed countries, a manager with a small fraction of shares can become entrenched, due to the dispersed ownership structure. However, ownership structure is concentrated in Chinese listed firms, and the only way that a manager can become entrenched is if the manager is also a large controlling shareholder (Jiang and Kim, 2015). The supervisory board was found to be significantly and positively correlated with firm performance, supporting *H7*, which is in line with Ran *et al.* (2015) and indicates that the supervisory board play a monitoring role in improving firm performance in Chinese listed firms.

Regarding the control variables, we found that both firm size and firm age had a positive, but not significant, effect on firm performance. Leverage appeared to have positive and significant effect on firm performance.

5.5 Robustness checks

We conducted several additional tests to investigate the sensitivity of our results. We substituted the Top10 variable for the Top5 variable in equation (1) and checked the robustness of our results. As presented in Table IV, the coefficient of Top10 was similar to that of Top5 (the direction of both was positive), and still not significant. The coefficients of other CG variables, including State, Duality, Mo and Sup in Table IV were basically unchanged in terms of direction and magnitude. Both independent directors and board size had no effect on firm performance, the result of which is similar to that in Table III.

Variable	Pooled OLS (1)	Fixed-effects (2)	GMM (3)
L.Inq	0.723*** (99.94)	0.474*** (75.95)	0.553*** (7.253)
Indep	0.144*** (3.529)	0.113** (2.375)	-0.985 (-1.083)
Lnbsize	0.010 (0.883)	0.013 (0.793)	-0.238 (-1.497)
Duality	0.011* (1.908)	0.015** (2.138)	-0.101*** (-2.689)
Top10	0.157*** (9.747)	0.436*** (17.27)	0.273** (1.161)
State	0.029*** (2.703)	0.119*** (9.340)	0.252** (2.429)
Mo	0.076*** (3.216)	-0.037 (-0.807)	-0.656*** (-2.534)
Sup	0.004** (2.323)	0.002 (0.621)	0.068*** (3.038)
Lnsize	-0.119*** (-41.16)	-0.293*** (-67.32)	0.013 (0.129)
leverage	0.005 (0.423)	0.096*** (6.225)	0.355*** (2.893)
Lnfage	0.044*** (11.43)	0.203*** (19.77)	0.045 (0.519)
Constant	2.636*** (33.38)	6.373*** (63.30)	-3.545 (-0.679)
Industry dummies	YES	YES	YES
Year dummies	YES	YES	YES
Observations	20,182	20,182	20,182
R ²	0.791	0.677	
AR(1) test (<i>p</i> -value)			0.00
AR(2) test (<i>p</i> -value)			0.13
Hansen test of over-identification			0.62
Diff-in-Hansen tests of exogeneity			0.77

Notes: *t*-Statistics are presented in parentheses; ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively

Table IV.
The relationship
between CG
structure and firm
performance (Top10)

To check the validity of system GMM estimator, according to methodology (Bond, 2002; Nguyen *et al.*, 2014), the reasonable coefficient of a lagged dependent variable in a regression with a GMM estimator should be well below the coefficient from OLS and well above the coefficient from a fixed-effects model. In Tables III and IV, the coefficient of lagged performance lay between those from OLS and the fixed-effects model, which meets expectations. The results of control variables for direction and significance were similar to that in Table III.

5.6 Test for change around the 2005 split share reform

This section explores whether there was a structural change around 2005. To test the discrete impact of split share reform, we utilized a dummy variable *D* that took the value of 0 for the years 2001-2004 and 1 for the years 2005-2015. This *D* dummy was interacted with all explanatory variables in the regression model. We exploited the joint significance of all interactive terms with *D* dummy by using the Chow test, and the *F*-statistics showed the significance to be less than the 1 per cent level, supporting the notion of a structural change around 2005. The results are not reported here in the interest of brevity.

6. Conclusion

This study provides a comprehensive investigation of relation between CG structure and firm performance in Chinese listed firms, using a huge unbalanced data embracing more than 22,700 firms from 2001 to 2015. Our motivation derives from the fact that the CG system in China differs from those in the US, the UK, Germany, Japan and other countries. The greatest differences are as follows: ownership structure is highly concentrated, state ownership plays a main role in operation, the monitoring mechanism in boards is imperfect, there is a dual supervisory board and managers of SOEs are not significant shareholders. Additionally, few integrative studies have examined the impact of CG structure on firm performance. Therefore, our investigation adds to the contributions of the literature by supporting a comprehensive survey of the impact of CG structure on firm performance. We add new empirical evidence that the relation between CG structure and performance in China is endogenous and dynamic when controlling unobserved heterogeneity, simultaneity and dynamic endogeneity.

Our research supports the opinion that Chinese CG structure is endogenously resolved by the CG mechanisms. No relationship occurs between board size (including independent director) and firm performance; Liu *et al.* (2015) explained that Chinese listed firms may merely include the minimum number of independent directors on a board to meet the institutional requirement and that independent directors on boards are only perfunctory and fail to perform their responsibilities. Chinese policy makers should, therefore, reshape the regulations of board structure through considering firm-specific characteristics. The concentrated ownership in Chinese listed firms was found to have a positive influence on firm performance but no significance. This finding endorses the view that larger shareholders may alleviate agency cost and enhance firm performance. Managerial ownership was negatively related with firm performance; our finding agrees with the “managerial entrenchment” hypothesis. The supervisory board institution in China differs from those in Western nations. A supervisory board is positively correlated with firm performance; our conclusions are in contrast with much of the literature on the ineffectiveness of the supervisory-board institution in China.

Compared with empirical evidence and theoretical opinions in the current literature, these findings also provide policymakers and firm managers with useful empirical guidance concerning CG in China: regulations regarding board structure should be changed to be

based on firm-specific characteristics. The number of independent directors in a firm should be an endogenous variable rather than be determined by a regulatory mandate, i.e. an exogenous shock: firms should minimize the functions duplicated between the supervisory board and independent directors. A dual board structure is rare globally. Distinguishing and separating their duplicated functions will be beneficial to firm performance.

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Corresponding author

Lin Shao can be contacted at: linshao@qlu.edu.cn and shaolinweihai@163.com