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# The board model corporate governance mechanism and financial performance of non-financial listed Chinese firms.

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**Abstract:** Corporate governance is widely suggested by economists and regulators as a solution to reduce agency problems and improve firm performance. However previous studies have failed to generate consistent results. Using a dynamic panel system GMM estimator to alleviate endogeneity concerns we determine the effect of corporate board structure on the performance of a panel of 1265 Chinese firms listed on the Shanghai and Shenzhen stock exchanges from 2010 to 2016. We compare the dynamic system GMM estimator to some commonly used estimators; ordinary least squares (OLS), fixed effects (FE) and the dynamic OLS, and show that these estimates are biased due to endogeneity. The dynamic system GMM estimator incorporates the dynamic nature of internal governance choices to provide valid and powerful instruments that address unobserved heterogeneity and simultaneity. Our results show support for the board model corporate governance mechanism. We find that board size is positive and significantly related to both return on assets and total net profit margin. In addition board independence is positive and significantly related to return on assets but insignificantly related to total net profit margin. Duality was found to have a negative but statistically insignificant relation with firm performance.

**Keywords:** Corporate governance, ROA, TNPM, dynamic system GMM, endogeneity, board size, board independence, ownership concentration.

**JEL Classification:**

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## 1. Introduction

Corporate governance is a pillar of wealth and a very important aspect of corporate finance (Becht, Bolton et al. 2003). The separation of corporate ownership and control creates the need for corporate governance mechanisms to address the potential conflicts between owners and those managing their wealth (Berle and Means 1932, Jensen and Meckling 1976, Fama and Jensen 1983, Becht, Bolton et al. 2003). When both owners and managers are utility maximizers, the manager may not always act in the interest of the owner (Jensen and Meckling 1976).

Instead the manager pursues objectives that are not consistent with the firm value maximization goal, behavior which is detrimental to the wealth of the shareholder and that of the firm. Recent corporate scandals such as Madoff, Libor scandal, Sub-Prime and Mortgage Scandals, Olympus Scandal, Enron, Worldcom, Danske Bank, Raj Rajaratnam, H.J. Heinz Company, Deepwater Horizon, Volkswagen and Lehman brothers highlight the detrimental effects of separation of corporate ownership and control (Zengin 2019). Economists, policy makers and regulators blame these scandals on corporate governance failure in those firms among other factors (Cuervo 2002, Mans-Kemp 2014, Admati 2018).

Existing literature propose several corporate governance mechanism that help to mitigate against principal agency conflicts (Fama and Jensen 1983, Cuervo 2002, Becht, Bolton et al. 2003, Lall 2009, Chou, Ng et al. 2011, Li 2019). Firstly, there are mechanisms that are internal to the firm such as, blockholder models, delegated monitoring and large creditors, board models, executive compensation models and multi-constituency models (Jensen 1986, Becht, Bolton et al. 2003). Secondly, there are mechanisms external to the firm such as the market for corporate control, market for managers, and the market for products and services (Cuervo 2002, Becht, Bolton et al. 2003, Li 2019). Legal systems which are commonly classified into common and civil law form another form of governance mechanism (Porta, Lopez-de-Silanes et al. 1998). These legal systems institute the rules that regulate the behavior of the firm and protect the rights of minority shareholders, influence the development of capital markets and the growth of a country (Porta, Lopez-de-Silanes et al. 1998, Cuervo 2002).

However, the choice of the mechanism depends on the corporate governance system prevalent in the country of study. Governance systems depend on the institutional environment. They are either market oriented, such as those in the USA and the UK or large-shareholders oriented such as in China, Germany, France or Spain (Shleifer and Vishny 1986, Shleifer and Vishny 1997, Cuervo 2002, Rong, Wu et al. 2017, Wang 2018). On one hand in the market oriented systems it is assumed that: (1) ownership is diffuse except for institutional investors, (2) control is vested in the board of directors with external directors playing an important role, (3) capital markets are very liquid and there is a developed market for corporate control and takeover market and (4) there is more defense for shareholder rights than in large-shareholder oriented systems. On the other hand large-shareholder systems are characterized by highly concentrated ownership in the hands of banks, companies and families; and boards that are controlled by internal directors or external directors linked to large shareholders (Cuervo 2002).

The current study focuses on China an emerging economic giant. Economists opine that China is a large-shareholders oriented market where ownership is highly concentrated in the hands of the state, family, institutional investors and financial institutions (Rong, Wu et al. 2017). There is evidence from previous studies that regardless of reform efforts to privatize and corporatize Chinese firms, the state continues to hold relatively substantial shareholding about a third of shares of listed Chinese firms making the state one of the largest shareholders (Rong, Wu et al. 2017). As proposed above such institutional environments are characterized by boards that are controlled by internal directors or external directors linked to the large shareholders. Given that the Chinese government is a large-shareholder, this brings us to our broad question: Is the board model an efficient mechanism to alleviate the corporate governance problems that arise from the separation of corporate ownership and control in the Chinese institutional environment?

Specifically in China, firms where the state has significant ownership are a part of the political system and are directed by the Central Committee of the Chinese Communist Party (CCP) (Rong, Wu et al. 2017). The government has direct influence on board chairman and CEO appointments, which ultimately exerts undue influence on managers to give priority to the interest of bureaucrats while minority shareholders' interests are ignored. The dilemma from this scenario arises from the fact that the interests of two groups may be conflicting: the interests of bureaucrats usually do not find convergence with the profitability goal, as they focus on achieving their political goals and pursuing any private benefits (Shleifer and Vishny 1997).

The central argument in this paper is that there is no convergence on existing empirical results on the impact of corporate governance structure on current firm performance. This paper argues that the lack of convergence emanates from the failure to address endogeneity issues that are pervasive in corporate finance research and particularly corporate governance. To simultaneously address our broad question stated above and the endogeneity concerns, this study estimates a dynamic panel system GMM using a unique dataset of 1265 firms listed on the Shanghai and the Shenzhen stock exchanges over a period of 7 years from 2010 to 2016. The panel system GMM estimator is efficient in dealing with endogeneity. Common sources of endogeneity are: unobserved heterogeneity and simultaneity (Wintoki, Linck et al. 2012, Roberts and Whited 2013). In addition we address another potential source of endogeneity which arises from the possibility that current values of governance variables are a function of past performance (Wintoki, Linck et al. 2012).

To the best of our knowledge, our paper is the first to comprehensively address the impact of the board model corporate governance mechanism on firm performance in the Chinese institutional setting by; (1) using the efficient dynamic panel system GMM estimator, (2) estimating four models for the dependent variable-firm performance: The OLS model, fixed-effects model, dynamic OLS model and the system GMM model to enable comparison of empirical results from this research to those established in previous research and to highlight the potential problems from ignoring that dynamic relation between current corporate governance structure and current firm performance, (3) empirically determining the number of lags required to capture all relevant past performance which allows us to use older lags which are exogenous with residuals of present as instruments, an important facet when estimating the dynamic panel system GMM. Previous studies just estimate the dynamic panel system GMM and interpret the results (Shao 2019). They do not empirically show the differences with other methodologies and how the instruments are generated.

The results from this study are quite interesting. First, we empirically confirm suggestions from previous studies that two lags are sufficient to capture all relevant influences of the past on the present (Glen, Lee et al. 2001, Gschwandtner 2005, Wintoki, Linck et al. 2012).

Second, we empirically show that corporate governance structure and the given firm-specific variables are related to past performance as suggested by (Wintoki, Linck et al. 2012). The results show that current board size has a positive significant relationship with past firm performance. Board independence is found to be significantly negatively related to past firm performance. In addition it was established that current board size is significantly positively related to past firm size, and firm size is significantly related to past performance. The results are largely consistent with the findings by (Hermalin and Weisbach 1998, Wintoki, Linck et al.

2012). These findings strongly support the view that listed Chinese firms that have performed well in the past have become larger today and consequently they have attained larger boards, a view shared by many previous researches (Fama and Jensen 1983, Boone, Field et al. 2007, Linck, Netter et al. 2008, Wintoki, Linck et al. 2012). We find robust evidence from the Chinese context that changes in board size in response to past performance are through the effect of performance on firm size thus replicating findings by (Fama and Jensen 1983, Wintoki, Linck et al. 2012). In addition we find that the selected potential control variables exhibit strong dynamic endogeneity.

Third, we find evidence in support of the board model corporate governance mechanism. The results of including fixed-effects in a dynamic model and estimating via GMM show that board size is statistically significant at the 10% level albeit with low magnitude compared to other static models, TNPM (0.039,  $t=1.66$ ) and IHSROA (0.039,  $t=1.79$ ). Board independence shows a positive significant relationship with IHSROA (0.112,  $t=1.74$ ), while TNPM shows a positive but insignificant coefficient (0.110,  $t=1.62$ ). Duality was found to have a negative but statistically insignificant relation with firm performance.

Fourth, we also carried various specification tests; (1) AR (2) second-order serial correlation tests, (2) the Hansen J test of over-identifying restrictions and (3) Diff-in-Hansen tests of exogeneity (p-value). We performed robust checks using lagged board structure and our results are consistent.

While this study attempts to address various corporate finance issues, it has its own limitations. First, due to data availability constraints the study considers only two accounting based financial ratios; return on assets (ROA) and total net profit margin (TNPM). Previous empirical studies show support for both market based and accounting based measures of performance such as TNPM (Arora and Sharma 2016, Darko, Aribi et al. 2016, Haque and Arun 2016, Lamichhane 2018, Salin, Ismail et al. 2019, Sekhon and Kathuria 2019), and ROA (Hermalin and Weisbach 1991, Sarkar and Sarkar 2000, O'Connor, Kinsella et al. 2014, Ciftci, Tatoglu et al. 2019) and Tobin's Q (Lozano, Martínez et al. 2016, Wang 2018, Shao 2019). Both accounting and market based performance measures have caveats (Ciftci, Tatoglu et al. 2019). Accounting performance measures may be subject to manipulation, and variations in accounting and consolidation methods (Dalton, Daily et al. 1999). On the other hand (Müller 2014) argues that market-based measures of performance may be affected by investor anticipation.

Second, this study focuses on board model corporate governance mechanisms, yet there are several mechanisms that have great potential to address the corporate governance problems. These mechanisms have been addressed above.

The findings of this study have very important policy implications. From the results it can be deduced that the board model has positive implications to the performance of Chinese firms. However this effect while it is significant has a smaller magnitude. It can be argued that the role of government in selecting board chairman and the CEO interferes with the independence of the board and management. As a result, we recommend more reforms that reduce government ownership in listed Chinese firms.

The rest of the paper is organized as follows: in section 2 we discuss the literature review and develop our hypothesis. We describe our data, variables and the methodology applied

Section 3. Various empirical analyses; (1) Number of significant lags of firm performance, (2) The dynamic relationship between CGS and firm performance, (3) The relationship between CGS and firm performance, and (4) robustness checks with lagged corporate governance structure are carried out section 4. Section 5 concludes the paper.

## 2. Literature review and hypotheses development

Corporate governance is a pillar of wealth and a very important aspect of corporate finance (Becht, Bolton et al. 2003). The separation of corporate ownership and control creates the need for corporate governance mechanisms to address the potential conflicts between owners and those managing their wealth (Berle and Means 1932, Jensen and Meckling 1976, Fama and Jensen 1983, Becht, Bolton et al. 2003). When both owners and managers are utility maximizers, the manager may not always act in the interest of the owner (Jensen and Meckling 1976). Instead the manager pursues objectives that are not consistent with the firm value maximization goal, behavior which is detrimental to the wealth of the shareholder and that of the firm. Recent corporate scandals such as Madof, Libor scandal, Sub-Prime and Mortgage Scandals, Olympus Scandal, Enron, Worldcom, Danske Bank, Raj Rajaratnam, H.J. Heinz Company, Deepwater Horizon, Volkswagen and Lehman brothers highlight the detrimental effects of separation of corporate ownership and control (Zengin 2019). Economists, policy makers and regulators blame these scandals on corporate governance failure in those firms among other factors (Cuervo 2002, Mans-Kemp 2014, Admati 2018).

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hands of banks, companies and families and boards that are controlled by internal directors or external directors linked to large shareholders (Cuervo 2002).

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In the next section, we discuss the various components that make up the board structure and simultaneously develop the hypotheses to be tested.

## **2.2. Board Structure**

For this study, the theoretical role of the board in monitoring and disciplining management is firmly grounded in the agency framework of (Fama and Jensen 1983). Empirical examination of board characteristics and company performance focuses on board size, board independence and CEO duality.

### **2.2.1. Board size**

The effect of board size on the firm performance remains a contested matter among researchers. From the perspective of the agency theory the board of directors is expected to monitor management on behalf of shareholders (Jensen and Meckling 1976). However the question of which board size is sufficient remains debatable. The resource-dependency theory suggests that larger boards are more likely to improve firm performance. (Sheikh, Shah et al. 2018) posit that board size is an important determinant of board effectiveness which is likely to positively impact the performance of a firm. When the size of the board increases, it significantly contributes to the quality of governance (Lipton and Lorsch 1992, Jensen 1993). This suggests a positive relationship between board size and performance (Dalton, Daily et al. 1999, Larmou and Vafeas 2010, Uadiale 2010, Chen and Al-Najjar 2012).

However the suggested positive relationship is contested by a number of studies. (Schultz, Tan et al. 2010, Wintoki, Linck et al. 2012, Sheikh, Shah et al. 2018, Shao 2019) found no

convincing relationship between board size and performance. Other researchers found a negative relationship between board size and firm performance (Guest 2009, Tulung and Ramdani 2018). The negative relationship for larger boards is attributed to less effective monitoring due to potential free riding, coordination and communication (Lipton and Lorsch 1992, Jensen 1993).

An interesting inverted U relationship between board size and company performance was obtained by (Kiel and Nicholson 2003). In their study (Kiel and Nicholson 2003) established that adding directors can bring the board a high level and mix of optimal skills and experience up to a certain point. Beyond that point the difficult dynamics of large board prevail over the skills and expertise that additional directors might bring.

The discord in the empirical findings discussed above can be attributed to econometric methodology, research context and sampling methods (Schultz, Tan et al. 2010, Wintoki, Linck et al. 2012, Roberts and Whited 2013, Rong, Wu et al. 2017, Wang 2018). China is an emerging market and its corporate governance is still developing. As a result (Jiang and Kim 2015) argue that unlike in developed markets board structure in China is largely influenced by regulations and not firm specific characteristics. Based on this view, this study proposes that Chinese boards are highly unlikely not to induce any significant influence on firm performance.

***H<sub>1</sub>. There is no significant relationship between board size and firm performance in listed Chinese firms.***

### **2.2.2. Board independence**

The board's ultimate goal is to align the shareholder-manager interests (Sheikh, Shah et al. 2018). The agency theory posit that boards should be independent in order to enhance the ability to effectively monitor management and achieve an optimum balance between manager and shareholder's interests (Fama and Jensen 1983, Kiel and Nicholson 2003, Shao 2019). Independent directors are less likely to collude with management and are less related to managerial opportunism (Sheikh, Shah et al. 2018). According to (Boo and Sharma 2008) independent directors are effective monitors because they do not have financial interests in the company or psychological ties to management. In that regard independent directors are in a better position to objectively challenge management (Klein 2002, Abbott, Parker et al. 2004). It is also argued that higher independent director representation on the board provides more vigilant oversight of the primary purpose of monitoring.

An independent director is a director who has no operational relationship with the firm, other than a seat on the board (Shao 2019). Contrary to board structures in developed markets such as the US and Europe corporate governance in China is composed of two types of outside board directors: independent directors and non-executive directors. Independent directors are those directors who just maintain a seat on the board but hold no posts in the company other than the position of director. These independent directors maintain no relations with the company they oversee. On the other hand non-executive directors are primarily those non-controlling directors who represent the interests of non-controlling shareholders (hence also called non-controlling directors) (Zhou, Fan et al. 2017).

There are some empirical studies in China that find board independence to be a monitoring mechanism that positively affect firm performance (Liu, Miletkov et al. 2015, Zhou, Fan et al. 2017). On the other hand some current studies show that board independence has no effect on firm performance (Shao 2019). Despite all the hype about the positive monitoring effect of independent directors by regulators, researchers and authorities, empirical studies have failed to reach convergence (Puchniak, Baum et al. 2017). The effectiveness of board independence as a monitoring mechanism is a function of the election process of the independent board and the institutional environment for the election process (Bahoo, Ahmed et al. 2019). In the Chinese context the process of appointing independent directors is influenced by top corporate executives, and these independent directors are concerned about their tenure in the firm when fulfilling their monitoring and supervising functions (Kangtaoa, Jigaob et al. 2011). Furthermore, the majority shareholders retain the final decision on whether an independent director stays or not.

Consequently such decisions impose undue influence on independent directors in Chinese firms naturally tying them closely with either CEOs or the controlling shareholders. In that vein, it can be argued that independent directors in China are not purely independent which makes it difficult to confront CEOs when making suggestions on CEO compensation and other matters (Zhou, Fan et al. 2017). This view is also shared by (Jiang and Kim 2015) who argue that controlling shareholders are only interested in meeting the minimum number of independent directors. (Chen and Al-Najjar 2012) weigh in by suggesting that board independence is only driven by regulation. The above literature shows that, considering substance over form, independent directors in China are not actually independent which stifles their monitoring role. In that vein we propose that:

***H<sub>2</sub> There is no significant relationship between board independence and firm performance.***

### **2.2.3. CEO duality**

CEO duality is a condition where the CEO of a firm doubles as the chairperson of the board. From the perspective of both the agency theory and the managerial power theory, CEO duality is considered as a sign of inefficient corporate governance which ultimately have a negative effect on firm performance (Sheikh, Shah et al. 2018, Shao 2019). Under the CEO duality situation, board independence is impaired and CEOs increase their executive powers over control of decisions which provides 'self-interested' ones with opportunities to influence major decisions in order to maximize their own utilities rather than maximizing shareholder's interests (Jensen and Meckling 1976, Fama and Jensen 1983, Sheikh, Shah et al. 2018). (Azim 2012) argues that if a single individual wears both 'hats', managerial dominance is enhanced since there is greater alignment with management rather than shareholders. The CEO duality potential negative effect on corporate governance is exposed in various studies that show its positive influence on executive compensation, which signals the likelihood of CEO entrenchment and excessive payment (Conyon and He 2012, Van Essen, Otten et al. 2015).

On the contrary stewardship theory suggests that CEO duality creates an important and necessary unity of command at the top of the organization (Donaldson and Davis 1991). (Donaldson and Davis 1991, Brickley, Coles et al. 1997) opines that under the condition of CEO



not being the chairperson of the board, the firm may experience conflicts at the top, reduced speed and effectiveness in decision-making which results in poor performance.

There is another stream of research that found no significant relationship between CEO duality and firm performance (Elsayed 2007, Yasser, Al Mamun et al. 2015). A study by (Lam and Lee 2008) established that neither the stewardship theory nor the agency theory can explain single handedly the impact of CEO duality on performance. Their study concluded that CEO duality is good for non-family firms while non-duality is good for family-controlled firms. Other studies however show a positive relationship between CEO duality and performance (Amaral-Baptista, Klotzle et al. 2011).

In China there is a general increase in pressure for companies to follow the agency theory prescription to abandon CEO duality (Song, Yuan et al. 2006). (Chen, Firth et al. 2009) reported that the proportion of CEO duality in listed firms has fallen from 23.7% to 13.8 percent over the period from 1999 to 2002. However the regulatory authority through the Code of Corporate Governance for Listed Companies in China does not prescribe whether CEOs should (or should not) be appointed as the board chair (Commission 2001).

Taking into consideration the research context this study adopts the agency theory perspective which assumes that the combined role of Chair/ CEO captures a subset of the 'non-independent chair' which has adverse effect on performance. As such we put forward the following hypothesis:

***H<sub>3</sub>: There is a negative relationship between CEO duality and firm performance.***

### **3. Data, Variables and Methodology**

#### **3.1. Data**

In this study both the firm-level financial and governance variables data were obtained from the Shanghai and the Shenzhen Stock exchanges through the Thompson DataStream channel and is composed of a sample of non-financial firms only. The decision to focus on the Stock Exchange listed firms is based on the idea that such firms follow rules and standards set by regulatory bodies in the course of their business operation. This gives confidence that disclosure of financial information is generally standardized in line with particular authoritative accounting standards.

The study focused on the period after the year 2009 a period which followed reviewed and significantly improved security legal framework and market transparency by the CSRC. Due to such reviews and improvements, it is expected that data from 2010 onwards is relatively up-to-date and the information disclosure requirement imposed on publicly listed firms is stricter than before that date (Lew, Yu et al. 2018)..

To avoid any sample selection issues, we use unbalanced panel data, rather than focusing on balanced panel data. Originally the population was 3556 firms across 11 industry categories (table 1), 2295 firms were then deleted. Firstly motivated by (Lozano, Martínez et al. 2016) we excluded banking and other financial institution. Secondly firms that had substantial amount of data missing were also excluded. After deleting cases that did not meet the criteria the remaining sample that consisted of 7727 firm-year observations, including 1265 companies in

2010, 1081 in 2011, 1170 in 2012, 1168 in 2013, 1166 in 2014, 1124 in 2015 and 1147 in 2016. The firm-level financial and ownership variables are drawn from Thompson DataStream.

**Table 1:** Summarized number of companies selected by industry and percentage of representativeness. Industry classification is based on the CSRC (2001 Edition) Guidelines for Industrial Classification of Listed Companies and is compiled according to the abbreviation of Shenzhen Stock Exchange.

Industry Code	Industry Name	Population	Deleted	Sample Size	Percentage
A	Crop Farming, Fisheries, Animal, Livestock and Forestry	48	26	22	1.74%
B	Mining and Oil Extraction	69	46	23	1.82%
C	Manufacturing Industry	1573	735	842	66.56%
D	Electricity, Gas and Water	80	58	22	1.74%
E	Civil Engineering Construction	57	29	28	2.21%
F	Transportation Industry	91	70	21	1.66%
G	Communication and Related Equipment Industry	209	58	151	11.94%
H	Wholesale and Retail Industry	135	77	58	4.58%
I	Banking, Insurance, Integrated Securities and Other Financial Institutions	41	41	0	0.00%
J	Real Estate Development and Management Industry	143	95	48	3.79%
K	Public Facilities	88	50	38	3.00%
L	Information, Cultural and Communication Industry	40	28	12	0.95%
M	Miscellaneous	55	55	0	0.00%
N	Unnamed Industries	927	927	0	0.00%
	<b>Total</b>	<b>3556</b>	<b>2295</b>	<b>1265</b>	<b>100.00%</b>

### 3.2. Variables definition

In this study variables have been categorized into three main categories: governance variables, financial performance variables and control variables. Governance variables were further subdivided into board monitoring variables while the rest were treated as control variables.

#### 3.2.1. Dependent variables

The dependent variable in this study is financial performance which is given by two accounting based financial ratios return on assets (ROA) and total net profit margin (TNPM). Previous empirical studies show support for both market based and accounting based measures

of performance such as TNPM (Arora and Sharma 2016, Darko, Aribi et al. 2016, Haque and Arun 2016, Lamichhane 2018, Salin, Ismail et al. 2019, Sekhon and Kathuria 2019), and ROA (Hermalin and Weisbach 1991, Sarkar and Sarkar 2000, O'Connor, Kinsella et al. 2014, Ciftci, Tatoglu et al. 2019) and Tobin's Q (Lozano, Martínez et al. 2016, Wang 2018, Shao 2019). Both accounting and market based performance measures have caveats (Ciftci, Tatoglu et al. 2019). Accounting performance measures may be subject to manipulation, and variations in accounting and consolidation methods (Dalton, Daily et al. 1999). On the other hand (Müller 2014) argues that market-based measures of performance may be affected by investor anticipation.

According to (Ciftci, Tatoglu et al. 2019) ROA is an accounting performance indicator which can be defined as the percentage of net income to total assets. This is a metric that shows the firm's operational performance for a specific period (mostly one year) as a percentage of total assets. ROA was obtained using the following formula:

$$\text{ROA} = [\text{Net Profits} / \text{Total Assets}]$$

The variable ROA was then transformed to IHSROA using the IHS transformation,  $\text{Sinh}^{-1}(x)$  (Burbidge, Magee et al. 1988) to minimize losses of negative values. The formula below was applied:

$$\text{IHSROA} = [\text{ROA} + (\text{ROA}^2 + 1)]^{1/2}$$

The combined use of these ratios is also popular with other studies (Sarkar and Sarkar 2000, O'Connor, Kinsella et al. 2014, Ciftci, Tatoglu et al. 2019). Both the TNPM and the ROA ratios were obtained from Thompson DataStream. Total net profit margin is a profitability ratio also known as return on sales which measures the percentage of net income to sales. It is computed as net income divided by total sale of firms.

### 3.2.2. Independent variables

In this study we adopt a board model corporate governance mechanism with the following variables: board size (IBSIZE), board independence (BIND), and CEO duality (DUALITY). IBSIZE is the natural logarithm of the number of directors appointed by the board (Chen and Al-Najjar 2012, Liu, Miletkov et al. 2015, Shao 2019). Board independence (BIND) is the proportion of the independent and non-executive directors. Some studies measure board independence as the percentage of independent board members (Bhagat and Black 2001, Ciftci, Tatoglu et al. 2019, Shao 2019). CEO duality (DUALITY) is defined as a situation when the CEO doubles as the chairperson of the board. For analysis purpose duality is measured using a dummy variable where "1" denotes a CEO also serving as a chairperson and "0" otherwise (Liu, Miletkov et al. 2015, Ciftci, Tatoglu et al. 2019, Shao 2019).

## 5. Control variables

In order to isolate the effects of other factors that have a predictable influence on firm performance we introduce both governance control variables and firm characteristic control variables. Ownership concentration (IOWNSHP) and managerial ownership (MSHRS) are

introduced as the corporate governance control variables. The variable ownership concentration is measured as a percentage of corporate shareholders to total shares. This variable was transformed by computing its natural logarithm to generate IOWNSHP (Shao 2019). Managerial ownership is measured as the total amount of shares held by top management which is transformed by generating its natural logarithm to give IMSHRS.

When ownership is concentrated, major shareholders can play an important role in monitoring management and reducing the scope of managerial opportunism (Shleifer and Vishny 1986). Listed firms in China are characterized by highly concentrated ownership (Rong, Wu et al. 2017). In most emerging economies ownership is highly concentrated and legal institutions are weak and this is considered to fuel investor expropriation (Wang 2018). We expect a positive relationship between ownership concentration firm-performance.

Managerial ownership was also included as a control variable. Managerial incentives are instruments to minimize moral hazard problems that result from the self-interested actions of managers (Mutlu, Van Essen et al. 2018). Managers can be induced to act in the best interest of shareholders through compensation contracts that are based on company performance. These contracts should be structured in a way that attract talented COEs and incentivize them to exert their effort, exploit growth opportunities and reject wasteful projects (Lyu, Decker et al. 2018). Such contracts will reduce agency risk, optimize corporate governance, and regulate executive rent seeking behavior (Jensen and Meckling 1976, Shleifer and Vishny 1997).

In line with the agency theory proposition, managerial ownership has been widely suggested as a solution to mitigate the owner-manager conflicts (Jensen and Meckling 1976, Belghitar, Clark et al. 2019, bin Hidthiir, Basheer et al. 2019, Murwaningsari 2019). Some studies analyzing the effect of managerial ownership on firm performance suggest that shareholders benefit from greater managerial ownership because it increases managers' incentives to accept riskier, more profitable projects that increase firm value (Jensen and Meckling 1976, Sheu and Yang 2005, Belghitar, Clark et al. 2019, bin Hidthiir, Basheer et al. 2019).

The firm-characteristics control variables adopted for this study are leverage (LEV), and firm size measure- asset tangibility (ASTAN) as the as the control variables. The use of these variables is also found in many empirical studies (Ciftci, Tatoglu et al. 2019, Shao 2019). LEV is the ratio of total debt over total assets. The effect of leverage on firm performance is not conclusive with some studies arguing that it has a negative effect on firm performance with others suggesting a positive effect. According (Jensen 1986) leverage has a positive effect on firm performance because high levels of debt decrease potential agency costs, which means managers have less cash available after servicing the debt. On the other hand (Campbell and Mínguez-Vera 2008) postulate that leverage is negatively associated with firm performance because a higher level of debt increases the risk of bankruptcy.

In this paper, asset tangibility (ASTAN)-the ratio of fixed assets to total assets is the selected firm size measure. This measure was chosen after considering data availability issues. (Tian and

Estrin 2008) argues that firms with higher asset tangibility tend to operate in more traditional industries where growth opportunities are relatively limited. Firm size measures are popular and have been used widely in corporate finance research (Shalit and Sankar 1977, Demsetz and Villalonga 2001, Dang, Li et al. 2018, Belghitar, Clark et al. 2019). Other widely used measures include total assets, total sales, market value of equity, enterprise value (market capitalization plus debt), the number of employees, total profits, net assets (total assets minus total liabilities) (Shalit and Sankar 1977, Dang, Li et al. 2018). The first three; total assets, total sales and market value of equity are the most popular according to (Dang, Li et al. 2018). However, the choice of which measure is appropriate depends on; a priori economic consideration, estimation problems and statistical properties of various measure and the practical considerations of data availability (Shalit and Sankar 1977). Also included as control variables are firm age (FRMAGE) and the firms' Tobin Q ration.

### 3.3. Pre-Estimation Tests

The panel data used in this study is unbalanced as such the Augmented Dickey Fuller (ADF) fisher type test was applied to check for unit root. To check for multicollinearity among all the determinants, the study applied the Pearson correlation. Lastly the study also performed variance inflation factor (VIF).

#### 3.3.1. Unit root

The unit root test is a common procedure to determine whether a variable follows a random walk. If the existence of a unit root for a series cannot be rejected in the test, then the series is said to follow a random walk (Azad, Ahsan et al. 2013)

To investigate the causal relationship between corporate governance monitoring mechanisms and firm performance, we first checked the stationarity of our data. There is a variety of panel-data based unit root tests that have been developed in recent years (Choi 2001, Levin, Lin et al. 2002, Im, Pesaran et al. 2003, Breitung 2005, Herwartz, Maxand et al. 2018, Das 2019). The data used in this study is unbalanced as such the Fisher-type Augmented Dickey Fuller (ADF) was used to test for unit root in line with previous research (Choi 2001, Nsiah and Fayissa 2013, Das 2019). (Choi 2001, Das 2019), posit that the ADF test is efficient for both balanced and unbalanced data, and allows for gaps in the individual series. The Fisher-type tests conduct the unit-root tests for each panel individually and then combine the  $p$ -values from these tests to produce an overall test to produce an overall test (Nsiah and Fayissa 2013).

The ADF specification can be written as follows:

$$\Delta y_{it} = \rho y_{i,t-1} + z_{it}\gamma + v_{it}$$

Where  $i=1 \dots N$ ,  $t=1 \dots T$ , and  $v_{it}$  denotes the stationary error term of the  $i$ th member in period  $t$ , respectively.  $y_{it}$  refers to the variable being tested,  $z_{it}$  represents control variables in the model with panel specific means, time trends, or nothing depending on the options specified. On the other hand, a trend scenario where  $z_{it} = (1, t)$  such that  $z_{it}\gamma$  represents fixed-effects and linear

time trends can be specified. In addition we can also specify  $z_{it}$  non-constant and omit the  $z_{it}^{\gamma_i}$  term altogether.

The ADF test the null hypothesis that, all panels contain a unit root i.e. ( $H_0: p_i = 1$ ) for all  $i$  versus the at least one panel is stationary i.e. ( $H_a: p_i < 0$ ) for some  $i$ . In order to perform the test four methods are applied individually; the inverse chi-square (P), inverse normal (Z), or inverse logit (L) transformation of  $p$ -values, and the modification of the inverse chi-squared method,  $\chi^2$  (Pm).

### 3.3.2. Multicollinearity

Multicollinearity refers to the linear relationship among two or more variables, which also means lack of orthogonality among them (Alin 2010). (Craney and Surles 2002, Belsley, Kuh et al. 2005) call this relationship collinearity. (Alin 2010) provides a more technical definition of multicollinearity as a situation that occurs if  $k$  vectors lie in a subspace dimension less than  $k$ . The condition of multicollinearity usually exists when there is data deficiency. (Alin 2010) observed that researchers confuse multicollinearity with correlation. While correlation is the relationship between two variables, multicollinearity can exist between two variables or between one variable and linear combination of others. Thus correlation is a special case of multicollinearity. When there is high correlation it implies that there is multicollinearity but the converse is not true. One can have multicollinearity among explanatory variables but still not have high correlation between pairs of these variables.

Collinearity can increase estimates of parameter variance, yield models in which no variable is statistically significant even though  $R^2_y$  is large, produce parameter estimates of the incorrect sign and of plausible magnitude, create situations in which small changes in the data produce wide swings in parameter estimates and, in truly extreme cases prevent the numerical solution of a model (Greene 2000, Belsley, Kuh et al. 2005)

The variance inflation factor (VIF) is a very popular diagnostic tool used to measure the degree of collinearity present for each factor (Alin 2010). VIFs get their name from the fact that they report how much of the variance of the estimated coefficients increases is due to collinear independent variables. Specifically they report how much of the regressor's variability is explained by the rest of the regressors in the model due to correlation among those regressors (Stine 1995, Craney and Surles 2002, O'brien 2007, Das 2019). The VIF values can be obtained using the following formula:

$$VIF_i = \frac{1}{1-R_i^2} \text{ for } i=1, 2, \dots, k,$$

where,  $R_i^2$  is the coefficient of determination of  $X_i$  on the remaining explanatory variables. VIF values measure the increase in  $\sigma_{b_i}^2$  because of multicollinearity relative to the variance that would result if there was no multicollinearity. The larger the VIF, the more the  $\sigma_{b_i}^2$  is inflated. A large value of  $VIF_i$  indicates the movement of  $X_i$  in at least some linear dependency, but does not reveal which  $X_i$ . The recommended threshold value to deviate from large is generally taken as 10 (Craney and Surles 2002, Alin 2010).

### 3.4. Econometric Methodology

A myriad of corporate governance literature around the world shows that there is still no consensus on the corporate governance – firm performance relation (Wintoki, Linck et al. 2012, Roberts and Whited 2013, Shao 2019). Empirical studies show inconsistency in their findings. A possible cause is that different studies applied different econometric methodologies such as the ordinary least squares (OLS), linear regression (LR), traditional fixed-effects (FE), correlated random effects (CRE) and system-generalized methods-of-moments to model panel data and make some inferences. OLS was applied in research such as by (Hermalin and Weisbach 1991, Linck, Netter et al. 2008, Ciftci, Tatoglu et al. 2019, Moral-Benito, Allison et al. 2019). Some of these methodologies do not address endogeneity which is pervasive in corporate finance (Roberts and Whited 2013). Endogeneity exists when there is correlation between explanatory variables and the error term in a regression.

According to (Roberts and Whited 2013), endogeneity leads to biased and inconsistent parameter estimates that make reliable inference virtually impossible. (Wintoki, Linck et al. 2012, Roberts and Whited 2013) suggest that at least three potential sources of endogeneity exist: omitted variables, simultaneity and measurement error. In the governance research, endogeneity can also arise from the possibility that current values of governance variables are a function of past firm performance-dynamic endogeneity (Schultz, Tan et al. 2010, Wintoki, Linck et al. 2012).

In corporate governance research, it is not unusual to omit some variables (implicitly or explicitly) that should have been included in the vector of explanatory variables. If these omitted variables are correlated with variables already included in the vector of explanatory variables, then there is an endogeneity problem that causes inference to break down (Roberts and Whited 2013). The simultaneity condition occurs when the dependent variable ( $y_{it}$ ), and one or more of the explanatory variable ( $x_{it}$ ) are determined in equilibrium so that it can be plausibly argued that there is reverse causality. Researchers also use proxies in corporate finance empirical studies for unobservable or difficult to quantify variables which might lead to measurement error if there are any discrepancies that arise or if there are conceptual differences between proxies and their unobservable counterparts (Roberts and Whited 2013).

As a remedy to the endogeneity problem (Holtz-Eakin, Newey et al. 1988, Arellano and Bond 1991, Arellano and Bover 1995, Blundell and Bond 1998) developed the system GMM. Since then the System Generalized Methods of Moments has become very popular featuring in studies such as, (Wintoki, Linck et al. 2012, Roberts and Whited 2013, Zaefarian, Kadile et al. 2017, Sheikh, Shah et al. 2018, Ullah, Akhtar et al. 2018, Shao 2019). (Sheikh, Shah et al. 2018) used the system GMM to examine the effects of firm performance and corporate governance on chief executive officer (CEO) compensation in Pakistan. In their study (Sheikh, Shah et al. 2018) found that both current and previous year accounting performances have positive impact on executive compensation suggesting the existence of dynamic endogeneity. (Shao 2019) investigated the relationship between corporate governance structure and firm performance in Chinese listed firms using a system-GMM estimator which they applied on a large unbalanced sample, covering 22,700 observations. The results from (Shao 2019) show no relation between board size, board independence and firm performance. However significant negative relation was established for CEO duality and managerial ownership while significant positive relation was established for supervisory board, ownership concentration and state ownership.

(Hermalin and Weisbach 1998) proposed the theory that board structure is partly a function of the bargaining process between the chief executive officer (CEO) and the board, and that since the CEO's bargaining position is a function of her ability (measured by past firm performance), board structure depends on past firm performance. This view is also supported by (Harris and Raviv 2008) who argue that past performance has a direct influence on the firm's information environment, profit potential, and the opportunity cost of outside directors, all of which are factors that may affect the optimal board structure. (Wintoki, Linck et al. 2012) established results consistent with this theoretical argument.

This study uses the system GMM ahead of other methodologies because it is the most efficient when dealing with all kinds of endogeneity discussed above (Arellano and Bond 1991, Wintoki, Linck et al. 2012, Roberts and Whited 2013). Compared to the OLS, system GMM estimation includes firm-fixed effects to account for (fixed) unobservable heterogeneity. The system GMM is also superior to fixed-effects estimates because it allows current governance to be influenced by previous realization of, or shocks to, past performance. In addition, unlike either OLS or traditional fixed-effects estimates theory discussed above suggest that the underlying economic process in the governance research is dynamic, i.e. current governance is related to past performance. The dynamic GMM then makes it possible to use some combination of variables from the firm's history as valid instruments to account for simultaneity (Wintoki, Linck et al. 2012).

### 3.5. Model Specification

As discussed in the previous section, most previous research applied econometric methodologies that do not sufficiently address endogeneity issues that are pervasive in corporate governance research. As noted by (Wintoki, Linck et al. 2012, Roberts and Whited 2013, Shao 2019) the commonly estimated models are of the form: firm performance =  $f(\text{Corporate governance mechanisms, firm specific characteristics, fixed effects})$ . The current study follows the dynamic model adopted in previous literature (Wintoki, Linck et al. 2012, Roberts and Whited 2013, Sheikh, Shah et al. 2018, Naciti 2019, Shao 2019). This dynamic model is in the form: firm performance =  $f(\text{past firm performance, corporate governance mechanisms, firm specific characteristics, fixed effects})$ . The basic model for this study is given below:

$$y_{it} = \alpha_0 + \delta y_{it-1} + \sum_{j=0}^j \beta_j X_{it}^j + \gamma Z_{it} + \eta_i + \varepsilon_{it}. \quad (1)$$

In equation (1) above,  $Y_{it}$  is the performance of non-financial firms represented by Tobin's Q, and return on assets (ROA).  $X_{it}$  is the vector of all explanatory variables identified in this study which are: firm specific variables (firm size, leverage, and age), industry specific variables, and corporate governance characteristics (Board size, Supervisor Board Size, Duality, Executive ownership, board ownership, ownership concentration). The lowercase subscripts  $i$  and  $t$  represent firm and time respectively while  $\eta_i$  represents the unobserved time-invariant effects,  $\varepsilon_{it}$  is a random error term and  $\beta$  is the effect of board structure on performance.

The study estimates the dynamic model of (1) in first-differenced form:



$$\Delta y_{it} = \alpha + k_p \sum p \Delta y_{it-p} + X_{it} + \gamma \Delta Z_{it} + \Delta \varepsilon_{it}, p > 0 \quad (2)$$

The purpose for differencing is to eliminate any potential bias that may arise from time-invariant unobserved heterogeneity. After first-differencing, we estimate (2) via GMM using lagged values of the explanatory variables as instruments for the current explanatory variables. That is, we use historical values of performance, board structure, and other firm specific variables as instruments for current changes in these variables.

In order to estimate this model, the lag length was empirically determined. (Wintoki, Linck et al. 2012, Shao 2019) suggests that researchers must determine how many lags of dependent variables in the panel GMM are required to capture all the information. Lags should not be too long because they will lead to a loss of degrees of freedom and over-parameterization, while too short might create biased results caused by omitting important variables and failing to capture the dynamic relationship between governance structure and firm performance (Wintoki, Linck et al. 2012, Acock 2013, Shao 2019). Following (Wintoki, Linck et al. 2012) this study proposed the use of two lags. The dynamic completeness of these lags was verified by regressing current performance on four lags of past performance while controlling for other firm-specific characteristics.

This study selected a baseline approach for comparative purposes with other methodologies to illustrate the consequences of implementing inappropriate econometric techniques when modeling governance-performance relation. As previously discussed, OLS and fixed effects estimators were used for baseline analysis (Schultz, Tan et al. 2010).

#### 4. Results and Analysis

The augmented Dickey Fuller (ADF) test for unit roots was conducted for all the time series used for the study. Table 4.2., shows the result of unit root tests using the ADF unit root test at level. The null hypothesis of non-stationarity is performed at the 1%, the 5% and 10% significance levels. In Table 4.2., the result of the ADF test illustrates that all the data series are stationary at level. The ADF results show that all the variable series were integrated series of order I (1).

All of the four tests; the inverse chi-square (P), inverse normal (Z), or inverse logit (L) transformation of  $p$ -values, and the modification of the inverse chi-squared method,  $\chi^2$  (Pm) strongly reject the null hypothesis that all panels contain unit roots. However this study reports the inverse normal (Z) results (Choi 2001). According to (Choi 2001) the inverse normal (Z) offers the best trade-off between size and power, while the modification of inverse chi-squared (Pm) is good with larger samples hence it is recommended for usage in applications.

The results of the variance inflation factors for the variables used in this study are given in Table 4.2. All the values are less than 10, as recommended in previous studies (Craney and Surles 2002, Alin 2010).

A Pearson's product-moment correlation was run to assess the relationship between the variables used in this study and the matrix is presented in table 4.3., below. The majority of the coefficients lie in the range,  $0.1 < |r| < 0.3$ ,  $p < 0.0005$  or below which implies that there is very small correlation (Cohen 1988).

**Table 4.2.: Unit Root Test - Augmented Dickey Fuller (ADF) & the Variance Inflation Factor (VIF).**

This table presents the results of the ADF and the VIF. The study presents two type of statistic Inverse normal (Z) is represented by (Z) and the Modified inverse chi-squared Pm represented as (Pm) in the table (Choi 2001). VIF is the variance inflation factor.

Variable Name	(Z)	(Pm)	PV	VIF
<i>Governance Variables</i>				
IBSIZE	(37.6545)	44.2377	0.0000	1.56
BIND	(46.2181)	58.9003	0.0000	1.41
IOWNSHP	(7.514)	12.0973	0.0000	1.06
IMSHRS	(22.8447)	22.5416	0.0000	1.35
<i>Firm Specific Variables</i>				
IFRMAGE	(43.1587)	45.7875	0.0000	1.28
LEV	(36.4185)	44.1534	0.0000	1.18
ASTAN	(37.3927)	44.0582	0.0000	1.13
LSIZE	(16.652)	18.1619	0.0000	2.01
ITQ	(33.0169)	36.9029	0.0000	1.91
IHSROA	(35.421)	39.7693	0.0000	1.05
<i>Dummy Variable</i>				
DUALITY	(29.4628)	30.694	0.0000	1.12

Table 4.3.: Pearson's Correlation coefficient matrix

This table shows the Pearson correlation coefficient,  $r$  and the level of significance. The magnitude of  $r$  shows the strength of association between variables. When  $r$  is negative it is given in parentheses (.).  $0.1 < |r| < 0.3$  is small correlation,  $0.3 < |r| < 0.5$  is moderate correlation,  $|r| > 0.5$  is strong correlation, (Cohen 1988). The  $p$  values show the level of significance at the 1%, 5%, and 10% which are represented in this table \*\*\*, \*\*, \* respectively.

	IBSIZE	BIND	DUALITY	IOWNSHP	IMSHRS	IFRMAGE	LEV	ASTAN	LSIZE	ITQ	IHSROA
<b>IBSIZE</b>	1										
<b>BIND</b>	(0.5189)***	1									
<b>DUALITY</b>	(0.1563)***	0.1208***	1								
<b>IOWNSHP</b>	(0.0626)***	0.0766***	0.0297***	1							
<b>IMSHRS</b>	(0.2087)*	0.0668***	0.2706***	(0.0623)***	1						
<b>IFRMAGE</b>	0.0673***	0.0298***	(0.1169)***	(0.1172)***	(0.2663)***	1					
<b>LEV</b>	(0.1165)***	0.0237***	0.1373***	0.0112	0.1930***	(0.2367)***	1				
<b>ASTAN</b>	0.1254***	(0.0481)***	(0.1003)***	(0.0019)	(0.2426)***	0.1601***	(0.1494)***	1			
<b>LSIZE</b>	0.2693***	(0.0205)*	(0.2079)***	0.0906***	(0.2440)***	0.3547***	(0.3364)***	0.0847***	1		
<b>ITQ</b>	(0.2506)***	0.0680***	0.1927***	(0.0693)***	0.3876***	(0.1942)***	0.3054***	(0.2376)***	(0.6208)***	1	
<b>IHSROA</b>	0.0204*	(0.0114)	0.0176	0.0879***	0.0962***	(0.1321)***	0.1007***	(0.1010)***	0.0071	(0.2547)***	1

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#### 4.1. Descriptive Statistics

**Table 4.4: The summary statistics of governance variables and firm characteristics variables**

The table contains the sample characteristics of the corporate governance and firm characteristics of the firms used in the study. The results are based on a sample of 1265 firms and 92,299 firm years selected every other year (2010, 2011, 2012, 2013, 2014, 2015, and 2016). Corporate governance and firm characteristics data was obtained from DataStream. BSIZE is board size (the number of directors on the board), BIND is board independence (is the proportion of independent and executive directors to total board), DUALITY is 1 if CEO is also chairman of the board and 0 otherwise, OWNSHP is ownership concentration, MSHR is total shareholding for management, TQ is the Tobin's Q ratio, ROA is return on equity, LEV is leverage, FRMAGE is firm age from the time it listed on the stock exchange, and ASTAN is asset tangibility. Median values are shown in parentheses ( ) and standard deviations are in brackets [ ].

YEAR	2010	2011	2012	2013	2014	2015	2016	Total
<b>Panel A: Mean, (Median) and Standard Deviation of Governance Variables</b>								
<b>BSIZE</b>	8.92 (9.00) [1.71]	8.81 (9.00) [1.62]	8.76 (9.00) [1.61]	8.64 (9.00) [1.60]	8.52 (9.00) [1.59]	8.44 (9.00) [1.67]	8.45 (9.00) [1.64]	8.64 (9.00) [1.64]
<b>BIND</b>	3.23 (3.00) [0.62]	3.22 (3.00) [0.59]	3.21 (3.00) [0.59]	3.19 (3.00) [0.55]	3.14 (3.00) [0.52]	3.13 (3.00) [0.54]	3.12 (3.00) [0.54]	3.18 (3.00) [0.57]
<b>DUALITY</b>	1.69 (2.00) [0.46]	1.68 (2.00) [0.47]	1.68 (2.00) [0.47]	1.68 (2.00) [0.47]	1.69 (2.00) [0.46]	1.70 (2.00) [0.46]	1.69 (2.00) [0.46]	1.69 (2.00) [0.46]
<b>OWNSHP</b>	35.28 (33.26) [14.99]	34.64 (33.03) [14.06]	34.59 (32.85) [14.08]	33.94 (32.04) [14.04]	33.01 (30.96) [13.78]	31.74 (30.00) [13.28]	30.11 (28.12) [12.79]	33.25 (31.11) [13.93]
<b>MSHRS (in Millions)</b>	62 (24) [117]	86 (43) [158]	98 (48) [170]	112 (55) [197]	130 (61) [225]	179 (75) [307]	207 (76) [362]	127 (52) [242]
<b>Panel B: Mean, (Median) and Standard Deviation of Firm Characteristic Variables</b>								
<b>FRMAGE</b>	4.91 (1.00) [6.90]	5.18 (2.00) [6.57]	5.71 (3.00) [6.45]	6.72 (4.00) [6.48]	7.68 (5.00) [6.46]	8.61 (6.00) [6.48]	9.60 (7.00) [6.49]	7.01 (5.00) [6.74]
<b>LEV</b>	5.30 (2.65) [7.90]	5.37 (2.91) [6.59]	5.05 (2.88) [6.50]	4.37 (2.65) [6.11]	3.89 (2.56) [5.16]	3.60 (2.56) [3.56]	3.61 (2.58) [3.50]	4.41 (2.65) [5.77]
<b>ASTAN</b>	0.20 (0.16) [0.16]	0.19 (0.16) [0.15]	0.20 (0.17) [0.15]	0.22 (0.19) [0.15]	0.22 (0.19) [0.15]	0.21 (0.18) [0.15]	0.20 (0.17) [0.16]	0.21 (0.18) [0.15]
<b>SIZE (in Millions)</b>	6,420 (1,850) [21,100]	6,900 (2,000) [24,100]	7,370 (2,100) [26,300]	8,460 (2,400) [30,700]	9,670 (2,800) [33,900]	11,200 (3,400) [38,200]	13,400 (4,200) [45,200]	9,180 (2,600) [32,800]
<b>TQ</b>	2.89 (2.64) [1.88]	2.25 (2.05) [1.38]	1.74 (1.52) [1.21]	1.88 (1.50) [1.49]	2.28 (1.83) [1.86]	3.60 (2.81) [3.23]	2.87 (2.34) [2.72]	2.49 (1.98) [2.19]
<b>ROA</b>	0.05 (0.04) [0.04]	0.04 (0.04) [0.04]	0.03 (0.03) [0.03]	0.03 (0.03) [0.04]	0.03 (0.03) [0.03]	0.03 (0.02) [0.03]	0.03 (0.02) [0.03]	0.03 (0.03) [0.04]
<b>TNPM</b>	0.04 (0.04) [0.04]	0.04 (0.04) [0.04]	0.03 (0.03) [0.03]	0.03 (0.03) [0.04]	0.03 (0.02) [0.04]	0.02 (0.02) [0.03]	0.02 (0.02) [0.03]	0.03 (0.03) [0.04]
<b>DEBT</b>	0.39 (0.38) [0.23]	0.36 (0.34) [0.23]	0.36 (0.33) [0.23]	0.38 (0.36) [0.22]	0.40 (0.38) [0.21]	0.40 (0.39) [0.20]	0.40 (0.39) [0.20]	0.38 (0.37) [0.22]
<b>Observations</b>	10,567	12,645	13,816	13,837	13,809	13,818	13,807	92,299

#### 4.2. The relationship between corporate governance and firm performance

This section presents the detailed examination of the empirical relationship between governance structure and firm performance using the dynamic econometric model developed above. First we establish the required number of lags that ensure dynamic completeness in section

4.2.1., below. We then determine empirically in section 4.2.2., evidence of the dynamic relation between corporate governance structure and firm's historical performance and characteristics. In section 4.2.3., we estimate the relationship between corporate governance structure and firm performance using the dynamic panel GMM estimator. These results are then compared with those estimated using the OLS and FE models to bring an understanding of endogeneity effects.

#### 4.2.1. Determining the number of lags

In this section we determine the number of lags of our performance variables required in order to capture all relevant past information. (Wintoki, Linck et al. 2012) argues that a model that fails to capture all the influences of the past on the present could result in misspecification of the model. In addition (Wintoki, Linck et al. 2012) also notes that older lags are exogenous with residuals of present and can be used as instruments an important facet when estimating using dynamic panel GMM. Previous studies suggest that two lags are sufficient to capture the persistence of performance measures (Glen, Lee et al. 2001, Gschwandtner 2005, Wintoki, Linck et al. 2012). In this study, a regression of performance measure on two lags while controlling for other firm specific characteristics was performed.

The results of the estimates are presented in table 4.5., and they show that the two lags suggested by (Glen, Lee et al. 2001, Wintoki, Linck et al. 2012) are sufficient to capture the dynamic aspect of governance performance relationship. The first columns of both IHSROA and ITQ, the lag (1) and lag (2) are statistically significant while the older lags are not. In the second columns of each of the performance variables IHSROA and ITQ, after dropping the recent two lags and including only the older lags, the older lags are statistically significant. This means that the relevant information within the older lags is subsumed by the more recent lags (Wintoki, Linck et al. 2012).

**Table 4.5.: Number of significant lags of firm performance**

This table reports the OLS regression results used to determine the number of lags. The results are based on a sample of 1265 firms and 92,299 firm years selected every other year (2010, 2011, 2012, 2013, 2014, 2015, and 2016). Corporate governance and firm characteristics data was obtained from DataStream. IBSIZE is board size (the number of directors on the board), BIND is board independence (is the proportion of independent and executive directors to total board), DUALITY is 1 if CEO is also chairman of the board and 0 otherwise, IOWNSHP is the natural logarithm of ownership concentration, IMSHR is the natural logarithm of total shareholding for management, ITQ is the natural logarithm of Tobin's Q ratio, IHSROA the ROA transformed using IHS, LEV is leverage, FRMAGE is firm age from the time it listed on the stock exchange, and ASTAN is asset tangibility which is fixed assets divided by total assets. All t-statistics are based on robust, firm-clustered standard errors which are in parentheses. The significance level of the p-values is given as, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

VARIABLES	IHSROA	IHSROA	ITQ	ITQ
L.IHSROA	0.323*** (0.040)		L.ITQ 0.865*** (0.031)	
L2.IHSROA	0.235*** (0.045)		L2.ITQ -0.211*** (0.046)	
L3.IHSROA	0.009 (0.023)	0.152*** (0.022)	L3.ITQ 0.026 (0.043)	0.411*** (0.047)
L4.IHSROA	0.012 (0.037)	0.209*** (0.036)	L4.ITQ 0.085* (0.048)	(0.041) (0.077)
L5.IHSROA	0.093** (0.036)	0.072* (0.039)	L5.ITQ 0.011 (0.055)	0.113 (0.089)
L6.IHSROA	-0.050** (0.024)	-0.048* (0.026)	L6.ITQ 0.011 (0.039)	-0.015 (0.064)
IBSIZE	0.004 (0.005)	0.005 (0.006)	-0.048 (0.052)	-0.107 (0.084)
BIND	-0.006 (0.019)	-0.010 (0.020)	-0.050 (0.177)	-0.184 (0.287)

IOWNSHP	0.003 (0.002)	0.005** (0.002)	0.052*** (0.018)	0.111*** (0.030)
IMSHRS	0.000 (0.000)	0.001* (0.000)	0.004 (0.003)	0.0164*** (0.005)
IFRMAGE	-0.002 (0.002)	-0.001 (0.002)	-0.008 (0.018)	-0.005 (0.029)
LEV	0.000 (0.000)	0.001* (0.000)	0.010*** (0.003)	0.019*** (0.005)
ASTAN	0.010* (0.006)	0.010* (0.006)	0.090 (0.055)	-0.463*** (0.086)
LSIZE	0.005*** (0.001)	0.009*** (0.001)	-0.156*** (0.010)	-0.331*** (0.014)
ITQ	0.008*** (0.002)	0.012*** (0.002)	IROA 0.057*** (0.010)	0.101*** (0.016)
Constant	-0.126*** (0.031)	-0.222*** (0.033)	3.509*** (0.278)	8.026*** (0.398)
Observations	942	942	813	813
R-squared	0.358	0.243	0.928	0.810

#### 4.2.2. The dynamic relationship between CGS and firm performance

This paper argues that corporate governance structure and the given firm-specific variables are related to past performance as suggested by (Wintoki, Linck et al. 2012). In order to confirm this assertion, a series of tests were performed and the results of the OLS regressions are presented in table 4.2.2., below.

Panel-A, in table 4.2.2., presents the OLS regression of current levels of corporate governance structure [board size, board independence, duality, ownership concentration, and management shares] and the given firm specific variables on performance and characteristics from a year before. The results show that current board size has a positive significant relationship with past firm performance. However controlling for past firm size reduces the level of significance of this positive relationship. Board independence is found to be significantly negatively related to past firm performance. In addition it was established that current board size is significantly positively related to past firm size, and firm size is significantly related to past performance.

The results are largely consistent with the findings by (Hermalin and Weisbach 1998, Wintoki, Linck et al. 2012). These findings strongly support the view that listed Chinese firms that have performed well in the past have become larger today and consequently they have attained larger boards, a view shared by many previous researches (Fama and Jensen 1983, Boone, Field et al. 2007, Linck, Netter et al. 2008, Wintoki, Linck et al. 2012).

Panel-B, in table 4.2.2., shows the results of the OLS regression of changes in corporate governance structure and firm characteristics on performance levels and characteristics from a year before. The results obtained from this regression are identical to those in Panel-A. The negative significant relationship between changes in board independence and past performance is maintained. On the other hand changes in board size show a positive significant relationship with past performance results which are consistent with findings by (Wintoki, Linck et al. 2012). These results provide robust evidence from the Chinese context that changes in board size in response to past performance are through the effect of performance on firm size thus replicating findings by (Fama and Jensen 1983, Wintoki, Linck et al. 2012).

A further important finding is that the selected potential control variables exhibit strong dynamic endogeneity. The results presented in Table 4.2.2., show that both current levels and changes in firm size, leverage, and Tobin's Q have significant relationship to past performance. As such this research argues that both corporate governance structure and firm specific variables are potentially endogenous which is consistent with findings by (Wintoki, Linck et al. 2012).

This table reports the OLS regression results of current corporate governance characteristics and current firm specific variables on past performance and historic values of firm specific variables. The results are based on a sample of 1265 firms and 92,299 firm years selected every other year (2010, 2011, 2012, 2013, 2014, 2015, and 2016). Corporate governance and firm characteristics data was obtained from DataStream. IBSIZE is board size (the number of directors on the board), BIND is board independence (is the proportion of independent and executive directors to total board), DUALITY is 1 if CEO is also chairman of the board and 0 otherwise, IOWNSHP is the natural logarithm of ownership concentration, IMSHR is the natural logarithm of total shareholding for management, ITQ is the natural logarithm of Tobin's Q ratio, IHSROA the ROA transformed using IHS, LEV is leverage, FRMAGE is firm age from the time it listed on the stock exchange, and ASTAN is asset tangibility which is fixed assets divided by total assets. All t-statistics are based on robust, firm-clustered standard errors which are in parentheses ( ). The significance level of the p-values is given as, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

VARIABLES	BIND	IBSIZE	IBSIZE	IOWNSHP	IMSHRS	LSIZE	ASTAN	LEV	ITQ
<i>Panel A: Dependent variable is level at time (t)</i>									
L.IHSROA	-0.030*	0.167***	0.116*	0.169**	0.478	8.084***	0.096	8.471***	3.856***
	(0.016)	(0.062)	(0.061)	(0.066)	(0.579)	(1.480)	(0.070)	(2.827)	(0.417)
L.LSIZE	(0.000)		0.007***	0.002	0.001		-0.019***	-0.867***	-0.448***
	(0.001)		(0.002)	(0.002)	(0.012)		(0.002)	(0.063)	(0.007)
L.ITQ	0.000	(0.003)	0.004	-0.008***	0.085***	-0.849***	-0.060***	0.794***	
	(0.001)	(0.002)	(0.002)	(0.003)	(0.027)	(0.022)	(0.003)	(0.090)	
L.ASTAN	(0.004)	0.007	0.012	-0.024*	-0.286***	-0.733***		-2.160***	-0.654***
	(0.003)	(0.008)	(0.008)	(0.012)	(0.089)	(0.079)		(0.336)	(0.050)
L.LEV	0.000	-0.000**	-0.000	0.001***	0.004***	-0.03***	-0.002***		0.012***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.003)	(0.000)		(0.002)
L.IFRMAGE	0.000	0.001	-0.001	-0.011***	-0.040***	0.310***	0.016***	-0.540***	0.135***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.015)	(0.015)	(0.002)	(0.058)	(0.009)
L.IBSIZE	-0.006*	0.857***	0.848***	0.015	(0.064)				
	(0.003)	(0.010)	(0.011)	(0.009)	(0.071)				
L.BIND	0.767***	0.009	-0.007	-0.012	-0.383				
	(0.015)	(0.032)	(0.032)	(0.032)	(0.272)				
L.IOWNSHP	0.002**	-0.005*	-0.007**	0.958***	-0.074**				
	(0.001)	(0.003)	(0.003)	(0.004)	(0.030)				
L.IMSHRS	0.000	-0.002***	-0.002***	-0.005***	0.956***				
	(0.000)	(0.000)	(0.000)	(0.001)	(0.006)				
Constant	0.010***	0.341***	0.210***	0.149***	1.420***	22.03***	0.653***	23.52***	10.10***
	(0.015)	(0.033)	(0.039)	(0.047)	(0.370)	(0.057)	(0.047)	(1.436)	(0.160)
Observations	6,998	6,998	6,998	7,005	6,970	7,065	7,065	7,065	7,134
R-squared	0.60	0.75	0.75	0.92	0.93	0.44	0.08	0.13	0.49
<i>Panel B: Dependent variable in change form t-1 to t</i>									
L.IHSROA	-0.030*	0.167***	0.116*	0.169**	0.478	0.345*	0.144***	0.697	-1.646***
	(0.016)	(0.062)	(0.061)	(0.066)	(0.579)	(0.193)	(0.047)	(1.215)	(0.390)
L.LSIZE	-0.000		0.007***	0.002	0.001		-0.001	0.226***	-0.057***
	(0.001)		(0.002)	(0.002)	(0.012)		(0.001)	(0.046)	(0.005)
L.ITQ	0.000	-0.003	0.004	-0.008***	0.085***	0.075***	-0.008***	-0.085	
	(0.001)	(0.002)	(0.002)	(0.003)	(0.027)	(0.006)	(0.001)	(0.062)	
L.ASTAN	-0.004	0.007	0.012	-0.024*	-0.286***	-0.100***		1.359***	0.140***
	(0.003)	(0.008)	(0.008)	(0.012)	(0.089)	(0.023)		(0.255)	(0.031)
L.LEV	0.000	-0.000**	-0.000	0.001***	0.004***	-0.003***	0.000***		0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.001)	(0.000)		(0.001)
L.IFRMAGE	0.000	0.001	-0.001	-0.012***	-0.040***	0.018***	-0.010***	0.248***	0.066***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.015)	(0.004)	(0.001)	(0.046)	(0.006)

<b>L.IBSIZE</b>	-0.006*	-0.143***	-0.152***	0.015	-0.064				
	(0.003)	(0.010)	(0.011)	(0.009)	(0.071)				
<b>L.BIND</b>	-0.233***	0.009	-0.007	-0.012	-0.383				
	(0.015)	(0.032)	(0.032)	(0.032)	(0.272)				
<b>L.IOWNSHP</b>	0.002**	-0.005*	-0.007**	-0.043***	-0.074**				
	(0.001)	(0.003)	(0.003)	(0.004)	(0.030)				
<b>L.IMSHRS</b>	0.000	-0.002***	-0.002***	-0.005***	-0.044***				
	(0.000)	(0.000)	(0.000)	(0.001)	(0.006)				
<b>Constant</b>	0.099***	0.341***	0.210***	0.149***	1.420***	0.116***	0.032	-5.994***	1.153***
	(0.015)	(0.033)	(0.039)	(0.047)	(0.370)	(0.012)	(0.021)	(1.058)	(0.097)
<b>Observations</b>	6,998	6,998	6,998	7,005	6,970	7,065	7,065	7,065	7,060
<b>R-squared</b>	0.11	0.07	0.08	0.04	0.03	0.06	0.03	0.02	0.07

#### 4.2.3. The relationship between CGS and firm performance

The relationship between corporate governance structure and firm performance is examined in this section, and the empirical results are presented in table 4.2.3., below. The central argument in this paper is that there is no convergence on existing empirical results on the impact of corporate governance structure on current firm performance. This paper argues that the lack of convergence emanates from the failure to address endogeneity issues that are pervasive in corporate finance research and particularly corporate governance. This paper estimates four models for each of the dependent variable-firm performance: The OLS model, fixed-effects model, dynamic OLS model and the system GMM model. Estimating the four models makes it possible to compare empirical results from this research to those established in previous research. In addition the strategy enables the researchers to highlight the potential problems from ignoring that dynamic relation between current corporate governance structure and current firm performance.

In this study two financial performance measures-TNPM and ISHROA where used and the results are reported in table 4.2.3., below. As discussed in section 4.2.1., two lags of performance were found to be sufficient to capture all the influences of the past on current performance and were included in the dynamic models. Since two lags were sufficient, historical performance and historical firm characteristics lagged three periods or more qualified for use as instruments. In this case the instruments for all the endogenous variables in the GMM estimates are all variables lagged three, four, five and six periods. Following (Wintoki, Linck et al. 2012) this paper assumes all the regressors in the system GMM are endogenous except firm age and the year dummies.

The results from the Static OLS models show that board size has a positive significant relationship with firm performance as measured by both TNPM (0.020,  $t=8.52$ ) and IHSROA (0.019,  $t=8.38$ ). This relationship becomes insignificant when the fixed-effects model is estimated TNPM (0.005,  $t=1.44$ ) and IHSROA (0.005,  $t=1.51$ ). After estimating the dynamic models; the pooled OLS and system GMM the positive statistically significant at the 10% level relationship between board size and current firm performance was maintained. The results from the dynamic pooled OLS show that TNPM (0.008,  $t=3.21$ ) and IHSROA (0.007,  $t=3.12$ ). All the models estimated show positive coefficients that differ only in magnitude and the level at which the statistics are significant. Board size remains statistically positively significant for both static OLS and dynamic OLS however there is a drop in the magnitudes of the estimated coefficients which suggests that current corporate governance structure is correlated with past performance. This is another potential source endogeneity that arises from the relationship between corporate governance structure and firm performance. These results are consistent with those obtained in many previous studies (Arora and Sharma 2016, Buallay, Hamdan et al. 2017, Ciftci, Tatoglu et al. 2019).

The results of the static OLS and dynamic OLS show that it is important to include lagged performance when assessing the impact of corporate governance structure on firm performance. The model explanatory power measured by the  $R^2$  improves from 10% [static OLS] to 27% [dynamic OLS] for IHSROA and from 17% [static OLS] to 32% [dynamic OLS] for TNPM. This result suggests



that the significant portion of variation in current performance can be explained by past performance.

The system GMM model was estimated in order to capture past performance and fixed effects in accounting for the dynamic aspects of corporate governance and firm performance relation and time invariant unobserved heterogeneity. The results of including fixed-effects in a dynamic model and estimating via GMM show that board size remains statistically significant at the 10% level albeit with low magnitude, TNPM (0.039,  $t=1.66$ ) and IHSROA (0.039,  $t=1.79$ ).

The static OLS suggest positive significant relation between board independence and firm performance, TNPM (0.019,  $t=2.69$ ) and IHSROA (0.015,  $t=2.20$ ). However results from the fixed-effects and the dynamic OLS while retaining the positive signs show that board independence has no statistically significant effect on firm performance. After estimating the system GMM board independence shows a positive significant relationship with IHSROA (0.112,  $t=1.74$ ), while TNPM shows a positive but insignificant coefficient (0.110,  $t=1.62$ ).

Duality was found to have a negative statistically significant relation with firm performance in the static OLS estimate, TNPM (-0.003,  $t=-2.98$ ) and IHSROA (-0.003,  $t=-2.95$ ). However the negative sign flips to positive in the fixed effects model, TNPM (0.003,  $t=2.90$ ) and IHSROA (0.003,  $t=2.86$ ). When the dynamic OLS and system GMM are estimated, the coefficient of DUALITY flips to negative and becomes statistically significant. The variable IOWNSHP yields a positive and significant relationship for all the estimated models albeit at different magnitude and level of significance.

Results from the static OLS model show that IOWNSHP has a positive significant relation with current firm performance TNPM (0.008,  $t=10.40$ ) and IHSROA (0.007,  $t=9.28$ ). Estimates from the fixed-effects model maintain a positive significant relation though the magnitudes are lower, TNPM (0.014,  $t=7.08$ ) and IHSROA (0.013,  $t=6.81$ ). The results of further estimations were done using the dynamic OLS and the system GMM also gave positive significant relation. The dynamic OLS shows that, TNPM (0.004,  $t=4.82$ ) and IHSROA (0.034,  $t=4.62$ ) while the system GMM show, TNPM (0.011,  $t=1.95$ ) and IHSROA (0.009,  $t=1.65$ ).

In addition table 4.2.3., also shows that the IMSHRS performance relation is not significant from the estimated static OLS, dynamic OLS and system GMM. A positive significant relationship is obtained from the fixed-effects estimate, TNPM (0.001,  $t=3.09$ ) and IHSROA (0.001,  $t=3.20$ ).

The result of the specification tests are also reported in table 4.2.3., the AR (2) second-order serial correlation tests and the Hansen J test of over-identifying restrictions. The AR(2) yields p-values of 0.419 and 0.392 for IHSROA and TNPM respectively which means for the two models based on the two performance measures, the null hypothesis of no second-order serial correlation cannot be rejected. The p-values of the J statistics for the two models are also show in table 4.2.3., 0.265 and 0.133 for IHSROA and TNPM respectively, as such the hypothesis that the instruments used are valid cannot be rejected. The test of exogeneity of a subset of the instruments used was also carried out using a difference in-Hansen test and the results reported in table 4.2.3. This test also yields a J-statistic which is distributed  $\chi^2$  under the null hypothesis that the subset of instruments that were used in the levels equations are exogenous. The results in table 4.2.3., show p-values of 0.479 and 0.612 for IHSROA and TNPM respectively. As such the hypothesis that the additional subset instruments used in the system GMM estimates is indeed exogenous was not rejected.

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This table reports results estimated using the following model:  $Y_{it} = \alpha_1 + k_1 Y_{it-1} + k_2 Y_{it-2} + \beta X_{it} + \gamma Z_{it} + \theta D_{it} + \eta_i + \varepsilon_{it}$ , where;  $Y_{it}$  represents financial performance measures IHSROA the ROA transformed using IHS and total net profit margin (TNPM).  $X_{it}$  is composed of IBSIZE which is board size (the number of directors on the board), BIND is board independence (is the proportion of independent and executive directors to total board), DUALITY is 1 if CEO is also chairman of the board and 0 otherwise, IOWNSHP is the natural logarithm of ownership concentration, IMSHR is the natural logarithm of total shareholding for management.  $Z_{it}$  includes leverage (LEV), and ASTAN is asset tangibility which is fixed assets divided by total assets and ITQ is the natural logarithm of Tobin's Q ratio.  $D_{it}$  is FRMAGE is firm age from the time it listed on the stock exchange and year dummies. The results are based on a sample of 1265 firms and 92,299 firm years selected every other year (2010, 2011, 2012, 2013, 2014, 2015, and 2016). Corporate governance and firm characteristics data was obtained from DataStream. It is assumed that  $K_1 = K_2 = 0$  for the static model. All t-statistics are based on robust, firm-clustered standard errors which are in parentheses ( ). The significance level of the p-values is given as, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . AR (1) and AR (2) are tests for first-

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order and second-order serial correlation in the first differenced residuals under the null hypothesis of no serial correlation. The Hansen test of over-identification is under the null hypothesis that all instruments are valid. The diff-in-Hansen test of exogeneity is under the null hypothesis instruments used for the equation in levels are exogenous. The instruments used in the GMM estimation are:  $Y_{it-3}$ ,  $Y_{it-4}$ ,  $Y_{it-5}$ ,  $Y_{it-6}$ ,  $X_{it-3}$ ,  $X_{it-4}$ ,  $X_{it-5}$ ,  $X_{it-6}$ ,  $Z_{it-3}$ ,  $Z_{it-4}$ ,  $Z_{it-5}$ ,  $Z_{it-6}$ ,  $\Delta D_{it}$ ; Level Equations  $\Delta Y_{it-2}$ ,  $\Delta X_{it-2}$ ,  $\Delta Z_{it-2}$ ,  $\Delta D_{it}$

VARIABLES	STATIC MODEL				DYNAMIC MODEL			
	Pooled OLS		Fixed Effects		Pooled OLS		System GMM	
	IHSROA	TNPM	IHSROA	TNPM	IHSROA	TNPM	IHSROA	TNPM
IBSIZE	0.019*** (0.002)	0.012*** (0.002)	0.005 (0.003)	0.005 (0.004)	0.007*** (0.002)	0.008*** (0.002)	0.039* (0.022)	0.039* (0.024)
BIND	0.015** (0.007)	0.019*** (0.007)	0.013 (0.010)	0.013 (0.011)	0.005 (0.007)	0.005 (0.007)	0.112* (0.064)	0.110 (0.068)
DUALITY	-0.003*** (0.001)	-0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.003 (0.004)	-0.003 (0.004)
IOWNSHP	0.008*** (0.001)	0.009*** (0.001)	0.013*** (0.002)	0.014*** (0.002)	0.004*** (0.001)	0.004*** (0.001)	0.009* (0.005)	0.011* (0.006)
IMSHRS	-0.000 (0.000)	-0.000 (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.001)	-0.001 (0.001)
LEV	-0.007 (0.008)	-0.030*** (0.009)	0.016*** (0.003)	-0.007* (0.004)	0.013 (0.012)	0.000 (0.011)	0.011 (0.010)	-0.009 (0.012)
ITQ	0.010*** (0.002)	0.009*** (0.002)	0.012*** (0.001)	0.012*** (0.001)	0.007*** (0.003)	0.007** (0.003)	0.010*** (0.003)	0.008*** (0.003)
IFRMAGE	-0.002*** (0.001)	-0.002*** (0.001)	-0.011*** (0.001)	-0.010*** (0.001)	0.002* (0.001)	0.002* (0.001)	-0.000 (0.002)	0.000 (0.002)
ASTAN	-0.009*** (0.003)	-0.025*** (0.003)	-0.048*** (0.004)	-0.058*** (0.004)	-0.005* (0.003)	-0.013*** (0.003)	0.013 (0.022)	-0.003 (0.023)
L.IHSROA					0.328*** (0.112)		0.423*** (0.149)	
L2.IHSROA					0.209*** (0.061)		0.043 (0.052)	
L.TNPM						0.314*** (0.116)		0.449*** (0.163)
L2.TNPM						0.222*** (0.066)		0.034 (0.070)
Observations	8,245	8,245	8,245	8,245	5,835	5,835	5,835	5,835
R-squared	0.095	0.173	0.129	0.140	0.267	0.316		
Companies			1,265	1,265			1,256	1,256
Instruments							46	46
F-statistic							255.77***	16.72***
AR(1)test p-value)							-1.46 (0.144)	-1.42 (0.156)
AR(2)test p-value)							0.81 (0.419)	0.86 (0.392)
Hansen test of over-identification (p-value)							32.23 (0.265)	36.39 (0.133)
Diff-in-Hansen tests of exogeneity (p-value)							4.51 (0.479)	3.57 (0.612)

### 3. Robustness checks

In order to perform a test for robustness of the results reported in table 4.2.3., lagged corporate governance structure were used to estimate the following model:

$$y_{it} = \alpha_1 + k_1 y_{t-i} + k_2 y_{it-2} + \beta X_{it-1} + \gamma Z_{it-1} + \theta D_{it} + \eta_i + \varepsilon_{it} \quad (3)$$

Again for comparative purposes we estimated the pooled OLS, system GMM and the bias corrected fixed-effects models. As argued by (Wintoki, Linck et al. 2012), the above model reduces that impact of simultaneity since past corporate governance structure is not determined in the same period with current performance. In that regard the robustness checks apply different assumptions from those applied in 4.2.3., at the same time alternative instruments were also applied. The results estimated from the robustness checks largely replicate our main findings and are reported in table 4.2.4., below.

In the main findings the system GMM estimates showed a positive relation between board size and current firm performance but only at a marginal 10% level. While board independence firm performance relation considering IHSROA was positive and statistically significant, the robust results show that the positive coefficient is maintained albeit insignificant. While the robust results are insignificant, they retain a positive coefficient. IOWNSHIP maintained a positive statistically significant relation with firm performance IHSROA (0.019,  $t= 2.54$ ) and TNPM (0.017,  $t=2.13$ ). DUALITY and MSHRS both consistently retain the negative but insignificant coefficients which gives confidence in the finding of this research.

The result of the specification tests are also reported in table 4.2.4., the AR (2) second-order serial correlation tests and the Hansen J test of over-identifying restrictions. The AR(2) yields p-values of 0.222 and 0.240 for IHSROA and TNPM respectively which means for the two models based on the two performance measures, the null hypothesis of no second-order serial correlation cannot be rejected. The p-values of the J statistics for the two models are also show in table 4.2.4., 0.119 and 0.109 for IHSROA and TNPM respectively, as such the hypothesis that the instruments used are valid cannot be rejected. The test of exogeneity of a subset of the instruments used was also carried out using a difference in-Hansen test and the results reported in table 4.2.4. This test also yields a J-statistic which is distributed  $\chi^2$  under the null hypothesis that the subset of instruments that were used in the levels equations are exogenous. The results in table 4.2.4., show p-values of 0.929 and 0.973 for IHSROA and TNPM respectively. As such the hypothesis that the additional subset instruments used in the system GMM estimates is indeed exogenous was not rejected.

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This table reports results of the lagged corporate governance structure on current performance estimated using the following model:  $Y_{it} = \alpha_1 + k_1 Y_{t-1} + k_2 Y_{it-2} + \beta X_{it-1} + \gamma Z_{it-1} + \theta D_{it} + \eta_i + \varepsilon_{it}$ , where;  $Y_{it}$  represents financial performance measures IHSROA the ROA transformed using IHS and total net profit margin (TNPM).  $X_{it}$  is composed of IBSIZE which is board size (the number of directors on the board), BIND is board independence (is the proportion of independent and executive directors to total board), DUALITY is 1 if CEO is also chairman of the board and 0 otherwise, IOWNSHIP is the natural logarithm of ownership concentration, IMSHR is the natural logarithm of total shareholding for management.  $Z_{it}$  includes leverage (LEV), and ASTAN is asset tangibility which is fixed assets divided by total assets and ITQ is the natural logarithm of Tobin's Q ratio.  $D_{it}$  is FRMAGE is firm age from the time it listed on the stock exchange and year dummies. The results are based on a sample of 1265 firms and 92,299 firm years selected every other year (2010, 2011, 2012, 2013, 2014, 2015, and 2016). Corporate governance and firm characteristics data was obtained from DataStream. It is assumed that  $K_1 = K_2 = 0$  for the static model. All t-statistics are based on robust, firm-clustered standard errors which are in parentheses ( ). The significance level of the p-values is given as, \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . AR (1) and AR (2) are tests for first-order and second-order serial correlation in the first differenced residuals under the null hypothesis of no serial correlation. The Hansen test of over-identification is under the null hypothesis that all instruments are valid. The diff-in-Hansen test of exogeneity is under the null hypothesis instruments used for the equation in levels are exogenous. The instruments used in the GMM estimation are:  $Y_{it-3}, Y_{it-4}, Y_{it-5}, Y_{it-6}, X_{it-3}, X_{it-4}, X_{it-5}, X_{it-6}, Z_{it-3}, Z_{it-4}, Z_{it-5}, Z_{it-6}, \Delta D_{it}$ ; Level Equations  $\Delta Y_{it-2}, \Delta X_{it-2}, \Delta Z_{it-2}, \Delta D_{it}$

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VARIABLES	Pooled OLS		System GMM		Bias Corrected Fixed Effects	
	TNPM	IHSROA	TNPM	IHSROA	IHSROA	TNPM
L.IBSIZE	0.0064 (0.0054)	0.0062 (0.0050)	0.0422 (0.0338)	0.0397 (0.0344)	-0.0037 (0.0090)	-0.0032 (0.0104)
L.BIND	0.0013	0.0004	0.1700**	0.1320	0.0051	0.0028

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	(0.0093)	(0.0087)	(0.0863)	(0.0810)	(0.0129)	(0.0159)
L.DUALITY	-0.0023***	-0.0022***	-0.0010	-0.0010	0.0034*	0.0037*
	(0.0008)	(0.0008)	(0.0048)	(0.0048)	(0.0018)	(0.0022)
L.IOWNSHP	0.0033***	0.0032***	0.0166**	0.0193**	0.0083***	0.0084***
	(0.0009)	(0.0008)	(0.0078)	(0.0076)	(0.0020)	(0.0023)
L.IMSHRS	0.0001	0.0002	-0.0006	-0.0002	0.0017***	0.0015***
	(0.0002)	(0.0002)	(0.0012)	(0.0011)	(0.0004)	(0.0004)
L.LEV	-0.0031	0.0058	-0.0085	0.0119	0.0278	0.0037
	(0.0066)	(0.0074)	(0.0123)	(0.0108)	(0.0198)	(0.0188)
L.ITQ	0.0055**	0.0053**	0.0107**	0.0143***	0.0174***	0.0180***
	(0.0024)	(0.0023)	(0.0046)	(0.0052)	(0.0030)	(0.0030)
L.IFRMAGE	0.0018*	0.0015	0.0004	0.0018	-0.0014	-0.0030
	(0.0010)	(0.0009)	(0.0030)	(0.0030)	(0.0032)	(0.0029)
L.ASTAN	-0.0035	0.0036	0.0389	0.0458	-0.0489***	-0.0588***
	(0.0024)	(0.0028)	(0.0295)	(0.0305)	(0.0175)	(0.0169)
L.TNPM	0.3160***		-0.0235			0.1790
	(0.1220)		(0.1930)			(0.1110)
L2.TNPM	0.2140***		0.2980***			0.2360***
	(0.0594)		(0.0870)			(0.0525)
L.IHSROA		0.3190***		-0.1400	0.1920**	
		(0.1180)		(0.2230)	(0.0960)	
L2.IHSROA		0.1990***		0.2540***	0.2330***	
		(0.0551)		(0.0739)	(0.0490)	
Observations	5,839	5,839	5,839	5,839	5,819	5,819
R-squared	0.298	0.251				
Number of Companies			1,256	1,256	1,256	1,256
Instruments			38	38		
F-statistic			7.01***	4.82***		
AR (1) test (p-value)			-1.23 (0.22)	-1.04 (0.301)		
AR (2) test (p-value)			-1.18 (0.240)	-1.22 (0.222)		
Hansen test of over-identification (p-value)			28.02(0.109)	27.61 (0.119)		
Diff-in-Hansen tests of exogeneity (p-value)			0.86 (0.973)	1.36 (0.929)		

## 5. Conclusions

Existing literature propose several corporate governance mechanism that help to mitigate against principal agency conflicts (Fama and Jensen 1983, Cuervo 2002, Becht, Bolton et al. 2003, Lall 2009, Chou, Ng et al. 2011, Li 2019). Firstly, there are mechanisms that are internal to the firm such as, blockholder models, delegated monitoring and large creditors, board models, executive compensation models and multi-constituency models (Jensen 1986, Becht, Bolton et al. 2003). Secondly, there are mechanisms external to the firm such as the market for corporate control, market for managers, and the market for products and services (Cuervo 2002, Becht, Bolton et al. 2003, Li 2019). Legal systems which are commonly classified into common and civil law form another form of governance mechanism (Porta, Lopez-de-Silanes et al. 1998). These legal systems institute the rules that regulate the behavior of the firm and protect the rights of minority shareholders, influence

the development of capital markets and the growth of a country (Porta, Lopez-de-Silanes et al. 1998, Cuervo 2002).

The current study was examined the impact of board model as a corporate governance mechanism focusing on China an emerging economic giant. Specifically in China, firms where the state has significant ownership are a part of the political system and are directed by the Central Committee of the Chinese Communist Party (CCP) (Rong, Wu et al. 2017). The government has direct influence on board chairman and CEO appointments, which ultimately exerts undue influence on managers to give priority to the interest of bureaucrats while minority shareholders' interests are ignored. The dilemma from this scenario arises from the fact that the interests of two groups maybe conflicting: the interests of bureaucrats usually do not find convergence with the profitability goal, as they focus on achieving their political goals and pursuing any private benefits (Shleifer and Vishny 1997).

The central argument in this paper is that there is no convergence on existing empirical results on the impact of corporate governance structure on current firm performance. This paper argues that the lack of convergence emanates from the failure to address endogeneity issues that are pervasive in corporate finance research and particularly corporate governance. To simultaneously address our broad question stated above and the endogeneity concerns, this study estimates a dynamic panel system GMM using a unique dataset of 1265 firms listed on the Shanghai and the Shenzhen stock exchanges over a period of 7 years from 2010 to 2016. The panel system GMM estimator is efficient in dealing with endogeneity. Common sources of endogeneity are: unobserved heterogeneity and simultaneity (Wintoki, Linck et al. 2012, Roberts and Whited 2013). In addition we address another potential source of endogeneity which arises from the possibility that current values of governance variables are a function of past performance (Wintoki, Linck et al. 2012).

The results from this study are quite interesting. First, we empirically confirm suggestions from previous studies that two lags are sufficient to capture all relevant influences of the past on the present (Glen, Lee et al. 2001, Gschwandtner 2005, Wintoki, Linck et al. 2012).

Second, we empirically show that corporate governance structure and the given firm-specific variables are related to past performance as suggested by (Wintoki, Linck et al. 2012). The results show that current board size has a positive significant relationship with past firm performance. Board independence is found to be significantly negatively related to past firm performance. In addition it was established that current board size is significantly positively related to past firm size, and firm size is significantly related to past performance. The results are largely consistent with the findings by (Hermalin and Weisbach 1998, Wintoki, Linck et al. 2012). These findings strongly support the view that listed Chinese firms that have performed well in the past have become larger today and consequently they have attained larger boards, a view shared by many previous researches (Fama and Jensen 1983, Boone, Field et al. 2007, Linck, Netter et al. 2008, Wintoki, Linck et al. 2012). We find robust evidence from the Chinese context that changes in board size in response to past performance are through the effect of performance on firm size thus replicating findings by (Fama and Jensen 1983, Wintoki, Linck et al. 2012). In addition we find that the selected potential control variables exhibit strong dynamic endogeneity.

Third, we find evidence in support of the board model corporate governance mechanism. The results of including fixed-effects in a dynamic model and estimating via

GMM show that board size is statistically significant at the 10% level albeit with low magnitude compared to other static models, TNPM (0.039,  $t=1.66$ ) and IHSROA (0.039,  $t=1.79$ ). Board independence shows a positive significant relationship with IHSROA (0.112,  $t=1.74$ ), while TNPM shows a positive but insignificant coefficient (0.110,  $t=1.62$ ). Duality was found to have a negative but statistically insignificant relation with firm performance.

Fourth, we also carried various specification tests; (1) AR (2) second-order serial correlation tests, (2) the Hansen J test of over-identifying restrictions and (3) Diff-in-Hansen tests of exogeneity (p-value). We performed robust checks using lagged board structure and our results are consistent.

While this study attempts to address various corporate finance issues, it has its own limitations. First, due to data availability constraints the study considers only two accounting based financial ratios; return on assets (ROA) and total net profit margin (TNPM). Previous empirical studies show support for both market based and accounting based measures of performance such as TNPM (Arora and Sharma 2016, Darko, Aribi et al. 2016, Haque and Arun 2016, Lamichhane 2018, Salin, Ismail et al. 2019, Sekhon and Kathuria 2019), and ROA (Hermalin and Weisbach 1991, Sarkar and Sarkar 2000, O'Connor, Kinsella et al. 2014, Ciftci, Tatoglu et al. 2019) and Tobin's Q (Lozano, Martínez et al. 2016, Wang 2018, Shao 2019). Both accounting and market based performance measures have caveats (Ciftci, Tatoglu et al. 2019). Accounting performance measures may be subject to manipulation, and variations in accounting and consolidation methods (Dalton, Daily et al. 1999). On the other hand (Müller 2014) argues that market-based measures of performance may be affected by investor anticipation.

Second, this study focuses on board model corporate governance mechanisms, yet there are several mechanisms that have great potential to address the corporate governance problems. These mechanisms have been addressed above.

The findings of this study have very important policy implications. From the results it can be deduced that the board model has positive implications to the performance of Chinese firms. However this effect while it is significant has a smaller magnitude. It can be argued that the role of government in selecting board chairman and the CEO interferes with the independence of the board and management. As a result, we recommend more reforms that reduce government ownership in listed Chinese firms.

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