Monitoring corporate boards: evidence from China

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China's listed companies have two-tier boards comprising of a supervisory board and a board of directors. The supervisory board has the responsibility to oversee and monitor the board of directors. Similarly, the role of the independent non-executive directors (INEDs) is to advise and monitor directors. In this paper, we investigate the main board structure hypotheses namely the scope of operations, monitoring and negotiation hypotheses for a sample of Chinese Initial Public Offerings floated on both the Shanghai and Shenzhen stock exchanges. Our results provide evidence to support the three hypotheses. Interestingly, we find that the larger the size of the board of directors, the larger the supervisory board size. Moreover, we find that the higher the proportion of INEDs, the smaller the supervisory board size and this implies that INEDs are perhaps a substituting mechanism for the supervisors' monitoring role. Finally, we argue that as the Chinese governance structure combines both the German and the Anglo-Saxon models, this creates a conflict between the two boards with respect to the monitoring role. Our results, therefore call for a comprehensive reform in the Chinese governance mechanism.

Keywords: corporate governance; monitoring boards; dual board structure; IPOs

1. Introduction

Chinese listed companies have dual boards namely a supervisory board and a board of directors. However, China's dual board structure differs from the two-tier board mechanism in continental Europe in which the supervisory board appoints the directors on the management board and that management board comprises only of executive directors. According to the Code of Corporate Governance for Listed Companies in China 2001[1] (hereafter 'the Code') issued by the China Securities Regulatory Commission (CSRC 2001a), there is no hierarchical relationship between the two boards and both boards report to the shareholders. Directors and supervisors are usually nominated by controlling shareholders and institutional investors but are eventually appointed by the shareholders. In practice, the state plays a significant role in appointing directors and supervisors on the supervisory board (Kato and Long 2006; Firth et al. 2009).

The board of directors comprises of executive, non-executive (NEDs) and independent non-executive directors (INEDs). The main responsibility of the INEDs is to monitor and advise directors and to protect the overall interests of the company and minority shareholders in particular. On the other hand, the supervisory board has the responsibility to monitor the acts of directors and Chief Executive Officers (CEOs) and to review the financial affairs of the company. Therefore, we argue that there might be a conflict in roles between the supervisory board and the INEDs and hence it is interesting to investigate the monitoring hypothesis and the main determinants of the board of directors and the supervisory board structure for Chinese companies.

The Chinese economy has an increasing power worldwide. There has been a remarkable growth in the Chinese Initial Public Offering (IPO) market compared with other emerging markets. For instance, in 2007, China was declared the top country with respect to the number of IPO new issues[2] (Xu and Oh 2011). However, in 2012, there was a sharp decline (62%) in funds raised through IPOs; therefore, the CSRC suspended the approval of new IPOs in October 2012.[3] We argue that little is known about IPOs' board structure overall and the Chinese IPOs in particular, as the existing literature tends to focus on the US (Hermalin and Weisbach 2003; Boone et al. 2007).

Our study addresses these limitations. Moreover, to the best of our knowledge, this is the first paper to investigate the main board structure hypotheses, the determinants of the two-tier board structure for Chinese IPOs and the interrelationship and the potential conflict between the two boards with respect to the monitoring role. Studying IPOs' board structure is interesting and our data set of young companies is unique as we can monitor their evolution over time (Boone et al. 2007). On the other hand, IPOs are subject to substantial changes in governance mechanisms post-IPO as they are expected to adopt more value-maximising governance characteristics (Baker and Gompers 2003). Therefore, we argue that studying the determinants of IPOs' board structure is timely and may offer new insights to the literature on corporate governance.

Motivated by Baker and Gompers (2003), Boone et al. (2007) and Hermalin and Weisbach (2003), this paper investigates the main board structure hypotheses namely the scope of operations, monitoring and negotiation and the determinants of the board of directors' size, the supervisory board size in addition to the interrelationships between the two boards for a sample of Chinese IPOs floated in both the Shanghai (SSE) and Shenzhen stock exchanges (SZSE) over the period 1999–2009 tracked for at least four years since the IPO year until 2012. This allows us to measure the evolution of corporate boards over the life cycle of a company. Moreover, since the influence of board structure on financial performance has been investigated in the literature in different institutional settings (e.g. Jensen 1993; Yermack 1996), our paper extends this debate in the corporate governance literature and investigates the board structure-financial performance nexus for Chinese IPOs. We believe that companies should appoint experienced and talented directors to the board of directors so that they are able to achieve shareholders' objectives and hence boost the economy.

Using the system Generalized Method of Moments (GMM) and propensity score matching (PSM) techniques, we find evidence of the scope of operations hypothesis and that boards of directors of more complex companies tend to be larger. Interestingly we find that the higher the proportion of INEDs, the smaller the supervisory board size and this implies that INEDs are perhaps a substituting mechanism for the supervisors' monitoring role. More interestingly, we find that the state – as a controlling shareholder – may influence and enforce the appointment of supervisors on the supervisory boards to carry out the monitoring role. This argument is consistent with Dahya et al. (2003) as they argue that supervisors in reality act as the voice of the government and the ruling party.

We also find consistent results with Jensen (1986) and Boone et al. (2007) with respect to the monitoring hypothesis as the greater the private benefits of directors the larger the board of directors' size. Moreover, the higher the monitoring costs the smaller the board size. Therefore, board structure is the outcome of the relationship between directors' private benefits and the cost of monitoring. Finally, we find consistent results with the negotiation hypothesis, as the Chinese board independence is determined as a trade-off between CEOs' influence and the constraints on this influence.

Our paper has clear policy implications for the Chinese regulator. We argue that supervisory boards in China play no significant role in corporate governance and have no actual power to oversee and monitor the board of directors as intended and stated in the Chinese Company Law (Clarke 2006). This is mainly due to the potential conflict in roles between supervisors and INEDs on the board of directors and the overall overlap of duties between the two boards. This dilutes the power of both boards and increases directors' and supervisors' compensation schemes (CFA Institute 2007). Therefore, the governance mechanism followed by Chinese companies is a quasi-two-tier structure (CFA Institute 2007).

Our results reveal the need for the regulator to reconsider the roles of either INEDs or the supervisory board members for, at least, listed companies or non-state-owned companies within a comprehensive reform of the Chinese governance mechanism. This is due to the clear conflict in the monitoring role between the supervisory board members and the INEDs on the board of directors. The remainder of the paper is structured as follows. The next section discusses the institutional background and board structure dynamics in China. Section 3 presents the literature review and hypotheses development. Sections 4 and 5 present a description of our dataset and the empirical modelling respectively. Section 6 presents the results of our empirical analysis and finally, we discuss the implications of the results in Section 7.

2. Institutional background

Chinese listed companies have a two-tier (dual) governance structure that comprises a supervisory board/committee and a board of directors. The two boards are independent as there is no hierarchical relationship between them. The Chinese government and the ruling party influence the appointment of the directors and supervisors on the supervisory board (Kato and Long 2006). Fan, Wong, and Zhang (2007) find that 27% of CEOs of the newly privatised companies are politically connected and this leads to 18% lower stock returns than IPOs with non-politically connected CEOs. Firth et al. (2009) argue that politically connected directors do not necessarily have sufficient experience and managerial know-how.

According to the Company Law (2013, Article 108) and the Code, the size of the board of directors of a joint stock limited company ranges from 3 to 13 directors.[4] The board of directors should also include independent directors who may not hold any other positions in the listed company. Their main responsibilities are to protect the overall interests of the company and minority shareholders in particular. Independent directors should carry out their duties independently away from any influence of the company's major shareholders, or any other interested parties. Moreover, independent directors have the power to postpone the board of directors meeting or to postpone the discussion on a particular matter when two or more independent directors find that the materials provided by the board of directors before the meeting are not adequate or unclear.

Finally, the supervisory board consists of at least three supervisors, one of whom represents shareholders and another democratically elected employee representative (apart from the General Manager and the Chief Financial Officer) (Article 51 of the Company Law 2013). The board of supervisors has the following authorities amongst others:[5]

> to examine the company's financial affairs; to supervise the execution of company duties by the directors and the senior officers and to recommend the removal of directors and senior officers that violate laws, administrative regulations, the articles of association of the company or the resolutions of general meeting; . . . .. (Article 53 of the Company Law 2013)

Supervisors should have professional knowledge and experience in law and accounting. The members and the structure of the supervisory board shall ensure its capability to independently and efficiently conduct its supervision of directors, managers and other senior management personnel and to supervise and examine the company's financial matters, (The Code, Article 64). The Code also states that directors/supervisors should be nominated by controlling shareholders based on their professional knowledge. However, appointing directors in state-owned companies is influenced by both central and provincial governments to ensure companies' compliance with government policies (Chang and Wong 2009; Li and Tang 2010; Pessarossi and Weill 2013).

Yang, Chi, and Young (2011) argue that the supervisory boards are unable to influence the decisions made by the board of directors as supervisors usually have less experience and are not qualified enough to monitor the board of directors. We argue that this may lead to the appointment of less profiled – but loyal – directors in state-owned companies and hence undermines a major internal corporate governance mechanism (Pessarossi and Weill 2013; Farag and Mallin 2016).

3. Literature review and hypotheses development

The literature on board structure has largely investigated three main hypotheses namely the scope of operations, monitoring and negotiation hypotheses (Boone et al. 2007). In this section we present the literature on the three board structure hypotheses and the main determinants and dynamics of the unique Chinese board structure. Finally, we present the literature on the relationship between board structure and financial performance.

3.1 The scope of operations hypothesis

Companies with different product lines and those operating in different segments or geographical areas usually have high growth opportunities and tend to be more complex (Boone et al. 2007; Coles, Daniel, and Naveen 2008). As companies grow and expand, they might need more directors with specific expertise and knowledge to help oversee managers' performance (Yermack 1996; Bhagat and Black 1999; Agrawal and Knoeber 2001; Lehn, Patro, and Zhao 2009). Therefore, the scope of operations hypothesis states that large and complex companies need larger boards to better perform the monitoring and advising roles (Fama and Jensen 1983; Coles, Daniel, and Naveen 2008).

The human capital theory states that larger boards may have more diverse opinions and hence better quality decisions are likely to be made (Sah and Stiglitz 1991). However, larger boards are subject to more agency problems. Therefore, they are associated with a higher proportion of INEDs to better monitor their scope of operations (Boone et al. 2007). Coles, Daniel, and Naveen (2008) find that complex companies have greater advising requirements and hence have larger boards with a higher proportion of INEDs. Jensen (1993) argues that large boards with more than seven or eight directors may have communication and coordination problems and hence have less effective monitoring and advising roles and this enables CEOs to influence and control the board easily. Yermack (1996) finds that the smaller the board of directors' size, the more effective the monitoring and advising roles. Cheng (2008) argues that it usually takes more negotiation and hence a longer time to reach a final decision in a larger board.

We agree with Linck, Netter, and Yang (2008) as they conclude that board structure is a trade-off between the costs and benefits of a board's monitoring and advising roles. Therefore, based on the scope of operations hypothesis, we expect that there should be a positive relationship

between the scope and complexity of the firm's operations proxied by company size and both board size and independence.

Few studies have been conducted in the Chinese setting. Chen and Al-Najjar (2012) find that firm complexity drives board size whereas regulations mainly drive board independence. Moreover, they find a negative relationship between board independence and both supervisory board size and the proportion of state ownership. However, no other studies have investigated the determinants of the supervisory board size in China. Therefore, we are trying to fill this gap in the literature.

We argue that the role of the supervisory board is controversial. Using interview data, Dahya et al. (2003) find that the Chinese supervisory boards in reality act as an honoured guest, a friendly advisor, or a censored watchdog. Therefore, they argue that there is a need to strengthen the functioning and independence of the supervisory boards in China. Using the grounded theory methodology, Xiao, Dahya, and Lin (2004) find that the role of the supervisory boards is limited overall and that the main determinants of the supervisory board role are the influence of the Communist Party and the government, the role of independent directors and the power of the board of directors. Finally, they argue that the existence of independent directors affects the future of the supervisory boards.

Board structure and governance characteristics have not been a significant area of research in the IPO literature. Boone et al. (2007) track the developments in corporate board structure for IPOs in the US and find evidence to support the scope of operations hypothesis. They find a positive relationship between both company size and age and both board size and independence. They argue that more complex companies may need larger and more independent boards. Chancharat, Krishnamurti, and Tian (2012) find an association between board independence and the survival of Australian IPOs. They conclude that the optimal board structure is mainly determined by company and industry characteristics. Moreover, they argue that executive directors may also enhance board effectiveness where INEDs face higher information processing costs (Chancharat, Krishnamurti, and Tian 2012). Below, we formulate our first hypothesis; however, as most of previous literature focuses on different settings, the results could differ from previous research:

H1: The greater the degree of company complexity the larger its board size and independence.

3.2 The monitoring hypothesis

Complex and more diversified companies may need specific expertise in monitoring management and this may increase monitoring costs (Coles, Daniel, and Naveen 2008; Linck, Netter, and Yang 2008). Linck, Netter, and Yang (2008) argue that the higher the monitoring cost, the smaller the board size and independence. The monitoring hypothesis states that corporate business environment has an influence on monitoring activities (Boone et al. 2007). Gillan, Hartzell, and Starks (2004) argue that in noisy environments, for example, high growth, companies tend to monitor less compared with less noisy business environments (Demsetz and Lehn 1985). Coles, Daniel, and Naveen (2008) find that fast growth companies may have smaller boards and a lower proportion of INEDs due to the high monitoring costs. They argue that uncertainty increases monitoring costs and thus companies operating in noisy environments rely on insiders as they have company-specific knowledge.

Linck, Netter, and Yang (2008) find that companies with greater information asymmetry have smaller boards and a high proportion of executive directors. Lehn, Patro, and Zhao (2009) find

a negative relationship between board size and market-to-book value as a proxy for growth opportunities. Boone et al. (2007) and Linck, Netter, and Yang (2008) argue that the larger the board size the less effective the monitoring role due to free-riding problems. The monitoring hypothesis predicts that companies tend to have large boards when the benefits from appointing additional directors outweigh the monitoring costs and this mainly depends on the company characteristics (Boone et al. 2007). Therefore, Boone et al. (2007) argue that board size and independence are positively correlated with directors' private benefits and negatively correlated with monitoring costs.

The Chinese experience on the other hand provides interesting insights with respect to the monitoring hypothesis. It is well documented in the literature that the supervisory board is unlikely to have an effective monitoring role as in reality it acts as the voice of the government and the ruling party (Dahya et al. 2003). Therefore, the CSRC issued guidelines on the introduction of independent directors in August 2001 to enhance the monitoring role (CSRC 2001b). Wang (2008) argues that INEDs have made improvements to the governance mechanism in China compared with the role of the supervisory board.

However, Lu (2005) argues that INEDs have no actual role given the insiders' influence which does not provide a healthy environment for INEDs to exercise their monitoring role over directors. Li et al. (2012) find a performance gap with respect to the control and strategic roles of INEDs due to the lack of their time commitment, lack of objectivity and limited expertise. Therefore, we argue that the potential conflict in roles between INEDs and the supervisory board may influence the overall board effectiveness. Based on the above discussion we formulate our second and third hypotheses.

H2: There is a positive relationship between directors' private benefits and both board size and independence.

H3: There is a negative relationship between monitoring costs and both board size and independence.

3.3 The negotiation hypothesis

Successful CEOs have bargaining power and an influence on appointing insiders and affiliated INEDs (Hermalin and Weisbach 1998; Boone et al. 2007). Hermalin and Weisbach (1998) argue that CEOs in profitable companies may use their power to influence the appointment of loyal INEDs. However, the presence of venture capitalists (VCs) and other institutional investors might impose constraints on CEOs' power (Boone et al. 2007). Boone et al. (2007) find a negative and significant relationship between CEO power proxied by both CEO's share ownership and tenure and board independence; however, they find that the latter is positively related to the constraints on CEO's influence. Therefore, the negotiation hypothesis states that there is a negative relationship between CEO's power and the proportion of INEDs; however, the proportion of INEDs is positively related to the constraints on CEO's influence.

Similarly, Baker and Gompers (2003) investigate the main determinants of board structure for VC-backed IPOs and find a negative and significant relationship between CEO power (proxied by tenure and voting control) and the proportion of INEDs. However, they find that the proportion of INEDs is positively associated with the power of outside investors, for example, VCs and that board structure is the outcome of the bargaining power between CEOs and outside investors.

Raheja (2005) finds that board structure influences the information flow and that an optimal board size and composition depend on company and directors' characteristics.

The Chinese board structure is a rich environment that has unique interrelationships between CEOs and INEDs. Ma and Khanna (2015) investigate the role of INEDs and find that as INEDs 'feel indebted for being offered a director position', they usually offer their support to top management. Wang (2008) claims that INEDs have made a limited contribution to the Chinese corporate governance and that there should be a fundamental regulatory reform to enhance both the overall board effectiveness and the relationship between the board of directors and the supervisory board. Furthermore, Wang (2008) argues that political connections on the two boards play a fundamental role in shaping the relationships between insiders and outsiders. Based on the above discussion, we formulate our fourth and fifth hypotheses.

H4: There is a negative relationship between CEOs' influence and the proportion of INEDs.

H5: There is a positive relationship between the limitations on CEOs' influence and the proportion of INEDs.

3.4 Board structure and financial performance

The influence of board structure on financial performance has been investigated in the literature in different institutional settings. The results are largely in favour of a negative association between board size and financial performance. The proponents of the negative association between board size and financial performance argue that the larger the board size the greater the agency conflicts in addition to the coordination/communication problems (Jensen 1993). Yermack (1996) finds a negative and significant relationship between board size and company valuation. Using a large UK data set, Guest (2009) finds a negative and significant relationship between board size and financial performance due to communication problems amongst board directors. On the other hand, a few studies find a positive association between board size and financial performance, for example, Prevost, Rao, and Hossain (2002) in New Zealand. Moreover, Li and Naughton (2007) find a positive and significant relationship between board size and IPOs' short-term returns.

Similarly, there has been a disagreement in the corporate governance literature on the impact of board independence. However, most of the existing studies largely find a positive relationship between board independence and financial performance. Cho and Rui (2009) find a positive and significant influence of the proportion of INEDs on financial performance in China. However, they find a negative and significant relationship between stock returns reaction to the reported earnings and the proportion of INEDs. Bezemer et al. (2014) claim that NEDs in two-tier boards may face some challenges including information asymmetries between the management and supervisory boards in the Netherlands.

Omran (2009) finds a positive and significant relationship between the proportion of INEDs and financial performance post-IPO. He claims that post-IPO, the change in ownership structure of state-owned companies is not effective unless the state gives up control and this may lead to an enhancement in financial performance post-IPO. Peng (2004) finds that the proportion of INEDs has little influence on financial performance measured by return on equity. Firth, Fung, and Rui (2007) find that a higher proportion of INEDs may lead to greater earnings informativeness and this has a positive impact on investors' confidence in

the financial statements. Based on the above discussion we formulate the following two hypotheses:

H6: There is a negative relationship between both board of directors and supervisory board size and financial performance

H7: There is a positive relationship between board of directors' independence and financial performance

4. Data and sample

We collect data on non-financial Chinese IPOs floated in both the SSE and SZSE over the period 1999–2009. We track the changes in board structure from the IPO launch year until 2012. Our final sample is an unbalanced panel that comprises of 892 IPOs and 8006 company-year observations. Data are collected from the China Stock Market and Accounting Research (CSMAR) database which is designed and developed by GTA Information Technology Corporation. Our dependent variable is board structure proxied by board of directors' size, supervisory board size and the proportion of INEDs on the board of directors. Board size is measured by the total number of directors/supervisors on both the board of directors and the supervisory board. Board independence is measured by the proportion of INEDs on the board of directors.

Our independent variables are proxies for our three main hypotheses. We use company size, age and the leverage ratio as alternative proxies for the scope of operations hypothesis following Boone et al. (2007) and Linck, Netter, and Yang (2008). We use companies' natural log of total assets as a proxy for company size. We also use companies' age since IPO and since the establishment date as alternative proxies for company age. Moreover, we use the ratio of total debt to total assets as a proxy for leverage. The scope of operations hypothesis predicts a positive relationship between company size, age and debt/total assets ratio and both board size and independence. We also posit the same relationship applies with respect to the supervisory board size.

The monitoring hypothesis predicts a positive relationship between directors' private benefits' proxies and both board size and independence. To test the monitoring hypothesis, we use both companies' free cash flow and industry concentration as proxies for the potential private benefits following Boone et al. (2007), Guest (2008) and Coles, Daniel, and Naveen (2008). Free cash flow is measured as (earnings plus depreciation minus capital expenditures)/total assets. Industry concentration is measured by the Herfindahl index of industry sales. Jensen (1986) and Boone et al. (2007) argue that directors may use cash flow to achieve private benefits rather than maximising shareholders' wealth. Moreover, directors in highly concentrated industries have the power to consume private benefits as they are less subject to market discipline (Boone et al. 2007).

The monitoring hypothesis also predicts a negative relationship between monitoring costs and both board size and independence. We argue that fast growing companies or those with higher market-to-book ratio and greater volatility have higher growth opportunities and higher monitoring costs. Boone et al. (2007) argue that high volatility may imply high uncertainty about the future cash flows and hence complicates the mission of INEDs with respect to their monitoring role. Pathan (2009), Linck, Netter, and Yang (2008) and Adams and Ferreira (2007) find that board structure reduces company uncertainty. Moreover, directors' ownership mitigates agency conflicts that arise from high monitoring costs in some industries, for example, fast growth industries (Boone et al. 2007).

Therefore, we use the natural log of market-to-book ratio and the annualised standard deviation of daily stock returns as proxies for the cost of monitoring following Boone et al. (2007) and Linck, Netter, and Yang (2008). Market-to-book ratio is calculated as (book value of debt + market value of equity)/book value of assets. Daily stock returns are calculated as the

Table 1. Variables description.

Variable	Description
Academics	Proportion of academics on the board of directors
B.size	Board of directors' size measured by the number of directors on the board of directors
CEO Tenure	Board experience defined as the length of time served on the current board
CEOage	CEO age measured by years
CEOPolcon	Dummy variable takes the value of 1 if the CEO is politically connected and 0 otherwise
Coage	Company age since its establishment year
D/TA	Total debt to total assets ratio as a proxy for leverage
DirOwn	Proportion of shares held by directors
FCF	Free cash flow to total assets ratio measured as (earnings plus depreciation minus capital expenditures)/total assets
FemCEO	Dummy variable takes the value of 1 if the CEO is female and 0 otherwise
Foreign	Proportion of foreign directors on the board of directors
Growth	Dummy variable equals to one for fast growth companies and 0 otherwise
HHI	Industry concentration measured by the Herfindahl index. Herfindahl index constructed by the sales ratio of the companies in the same industry
INED	Percentage of INEDs
IPO	Dummy variable takes the value of 1 for IPOs and 0 for non-IPOs
IPO*Post Reform	Dummy variable takes the value of 1 for IPOs post stock split reform and 0 otherwise
L.B.size	Lagged board of directors' size
L.INED	Lagged proportion of INEDs
L.ROA	Lagged ROA
L.SB.size	Lagged supervisory board size
LogMTB	Natural logarithm of market-to-book ratio calculated as (book value of debt + market value of equity)/book value of assets)
LogTA	Natural logarithm of company's total assets as a proxy for company size
PolconBoD	Proportion of politically connected directors on the board of directors
Post Reform	Dummy variable takes the value of 1 post stock split reform and 0 otherwise
ROA	ROA calculated as (net profits + financial expenses)/average total assets
SB.size	Supervisory board size measured by the number of supervisors on the supervisory board
Sdsrtn	Annualised standard deviation of daily stock returns for each IPO year. Daily stock returns are calculated as the first difference in the natural logarithm of the closing price over two consecutive trading days adjusted for dividends, rights issues, stock dividends, and stock splits
StateOwn	Percentage of State share ownership
SupOwn	Proportion of shares held by supervisors
Tobin's Q	*Q* ratio measured by (market value of equity, the book value of debt and the book value of preferred stocks divided by the book value of total assets)
VC	Dummy variable takes the value of 1 if the company is venture capital backed and 0 otherwise

Note: Data are collected from the CSMAR database which is designed and developed by GTA Information Technology Corporation.

first difference in the natural logarithm of the closing price over two consecutive trading days adjusted for dividends, rights issues, stock dividends and stock splits. We also use the proportion of directors' ownership and a fast growth dummy that is equal to 1 for fast growth companies and 0 otherwise as proxies for the cost of monitoring. Therefore, according to the monitoring hypothesis, we expect a negative relationship between both board size and independence and the log of market-to-book ratio, the annualised standard deviation of daily stock returns, the fast growth dummy and directors' ownership.

The negotiation hypothesis predicts a negative association between the proportion of INEDs and the proxies for CEOs' influence and a positive association with the constraints on their influence (Boone et al. 2007). To test the negotiation hypothesis and whether board composition reflects the potential negotiation between CEOs and INEDs following Boone et al. (2007) and Coles, Daniel, and Naveen (2008), we use four proxies namely CEO tenure, age, gender and state share ownership. CEO tenure is measured by the number of years that a CEO has spent in this role. CEO gender is measured by a dummy variable that takes the value of 1 if a CEO is female and 0 otherwise. The Chinese government still owns considerable controlling shareholdings in listed companies (Sun and Tong 2003). We argue that state ownership may influence board structure and the relationship between executive directors and INEDs. CEO tenure reflects board entrenchment as longer tenured CEOs may have more influence on the appointment of INEDs. We also argue that CEOs' characteristics, for example, age and gender can be used as proxies for their influence. Younger directors and female directors may have different perspectives and hence may have an influence on the appointment of INEDs.

To measure the constraints on CEOs' influence in the Chinese context, we use three proxies namely CEO's political connections, the proportion of academics on the board of directors and the proportion of shares owned by supervisory board members. Foreign directors and VCs may also influence CEO's ability to appoint INEDs (Boone et al. 2007). Therefore, as a robustness check we use the proportion of foreign directors on the board of directors and the VC-backed IPOs dummy as alternative proxies for CEOs' influence.

Furthermore, we use other control variables that may drive our results, for example, IPO proceeds and the number of IPO shares as alternative proxies for IPO size following the study of Butler, Keefe, and Kieschnick (2014). We use different measures of financial performance (accounting and market-based measures), for example, return on assets (ROA) and Tobin's *Q* (market value of equity + book value of debt and the book value of preferred stocks/book value of total assets). Finally, we create a set of industry and year dummies to control for the potential inter-industry and time-specific effects. Table 1 presents a description of the variables used in the empirical analysis.

5. Empirical modelling

Endogeneity between both board size and independence and financial performance may lead to spurious correlations due to the omitted unobservable company characteristics, for example, corporate culture, norms which are assumed to be time invariant during the period of study (Farag and Mallin 2016). To investigate the main determinants of Chinese IPOs' two-tier board structure and the influence of board structure on financial performance, we carefully address the endogeneity concerns using four strategies; firstly, we control for industry fixed effects in all models to control for unobservable characteristics and underlying economic indicators and environment (e.g. market conditions, competition and technology) which may drive the results

(Boone et al. 2007; Cheng 2008; Coles, Daniel, and Naveen 2008; Adams and Ferreira 2009; Farag and Mallin 2016).

Secondly, following Farag and Mallin (2016) we use the system GMM estimator[6] of Blundell and Bond (1998) as a robustness check to address the dynamic nature of board structure and the potential reverse causality in the estimation. The use of historical values of suspect endogenous variables as internal instruments is widely used in the literature to control for simultaneity and other sources of endogeneity and that a higher order of lag length results in more exogenous instruments;[7] see, for example, Roodman (2009), Wintoki, Linck, and Netter (2012) and Farag and Mallin (2016). Therefore, following Wintoki, Linck, and Netter (2012), we use four lags of suspect endogenous variables as instruments in the equation in first-differences, and three lags of their difference as instruments in the equation in levels. We also use both the Hansen over-identification test and the Arellano and Bond (1991) test for first- and second-order auto-correlation to measure the validity of our instruments and the validity of moments conditions used, respectively. Moreover, we estimate robust standard errors clustered at the company level to produce robust, reliable and unbiased coefficient estimates.

Thirdly, we use the PSM technique to control for observable differences in company and industry characteristics using the nearest neighbour technique with replacement and common support and within a maximum distance of 1% following Rosenbaum and Rubin (1983) and Abadie and Imbens (2006). Our treatment and control groups are IPOs and non-IPOs, respectively. We match our sample of IPOs with that of non-IPOs with similar characteristics namely company size, profitability, leverage, industry concentration (HHI) and state ownership over the same period of time.

Finally, we use the 2005 stock split reform as an exogenous shock within our identification strategy to check whether or not our results are driven by this event. In April 2005, the Chinese government and the regulator (the CSRC) introduced the share reform plan by which it allowed non-tradable shares owned mainly by the government to be tradable. Therefore, we apply the difference-in-differences specification using the propensity score matched sample.

6. Empirical results

6.1 *Descriptive statistics*

Table 2 presents the summary statistics for the pooled sample during the period 1999–2009. We find that the average size for the board of directors and the supervisory board is 9.5 and 4.19 directors/supervisors, respectively. Moreover, the average proportion of INEDs on the board of directors is 32.7%.

The average ROA and Tobin's *Q* are 6.8% and 1.78, respectively, and the average company size, measured by log total assets is 21.48 (2130 million RMB) whilst the average annualised standard deviation of daily stock returns is 70.3%. Table 2 also presents the CEOs' characteristics for our sample. The average CEO age and tenure is 46.67 and 3.33 years, respectively, whilst the average proportions of female and politically connected CEOs are 4.6% and 0.6%, respectively. Moreover, the proportions of academics and foreign directors on the board of directors are 15.3% and 0.9%, respectively, over the same period of time. Furthermore, the average directors' and supervisors' share ownership are 5.9% and 0.2%, respectively. However, the average state ownership is 21.6%; whereas 0.6% of our sample companies are VC-backed. The average company age is 9.63 years and finally, the average ratios of debt to total assets and free cash flow to total assets are 45.2% and 8.1%, respectively, whilst 19.1% of our sample is fast growth companies.

Table 2. Descriptive statistics for the pooled sample.

	Mean	Median	SD	Min	Max
B.size	9.501	9.000	2.005	5.000	19.000
SB.size	4.193	3.000	1.555	3.000	15.000
INED	0.327	0.333	0.102	0.000	0.800
ROA	0.068	0.059	0.089	−1.674	1.789
Tobin's *Q*	1.786	1.368	1.188	0.464	15.929
LogTA	21.480	21.236	1.239	17.272	28.405
Sdsrtn	0.703	0.463	1.208	0.002	4.465
CEOage	46.672	46.000	6.701	24.000	77.000
CEO Tenure	3.332	3.000	1.692	1.000	20.000
FemCEO	0.046	0.000	0.187	0.000	1.000
CEOPolcon	0.006	0.000	0.077	0.000	1.000
PolconBoD	0.232	0.222	0.187	0.000	1.000
Academics	0.153	0.111	0.1659	0.000	0.950
Foreign	0.009	0.000	0.045	0.000	0.778
DirOwn	0.059	0.000	0.144	0.000	0.748
SupOwn	0.002	0.000	0.013	0.000	0.271
StateOwn	0.216	0.015	0.266	0.000	0.863
VC	0.006	0.000	0.076	0.000	1.000
Coage	9.632	9.000	4.189	1.000	25.000
D/TA	0.452	0.451	0.198	0.003	1.179
FCF	0.081	0.079	0.093	−0.315	0.867
MTB	1.710	1.368	1.211	0.420	31.031
HHI	0.075	0.410	0.095	0.014	0.851
Growth	0.191	0.000	0.393	0.000	1.000

Notes: Table 2 presents the summary statistics for the pooled sample during the period 1999–2009. Please see variables definition in Table 1.

Table 3 presents a summary of board structure and governance characteristics for the Chinese IPOs over time since the IPO year.

We find that the average board size decreases from 9.4 directors in the IPO year to around 9 directors on year 12 post-IPO, whereas the supervisory board size increases from 4 to 4.3 supervisors during the same period. Moreover, we notice an increase in the proportion of INEDs during the same period from 24.4% in the IPO year to 36.9% on year 12 post-IPO. This reflects the impact of the published corporate governance guidelines with respect to board independence.[8]

We also notice that, consistent with the Chinese economic reform, the proportion of state share ownership decreases from 29.3% in the IPO year to 5.7% on year 12 post-IPO. Moreover, directors' ownership significantly decreases from 10.5% to 0.1% during the same period. Table 3 also reports that there is a slight increase in the average proportion of female CEOs from 4.1% in the IPO year to 5.1% in year 12 post-IPO. Similarly, the average CEO tenure and age increased from 3.1 and 45.8 years in IPO year to 4.7 and 49.8 in year 12 post-IPO. Finally, we notice a constant proportion of politically connected directors of 23% approximately over the same period of time whilst there is a remarkable increase in the average proportion of academics on the board of directors from 12.3% in the IPO year to 18.6% in year 12 post-IPO.

In Table 4, we investigate whether there is a significant difference between board size and independence for both the supervisory board and the board of directors. We split the sample based on median company size (big and small companies). We also split the sample based on

Table 3. Board structure and governance characteristics for IPOs.

	Year from IPO					
	IPO year	Year 3	Year 5	Year 7	Year 10	Year 12
B.size	9.489	9.607	9.620	9.466	9.339	9.077
SB.size	4.037	4.141	4.257	4.273	4.339	4.321
INED	0.244	0.341	0.349	0.356	0.361	0.369
StateOwn	0.293	0.220	0.221	0.193	0.101	0.057
DirOwn	0.105	0.088	0.045	0.020	0.004	0.001
FemCEO	0.041	0.040	0.037	0.025	0.041	0.051
CEO Tenure	3.147	3.306	3.520	3.164	3.336	4.750
CEOage	45.810	46.481	46.819	46.678	47.802	49.805
PolconBoD	0.228	0.230	0.238	0.233	0.226	0.229
Academics	12.364	17.021	16.408	15.306	16.760	18.673
Obs	892	783	596	410	277	212

Notes: Table 3 presents a summary of board structure and governance characteristics for the Chinese IPOs over time since the IPO year. Please see variables definition in Table 1.

Table 4. Univariate analysis of board size and independence for the supervisory board and the board of directors.

	Big size	Small size	High growth	Low growth	SSE	SZSE
B.size	12.877	9.058	9.227	9.566	9.678	9.247
t-statistics	11.020***		−5.965***		9.536***	
SB.size	5.115	3.832	3.933	4.254	4.353	3.961
t-statistics	10.070***		− 7.297***		11.169***	
INED	0.376	0.343	0.326	0.335	0.325	0.331
t-statistics	3.231***		−7.598***		− 12.331***	

Notes: The table presents the results of the univariate analysis of board size and independence for both the supervisory board and the board of directors. The univariate analysis is designed to compare the median of company size (big and small companies), growth potential (high and low growth companies) and stock exchange (Shanghai, (SSE) and Shenzhen, (SZSE)). Please see variables definition in Table 1.
***Significance at the 1% level.

growth potential (high and low growth companies) and finally based on the stock exchange where the IPOs were floated (Shanghai or Shenzhen).

Table 4 shows that big companies and those floated on the Shanghai Stock Exchange (SSE) are characterised by a larger board of director size and a larger supervisory board size compared with small companies and those floated on the SZSE. By contrast, high growth companies are characterised by smaller board size and less independence. These results are consistent with the monitoring hypothesis. Moreover, Table 4 shows that big companies and those floated in SZSE have more independent boards compared with small companies and those floated in SSE.

Table 5 presents the correlation matrix for the main variables used in the empirical analysis. The signs on the coefficients are in line with the literature on board structure. We find no evidence of multicollinearity problem. We also calculate the Variance Inflation Factor (VIF) for all fixed effects regressions and find that the mean VIF values range from 1.45 to 1.91 suggesting that our models are not subject to severe multicollinearity problem.

Table 5. Correlation matrix.

	B.size	INED	SB. size	Acdm	LogTA	Coage	D/TA	FCF	HHI	Log MTB	Sdsrtn	Growth	Dir own
B.size	1.000												
INED	**−0.132**	1.000											
SB.size	**0.288**	**−0.074**	1.000										
Academics	**−0.032**	**0.307**	**0.033**	1.000									
LogTA	**0.221**	**0.184**	**0.189**	**0.147**	1.000								
Coage	**0.054**	**0.352**	**0.025**	**0.108**	**0.221**	1.000							
D/TA	**0.073**	**0.139**	**0.089**	**0.041**	**0.385**	**0.231**	1.000						
FCF	**0.080**	0.016	**0.044**	**0.026**	**0.168**	**−0.070**	**−0.232**	1.000					
HHI	**0.100**	0.004	**0.161**	**0.066**	**0.196**	**−0.104**	−0.017	**0.121**	1.000				
LogMTB	**−0.131**	0.004	**−0.087**	**0.063**	**−0.325**	**0.092**	**−0.270**	**0.088**	−0.016	1.000			
Sdsrtn	0.010	**−0.191**	**−0.024**	**−0.047**	**−0.138**	**−0.174**	**−0.097**	**0.025**	0.010	**0.071**	1.000		
Growth	**−0.067**	**0.044**	**−0.081**	**0.048**	**−0.178**	**−0.046**	**−0.227**	0.004	**0.070**	**0.198**	0.020	1.000	
DirOwn	**−0.160**	**0.143**	**−0.198**	**0.078**	**−0.181**	**−0.107**	**−0.209**	**0.049**	−0.019	**0.110**	**0.067**	**0.143**	1.000
StateOwn	**0.212**	**−0.239**	**0.213**	**−0.080**	**0.089**	**−0.348**	0.018	**0.052**	**0.116**	**−0.304**	**0.054**	**−0.121**	**−0.314**
SupOwn	**−0.061**	**0.048**	**−0.043**	**0.037**	**−0.102**	**−0.074**	**−0.097**	**0.030**	−0.018	**0.033**	**0.076**	**0.075**	**0.374**
ROA	**0.035**	−0.017	0.006	**0.035**	**0.086**	**−0.050**	**−0.256**	**0.419**	**0.091**	**0.185**	**0.041**	**0.040**	**0.088**
Tobin's Q	**−0.106**	**0.036**	**−0.064**	**0.068**	**−0.252**	**0.106**	**−0.222**	**0.094**	−0.014	**0.918**	**0.028**	**0.178**	**0.068**
FemCEO	**−0.063**	**0.029**	**−0.038**	0.016	**−0.047**	**0.018**	−0.025	**−0.020**	**−0.028**	0.044	0.020	−0.005	**0.083**
CEO Tenure	0.010	−0.015	−0.0002	**0.029**	**0.077**	0.059	**−0.040**	**0.034**	**0.045**	0.009	**−0.048**	**0.035**	**0.028**
VC	−0.017	0.005	−0.018	**0.039**	0.000	**0.014**	**−0.031**	0.0003	−0.014	0.006	**0.037**	0.010	**0.062**
CEOage	**0.084**	**0.054**	**0.034**	**0.060**	**0.187**	0.120	**0.027**	**0.045**	**0.041**	−0.002	**−0.032**	**−0.043**	**−0.062**
CEOPolcon	0.014	0.012	**0.033**	0.013	**0.028**	−0.032	0.017	−0.002	−0.003	**−0.025**	0.005	−0.016	−0.018
PolconBoD	**0.112**	**0.050**	**0.068**	**0.121**	**0.232**	**−0.013**	**0.040**	**0.074**	**0.129**	**−0.082**	**−0.035**	**−0.067**	**−0.079**
Foreign	**0.040**	**−0.059**	**−0.035**	−0.010	0.018	**0.021**	**−0.036**	**0.047**	**−0.040**	0.003	0.023	0.011	0.019

(*Continued*)

Table 5. Continued.

	StateOwn	SupOwn	ROA	Tobin's Q	Fem CEO	CEO Tenure	VC	CEO age	CEO Polcon	Polcon BoD	Foreign
StateOwn	1.000										
SupOwn	**−0.130**	1.000									
ROA	0.003	**0.039**	1.000								
Tobin's Q	**− 0.250**	0.012	**0.175**	1.000							
FemCEO	**− 0.051**	0.022	0.015	**0.040**	1.000						
CEO Tenure	**−0.074**	−0.007	**0.038**	0.003	0.008	1.000					
VC	**−0.039**	0.004	0.006	−0.001	0.012	**0.037**	1.000				
CEO age	0.021	−0.003	**0.049**	−0.006	−0.002	**0.102**	0.006	1.000			
CEOPolcon	**0.055**	**0.072**	−0.010	**−0.022**	−0.006	0.009	0.016	**0.049**	1.000		
PolconBoD	**0.098**	**−0.055**	**0.050**	**−0.064**	0.010	0.010	−0.007	**0.086**	**0.037**	1.000	
Foreign	**−0.077**	−0.001	**0.041**	−0.003	**0.035**	−0.007	0.022	**0.068**	−0.017	**−0.059**	1.000

Notes: The table presents the correlation matrix for the variables included in the empirical analysis. Please see variables definition in Table 1. Bold figures indicate significance at the 5% level or below.

6.2 The scope of operations hypothesis

Table 6 presents the estimation results of the scope of operations hypothesis for the board of directors' size (dependent variable) using both fixed effects and system GMM models as in Models 1–5, respectively. We include the lagged proportion of INEDs as an instrumental variable to control for endogeneity in Models 1–4 following Boone et al. (2007).

In Models 1–3, we control for the alternative proxies for the scope of operations hypothesis individually whilst in Model 4 the three measures are included. The results presented in Models 1–3 show that there is a positive and significant ($p < 1\%$ and $p < 5\%$) relationship between the alternative proxies for the scope of operations hypothesis (log total assets, company age and the leverage ratio) and board of directors' size. This suggests that the greater the company size, company age and leverage ratio (higher degree of complex operations), the more the directors there are on the board of directors. In Model 4, we find that all the proxies for the scope of

Table 6. Tests for the scope of operations hypothesis for the board of directors size using fixed effects and system GMM estimator.

BSize	Model 1	Model 2	Model 3	Model 4	Model 5
L.B.size					0.797***
					(0.047)
LogTA	0.394***			0.379***	0.160***
	(0.023)			(0.024)	(0.031)
Coage		0.016**		0.012*	0.036***
		(0.008)		(0.007)	(0.013)
D/TA			1.076***	0.260**	−0.474
			(0.128)	(0.127)	(0.446)
StateOwn	1.065***	1.451***	1.323***	1.091***	0.227
	(0.099)	(0.101)	(0.100)	(0.100)	(0.229)
L.INED	−2.794***	−2.308***	−2.325***	−2.847***	
	(0.281)	(0.279)	(0.277)	(0.283)	
INED					−7.149***
					(1.704)
L.ROA	0.321	1.282***	1.737***	0.470**	
	(0.201)	(0.220)	(0.255)	(0.210)	
ROA					−1.535*
					(0.930)
Cons	1.368***	9.180***	8.823***	1.470***	0.757
	(0.490)	(0.165)	(0.165)	(0.499)	(0.646)
Year dummy	Yes	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes	Yes
R^2	0.116	0.068	0.077	0.116	
F-Stat (*p* value)	0.000	0.000	0.000	0.000	0.000
Obs	7021	7025	7022	7019	7037
Arellano-Bond test for AR(1) *p* value					0.000
Arellano-Bond test for AR(2) *p* value					0.685
Hansen test *p* value					0.147

Notes: The table presents the results of both fixed effects and system GMM regressions for the scope of operations hypothesis using board of directors size as a dependent variable. Please see variables definition in Table 1. Robust standard errors clustered at the company level are reported in the parentheses.
*Significance at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

operations hypothesis are statistically significant. Moreover, in Model 5, the GMM estimation results also show a significant relationship between both company size and company age and the board of directors' size. Therefore, our results are consistent with the scope of operations hypothesis with respect to the board of directors.

Table 7 presents the results of both fixed effects and system GMM regressions for the scope of operations hypothesis with respect to the supervisory board size (dependent variable).

Table 7. Tests for the scope of operations hypothesis for the supervisory board size using fixed effects and system GMM estimator.

SB.size	Model 1	Model 2	Model 3	Model 4	Model 5
L.SB.size					0.645***
					(0.034)
L2.SB.size					0.113***
					(0.022)
LogTA	0.164***			0.165***	0.059***
	(0.020)			(0.021)	(0.015)
Coage		0.021***		0.021***	0.006**
		(0.006)		(0.006)	(0.003)
D/TA			0.294***	− 0.045	− 0.278**
			(0.100)	(0.103)	(0.124)
StateOwn	0.941***	1.116***	1.036***	1.001***	0.020
	(0.078)	(0.078)	(0.079)	(0.079)	(0.071)
L.B.size	0.175***	0.194***	0.192***	0.174***	
	(0.010)	(0.010)	(0.010)	(0.010)	
B.size					0.046***
					(0.017)
L.INED	− 0.601***	− 0.442**	− 0.374**	− 0.688***	
	(0.180)	(0.179)	(0.178)	(0.181)	
INED					− 0.371*
					(0.201)
L.ROA	0.354**	0.026	0.138	− 0.393**	
	(0.177)	(0.177)	(0.192)	(0.179)	
ROA					− 0.071
					(0.280)
Cons	− 1.374***	1.597***	1.642***	− 1.526***	− 0.547**
	(0.418)	(0.150)	(0.151)	(0.426)	(0.274)
Year dummy	Yes	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes	Yes
R^2	0.130	0.119	0.118	0.131	
F-stat (*p* value)	0.000	0.000	0.000	0.000	0.000
Obs	7020	7024	7021	7018	6156
Arellano-Bond test for AR(1) *p* value					0.000
Arellano-Bond test for AR(2) *p* value					0.954
Hansen test *p* value					0.360

Notes: The table presents the results of both fixed effects and system GMM regressions for the scope of operations hypothesis using supervisory board size as a dependent variable. Please see variables definition in Table 1. Robust standard errors clustered at the company level are reported in the parentheses.
*Significance at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

Again, the results are consistent with the scope of operations hypothesis as the coefficients on the three proxies of the scope of operations hypothesis are positive and significant at the 1% level as in Models 1–3. Putting all proxies together in Model 4, we find that the coefficient on LogTA is positive and highly significant ($p < 1\%$); however, the coefficient on D/TA is insignificant. The results presented in Model 5 using the system GMM also support the scope of operations hypothesis for the supervisory board. Interestingly, we find a positive and highly significant ($p < 1\%$) relationship between board of directors' size and the supervisory board size. This suggests that the bigger the board of directors size, the bigger the supervisory board size and that the supervisory board size might be determined by the board of directors' structure. However, and importantly, we find a negative and significant relationship ($p < 1\%$ and $p < 5\%$ in Models 1–4) between the proportion of INEDs on the board of directors and supervisory board size.[9] This suggests that the higher the proportion of INEDs, the smaller the supervisory board size and this implies that the INEDs are perhaps a substituting mechanism for the supervisors' monitoring role. We argue that there might be a conflict in monitoring roles between the supervisory board and the INEDs.

Table 8 presents the estimation results of the scope of operations hypothesis using the proportion of INEDs as a dependent variable.

We find consistent results with those presented in Table 6 as the coefficients on the three proxies for the scope of operations hypothesis are positive, statistically ($p < 1\%$) and economically significant. This suggests that more complex companies may have more independent boards and that the higher the leverage and the older the company the greater the board independence. In Model 4, when we include all the three proxies, we also find a positive relationship with the proportion of INEDs; however, this relationship is highly significant with respect to company size and age. The results of the system GMM estimator (Model 5) are also consistent with the scope of operations hypothesis; however, we find that only company size is positively and significantly correlated with board independence. We agree with Boone et al. (2007) and Lubotsky and Wittenberg (2006) that including alternative proxies in the same regression model may lead to an attenuation bias and hence insignificant individual coefficients. In sum, the results presented in Models 1–5 are consistent with the scope of operations hypothesis.

In Tables 6 and 7, we notice the positive and significant relationship between the proportion of state share ownership and both board of directors and the supervisory board size. Interestingly, in Table 8, we find a negative and highly significant relationship between state share ownership and the proportion of INEDs. This suggests that the greater the state share ownership, the larger the two boards and the lower the proportion of INEDs. This may suggest that state-owned companies may prefer to appoint supervisors on the supervisory board to carry out the monitoring role rather than appointing INEDs on the board of directors. This argument is consistent with Dahya et al. (2003) as they argue that it is unlikely that supervisory boards will have an effective monitoring role as in reality they act as the voice of the government and the ruling party.

Overall, the results presented in Tables 6–8 support the scope of operations hypothesis for Chinese IPOs suggesting that complex and more mature companies have larger and more independent boards. Therefore, we cannot reject our first hypothesis. Finally, the models presented in Tables 6–8 are well specified as the F statistics are highly significant ($p < 1\%$) for all fixed effects models; in addition, the Hansen test does not reject the over-identifying restrictions assumption and the results of the Arellano and Bond (1991) test for the second-order serial correlation are insignificant for the system GMM.

Table 8. Tests for the scope of operations hypothesis for the board of directors independence using fixed effects and system GMM estimator.

INED	Model 1	Model 2	Model 3	Model 4	Model 5
L.INED					0.599***
					(0.044)
LogTA	0.009***			0.009***	0.003***
	(0.001)			(0.001)	(0.001)
Coage		0.003***		0.003***	0.0002
		(0.001)		(0.0003)	(0.0005)
D/TA			0.015***	0.004	0.007
			(0.005)	(0.005)	(0.011)
StateOwn	− 0.053***	− 0.038***	−0.048***	−0.043***	− 0.004**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.002)
L.B.size	− 0.005***	− 0.004***	− 0.004***	− 0.004***	
	(0.001)	(0.001)	(0.001)	(0.001)	
B.size					−0.004***
					(0.001)
L.ROA	− 0.017*	0.003	0.012	− 0.018**	
	(0.009)	(0.008)	(0.009)	(0.009)	
ROA					0.001
					(0.021)
Cons	0.140***	0.292***	0.311***	0.119***	0.123***
	(0.020)	(0.010)	(0.009)	(0.020)	(0.019)
Year dummy	Yes	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes	Yes
R^2	0.156	0.153	0.143	0.166	
F-stat (*p* value)	0.000	0.000	0.000	0.000	0.000
Obs	7026	7030	7027	7024	6972
Arellano-Bond test for AR(1) *p* value					0.000
Arellano-Bond test for AR(2) *p* value					0.137
Hansen test *p* value					0.520

Notes: The table presents the results of both fixed effects and system GMM regressions for the scope of operations hypothesis using the proportion of INEDs as a dependent variable. Please see variables definition in Table 1. Robust standard errors clustered at the company level are reported in the parentheses.
*Significance at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

6.3 Monitoring hypothesis

Table 9 presents the estimation results of the monitoring hypothesis using board of directors' size as a dependent variable.

The monitoring hypothesis predicts that there is a trade-off between directors' private benefits and the cost of monitoring. In Models 1 and 2, we present the results of the influence of directors' private benefits proxied by companies' free cash flow ratio and industry concentration. As expected, we find a positive and highly significant ($p < 1\%$) relationship between the two proxies and board size. This suggests that the greater the directors' private benefits the larger the board size. Our results are consistent with Jensen (1986) and Boone et al. (2007) as they argue that directors may use cash flow to achieve private benefits rather than maximising shareholders' wealth. Moreover, directors in highly concentrated industries have the power to consume private benefits as they are less subject to market discipline.

Table 9. Tests for the monitoring hypothesis for board of directors size and independence using fixed effects and system GMM estimator.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
L.B.size								0.802***		
								(0.010)		
FCF	1.142***						1.010***	1.604***	0.240	0.023**
	(0.276)						(0.320)	(0.219)	(0.238)	(0.009)
HHI		1.486***					1.245***	0.339**	0.512*	0.005
		(0.328)					(0.316)	(0.142)	(0.310)	(0.008)
LogMTB			−0.115***				−0.102***	−0.008**	0.008	−0.002**
			(0.018)				(0.019)	(0.004)	(0.020)	(0.001)
Growth				−0.315***			−0.230***	−0.283***	−0.055	−0.016***
				(0.057)			(0.058)	(0.053)	(0.058)	(0.004)
Sdsrtn					0.003		0.014	0.067***	0.051***	−0.0004
					(0.030)		(0.024)	(0.024)	(0.013)	(0.001)
DirOwn						−1.524***	−1.447***	−0.121	−1.149***	−0.023*
						(0.173)	(0.169)	(0.133)	(0.165)	(0.013)
LogTA									0.374***	
									(0.026)	
Coage									0.007	
									(0.008)	
D/TA									0.154	
									(0.138)	
StateOwn	1.397***	1.406***	1.278***	1.346***	1.413***	1.141***	0.941***	0.388***	0.870***	−0.008***
	(0.100)	(0.108)	(0.102)	(0.100)	(0.100)	(0.106)	(0.118)	(0.058)	(0.116)	(0.003)
L.INED	−2.287***	−6.898***	−2.219***	−2.198***	−2.258***	−1.838***	−6.520***		−7.626***	0.462***
	(0.280)	(0.453)	(0.278)	(0.279)	(0.277)	(0.284)	(0.455)		(0.459)	(0.022)
INED								−5.019***		
								(0.407)		

(*Continued*).

Table 9. Continued.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
L.ROA	0.711***	1.099***	1.391***	1.309***	1.288***	1.417***	0.877***		0.232	
	(0.239)	(0.239)	(0.222)	(0.220)	(0.218)	(0.224)	(0.246)		(0.249)	
ROA								−1.016***		−0.003
								(0.205)		(0.005)
Cons	9.270***	11.102***	9.492***	9.305***	9.288***	9.395***	11.366***	3.660***	3.731***	0.190***
	(0.156)	(0.215)	(0.156)	(0.153)	(0.153)	(0.155)	(0.220)	(0.209)	(0.553)	(0.011)
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.071	0.106	0.072	0.071	0.069	0.076	0.124		0.165	
F-stat (p value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Obs	6993	6111	7021	7025	7005	7024	6067	6072	6066	5405
Arellano-Bond test for AR(1) p value								0.000		0.000
Arellano-Bond test for AR(2) p value								0.182		0.820
Hansen test p value								0.127		0.231

Notes: The table presents the fixed effects and system GMM estimation results for the monitoring hypothesis (the trade-off between directors' private benefits and the cost of monitoring) using board of directors' size as a dependent variable. In Model 10, we use the proportion of INEDs as a dependent variable. Please see variables definition in Table 1. Robust standard errors clustered at the company level are reported in the parentheses.
*Significance at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

On the other hand, we find consistent results with respect to the cost of monitoring proxied by the log of market-to-book ratio, the fast growth dummy and the proportion of directors' ownership as we find – as expected – a negative and highly significant ($p < 1\%$) relationship between the three proxies and board size as presented in Models 3, 4 and 6. However, the fourth proxy for the cost of monitoring, namely the annualised standard deviation of daily stock returns is insignificant as in Model 5. These results are consistent with Boone et al. (2007) as they suggest that in noisy environments, for example, fast growth, the cost of monitoring tends to be higher. Moreover, directors' ownership mitigates agency conflicts that arise from high monitoring costs in fast growth industries. In Models 7 and 8, we include all proxies for the monitoring hypothesis in the fixed effects and system GMM respectively. The results presented in Models 7 and 8 are consistent with the monitoring hypothesis with reasonably high statistical and economic significance. In Model 9, we include all proxies for the scope of operations and monitoring hypotheses in one regression. Again, we find consistent results (sign) with the two hypotheses; however the results are only significant at the 10% level with respect to the industry concentration variable measured by the Herfindahl index. This is mainly due to the attenuation bias resulting from including all the proxies in one regression model.

In Model 10, we estimate the monitoring hypothesis using the proportion of INEDs.[10] For brevity, we present the GMM estimation results which are found to be consistent with the monitoring hypothesis. Therefore, the results presented in Table 9 support our second and third hypotheses. Interestingly, we find a positive and highly significant ($p < 1\%$) relationship between the proportion of state share ownership and board size (Models 1–9); however, we find a negative and highly significant relationship with board independence (Model 10). This result is consistent with those presented in Tables 6–8 and suggests the potential preference of the state to appoint supervisors rather than INEDs. Finally, the results of the fixed effects and system GMM regressions are well specified as *F* statistics are highly significant and the Hansen test does not reject the over-identifying restrictions.

6.4 Negotiation hypothesis

The negotiation hypothesis posits that board composition is a trade-off between CEOs' power and the constraint on this power. Table 10 presents the results of the negotiation hypothesis for the Chinese IPOs.

Table 10. Tests for negotiation hypothesis for board independence using fixed effects and system GMM estimator.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
CEO Tenure	−0.002**		−0.002**	−0.003***	−0.002**	−0.0002
	(0.001)		(0.001)	(0.001)	(0.001)	(0.0005)
CEOage	0.0005**		0.0003***	0.0001	0.0004***	0.0002**
	(0.0002)		(0.0001)	(0.0001)	(0.0001)	(0.0001)
FemCEO	0.012**		0.012**	0.009	0.012**	0.005
	(0.005)		(0.005)	(0.020)	(0.005)	(0.004)
CEOPolcon		0.030***	0.027***	0.024***	0.025***	−0.0001
		(0.009)	(0.009)	(0.008)	(0.009)	(0.008)
StateOwn	− 0.047***	− 0.041***	− 0.041***	−0.009*	− 0.036***	− 0.011***
	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.003)

(*Continued*).

Table 10. Continued.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Academics		0.001***	0.001***	0.0001	0.001***	0.0003***
		(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.00005)
SupOwn		0.273***	0.258***	0.224*	0.298***	−0.037
		(0.051)	(0.050)	(0.135)	(0.047)	(0.039)
L.B.size	−0.004***	−0.003***	−0.004***	−0.003***	−0.004***	−0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.0004)
L.ROA	0.003***	−0.007	−0.007	0.004	−0.021**	−0.033***
	(0.001)	(0.008)	(0.008)	(0.033)	(0.009)	(0.010)
L.INED				0.396***		
				(0.030)		
LogTA					0.007***	0.009***
					(0.001)	(0.001)
Coage					0.003***	−0.001
					(0.001)	(0.002)
D/TA					−0.002	−0.010**
					(0.005)	(0.004)
FCF						−0.018**
						(0.008)
HHI						−0.015**
						(0.007)
LogMTB						0.009***
						(0.002)
Growth						0.004**
						(0.002)
Sdsrtn						0.001
						(0.001)
Cons	0.305***	0.301***	0.297***	0.253***	0.153***	0.222***
	(0.011)	(0.009)	(0.011)	(0.019)	(0.020)	(0.018)
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.141	0.196	0.195		0.210	0.109
F-stat (*p* value)	0.000	0.000	0.000	0.000	0.000	0.000
Obs	6886	7030	6886	6822	6881	5957
Arellano-Bond test for AR(1) *p* value				0.000		
Arellano-Bond test for AR(2) *p* value				0.130		
Hansen test *p* value				0.478		

Notes: The table presents the results of the negotiation hypothesis (the influence of CEOs' power and the constraints on CEOs' power) for board of directors' independence using fixed effects and system GMM estimator. Please see variables definition in Table 1. Robust standard errors clustered at the company level are reported in the parentheses.
*Significance at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

Model 1 presents the results of the influence of CEOs' power on the proportion of INEDs. We use four alternative measures of CEOs' influence namely CEO tenure, age, gender and state ownership. As expected, the results presented in Model 1 show that there is a negative and

significant relationship ($p < 5\%$ and $p < 1\%$, respectively) between both CEO tenure and state share ownership and board independence. The negative influence of CEO tenure is consistent with Boone et al. (2007). This suggests that the longer the CEO tenure, the lower the proportion of INEDs and hence longer tenured CEOs have more influence on appointing INEDs. The above results support our fourth hypothesis.

However, we find a positive and significant ($p < 5\%$) relationship between both CEO age and gender and board independence. This suggests that the presence of young and female CEOs may correlate with a greater proportion of INEDs. Female directors are well documented in the literature as having a better monitoring role compared with their male counterparts as they have different opinions and perspectives (Adams and Ferreira 2009). In China, Cumming, Leung, and Rui (2015) find evidence that female directors are more effective in reducing the frequency and severity of fraud in particular in male-dominated industries.

Model 2 presents the results of the constraints on CEOs' influence proxied by CEO political connections, the proportion of academics on the board of directors and shares owned by supervisory board members. As expected by the negotiation hypothesis, we find a positive and highly significant ($p < 1\%$) relationship between the three proxies and the proportion of INEDs. This suggests that CEOs' political connections and the presence of academics on the board of directors, in addition to the proportion of shares owned by the supervisory board members, may result in a greater proportion of INEDs. However, the economic significance of the proportion of shares owned by the supervisory board is the highest compared with the other two proxies. Again, the above results support our fifth hypothesis. Model 3 presents the results of combining both Models 1 and 2, that is, CEOs' influence and the constraints on their influence. We find consistent results with those presented in Models 1 and 2.

Model 4 presents the results of the negotiation hypothesis using system GMM to address the potential endogeneity concerns. Overall, we find consistent results with respect to CEO tenure, political connections, state share ownership and the proportion of shares owned by supervisors; however, the results are only significant at the 10% level for both state share ownership and the proportion of shares owned by supervisors. Moreover, we find that CEO gender and the proportion of academics have the same sign, though they are insignificant. Therefore, our results provide strong support for the negotiation hypothesis. In Models 5 and 6, we present the results of the negotiation hypothesis in addition to the scope of operations and the monitoring hypotheses, respectively. We find consistent results with the scope of operations hypothesis, however, we find opposite signs with respect to the monitoring hypothesis; Boone et al. (2007) argue that this is due to attenuation bias resulting from including multiple proxies in the same model. Finally, the results of fixed effects and system GMM regressions are well specified as *F* statistics for the fixed effects models are highly significant and the Hansen test does not reject the over-identifying restrictions.

6.5 The influence of board structure on financial performance

Table 11 presents the fixed effects and GMM estimation results of the influence of board structure on financial performance.

The results presented in Models 1 and 3, in which we use ROA as a dependent variable, show that there is a positive though insignificant relationship between board structure and financial performance. However, when using the *Q* ratio in Models 2 and 4, we find a positive and significant relationship between the proportion of INEDs and financial performance. This result is consistent with Prevost, Rao, and Hossain (2002) and Cho and Rui (2009) and suggests that the higher

Table 11. The influence of board structure on financial performance using fixed effects and system GMM estimator.

	Panel A		Panel B	
	Model 1 ROA	Model 2 Tobin's *Q*	Model 3 ROA	Model 4 Tobin's *Q*
L.ROA			0.508***	
			(0.170)	
L.T obin's *Q*				− 0.696**
				(0.355)
B.size	0.0005	0.001	0.009	0.226
	(0.001)	(0.007)	(0.009)	(0.268)
SB.size	0.0005	0.015*	0.005	− 0.587
	(0.001)	(0.008)	(0.008)	(0.465)
INED	0.023	1.346***	0.536	4.743**
	(0.019)	(0.304)	(0.352)	(2.184)
D/TA	− 0.017	− 0.058	− 0.015	2.151**
	(0.012)	(0.107)	(0.040)	(0.940)
LogTA	0.010***	0.231***	0.001	0.857***
	(0.001)	(0.015)	(0.007)	(0.215)
Sdsrtn	0.001**	0.046**	0.018	1.198**
	(0.0004)	(0.020)	(0.021)	(0.564)
StateOwn	0.015***	0.950***	0.012	2.425***
	(0.003)	(0.044)	(0.022)	(0.874)
VC	0.004	0.178*	0.092	22.934**
	(0.008)	(0.107)	(0.123)	(8.938)
Foreign	0.057***	− 0.042	0.107	7.347
	(0.020)	(0.291)	(0.143)	(8.404)
PolconBoD	0.014***	− 0.009	− 0.033	10.158***
	(0.004)	(0.069)	(0.079)	(3.748)
Cons	−0.110***	5.709***	0.255**	1.809
	(0.026)	(0.285)	(0.112)	(5.463)
Year dummy	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes
R^2	0.056	0.149		
F-stat (*p* value)	0.000	0.000	0.000	0.000
Obs	6363	6363	5890	5871
Arellano-Bond test for AR(1) *p* value			0.001	0.003
Arellano-Bond test for AR(2) *p* value			0.294	0.134
Hansen test *p* value			0.448	0.208

Notes: The table presents the fixed effects and GMM estimation results of the influence of board structure on financial performance. Please see variables definition in Table 1. Robust standard errors clustered at the company level are reported in the parentheses.
*Significance at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

the proportion of INEDs, the better the financial performance. In Model 2, we also find a positive and marginally significant relationship between the supervisory board size and financial performance. Again, we argue that there might be a conflict in the monitoring roles between INEDs and supervisors. The above results do not support our sixth hypothesis, but partially support the seventh hypothesis.

Finally, our models are well specified as *F* statistics for the fixed effects models are highly significant and the tests regarding serial correlation for the system GMM estimator reject the absence of first order, but not the second-order serial correlation. Moreover, the Hansen test does not reject the over-identifying restrictions.

6.6 Robustness tests

6.6.1 Propensity score matching

We further address endogeneity concerns by using the PSM technique to control for observable differences in company and industry characteristics. Using the nearest neighbour technique with replacement and common support and within a maximum distance of 1% following Rosenbaum and Rubin (1983) and Abadie and Imbens (2006), we match our sample of IPOs with that of non-IPOs with similar characteristics namely size, profitability, leverage, industry concentration (HHI) and state ownership over the same period of time. Table 12 presents the univariate analysis for the difference in means test between IPO (treatment) and non-IPO (control) samples using the matching variables. The results presented in Table 12 show that there is no significant difference between treated and control samples with respect to the matching variables and that our matched sample is balanced over those variables.

We present in Table 13 the estimation results of the scope of operations hypothesis using the PSM matched sample for the board of directors size and independence and the supervisory board size.

We firstly apply the probit model (Model 1) to investigate the main determinants of IPOs following the study of Pagano, Panetta, and Zingales (1998). We use company size, profitability, leverage and growth opportunities, in addition to year and industry dummies to estimate the probit model. Moreover, we control for the proportion of state ownership as a distinguishing feature of the Chinese market. We find that big company size, profitability and lower leverage are the main determinants for the Chinese companies to go public. We also find that there is a significant difference in board structure and independence for IPOs compared with non-IPOs as the coefficient on the IPO dummy is significant in Models 2–4. The results presented in Models 2 and 3 suggest that boards of directors tend to be larger; however supervisory boards tend to be smaller for IPOs. Moreover, in Model 4, we find that IPOs' boards are marginally more independent compared with non-IPOs. We argue that IPOs tend to increase their board independence to comply with corporate governance best practice. Furthermore, the results presented in Table 13 are consistent with the scope of operations hypothesis.[11]

Table 12. Difference in means test between IPOs and non-IPOs for the PSM matching variables.

Matching variables	Treated	Control	*t*-stats
Log TA	21.54	21.562	−0.94
ROA	0.041	0.039	0.62
D/TA	0.469	0.475	− 1.21
State own	0.186	0.185	0.39
HHI	0.075	0.073	1.41

Notes: The table presents the univariate analysis of the difference in means test between IPOs and non-IPOs for the variables used in the PSM. Please see variables definition in Table 1.

Table 13. Tests for the scope of operations hypothesis using propensity score matched sample.

	Probit model IPO	Board of directors size	Supervisory board size	INEDs
	Model 1	Model 2	Model 3	Model 4
IPO		0.133***	− 0.015***	0.002*
		(0.031)	(0.004)	(0.0012)
Log TA	0.018**	0.479***	0.029***	0.003***
	(0.008)	(0.012)	(0.002)	(0.0004)
D/TA	− 0.334***	0.030	0.006**	0.020***
	(0.036)	(0.026)	(0.003)	(0.001)
ROA	0.043**			
	(0.020)			
L.ROA		− 0.125*	− 0.006**	0.0001
		(0.071)	(0.003)	(0.002)
L.Bsize			0.034***	− 0.006***
			(0.001)	(0.0002)
L.INED		− 10.381***	− 0.211***	
		(0.279)	(0.038)	
State own	− 0.011	0.687***	0.153***	− 0.003
	(0.049)	(0.075)	(0.010)	(0.002)
HHI	0.072			
	(0.100)			
Constant	− 0.671***	5.067***	0.810***	0.345***
	(0.175)	(0.383)	(0.045)	(0.011)
Year dummy	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes
Obs	15,728	13,435	13,175	13,287
LR chi^2 (p value)	0.000			
F-stat (p value)		0.000	0.000	0.000
Pseudo R^2	0.018			
Adj. R^2		0.250	0.213	0.144

Notes: The table presents the estimation outputs of the scope of operations hypothesis using the PSM matched sample for the board of directors' size and independence and for the supervisory board size. Please see variables definition in Table 1. Bootstrapped standard errors are reported in the parentheses.
*Significance at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

6.6.2 Stock split reform exogenous shock

We use the 2005 stock split reform as an exogenous shock within our identification strategy to further check whether or not our results are derived from the stock split and economic reform. Table 14 presents the results of our experiment using difference-in-differences specification for the scope of operations hypothesis using the propensity score matched sample. We present the results of the scope of operations hypothesis using three dependent variables namely board of directors' size, supervisory board size and board independence as in Panels A, B and C, respectively.

Our treatment and control groups are IPOs and non-IPOs, respectively. We control for post reform period using a dummy variable (Post Reform) which takes the value of 1 post stock split reform and 0 otherwise. Moreover, we control for the interaction term (IPO*Post Reform) as a dummy variable that takes the value of 1 for IPOs post reform and 0 otherwise. In Panels A and

Table 14. The influence of stock split reform on board structure.

	Panel A		Panel B		Panel C	
	Board of directors size		Supervisory board size		INEDs	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
IPO	0.194***	0.231**	−0.022***	−0.032***	0.001	0.002
	(0.032)	(0.094)	(0.004)	(0.012)	(0.001)	(0.002)
Post reform	−0.742***	−0.731***	−0.062***	−0.065***	0.022***	0.022***
	(0.086)	(0.090)	(0.011)	(0.011)	(0.002)	(0.002)
IPO*Post reform		− 0.043		0.011		− 0.001
		(0.100)		(0.012)		(0.002)
LogTA	0.480***	0.480***	0.030***	0.030***	0.004***	0.004***
	(0.012)	(0.012)	(0.001)	(0.001)	(0.0004)	(0.0004)
D/TA	0.005***	0.005***	0.0002**	0.0002**	0.0001	0.0001
	(0.001)	(0.001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
State own	0.587***	0.587***	0.141***	0.141***	−0.005**	−0.005**
	(0.076)	(0.076)	(0.010)	(0.010)	(0.002)	(0.002)
L.ROA	− 0.001	− 0.001	−0.0004	−0.0004	− 0.005***	− 0.005***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.0002)	(0.0002)
L.Bsize			0.033***	0.033***	− 0.007***	− 0.007***
			(0.001)	(0.001)	(0.0002)	(0.0002)
L.INED	− 8.928***	−8.928***	− 0.007	− 0.006		
	(0.258)	(0.258)	(0.034)	(0.034)		
Constant	4.276***	4.276***	0.791***	0.794***	0.346***	0.346***
	(0.409)	(0.409)	(0.045)	(0.045)	(0.010)	(0.010)
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes
Obs	13,435	13,435	13,435	13,435	13,435	13,435
F-stat (*p* value)	0.000	0.000	0.000	0.000	0.000	0.000
Adj R^2	0.240	0.240	0.210	0.210	0.101	0.101

Notes: The table presents the results of the difference-in-differences specification of the scope of operation hypothesis for the board of directors, the supervisory board size and board independence using the propensity score matched sample as in Panels A, B and C, respectively. We use the 2005 stock split reform as an exogenous shock; we also use IPOs and non-IPOs dummies as treatment and control groups, respectively. Please see variables definition in Table 1. Bootstrapped standard errors are reported in the parentheses.
*Significance at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

B, we notice that the coefficients on the Post Reform dummy are negative and highly significant. This suggests that board of directors' size and supervisory board size tend to be smaller post stock split reform. However, and consistent with the calls for more independent boards, the proportion of INEDs tends to be higher post reform as the coefficient on the Post Reform dummy is positive and highly significant in Panel C. We also find that the coefficients on the interaction term (IPO*Post Reform) are insignificant in all Models suggesting that the changes in board size and independence and supervisory board size pre and post stock split reform are not driving our findings on the scope of operations hypothesis.[12]

Furthermore, as another robustness test, we calculate the annual changes in board structure around the IPO year and re-estimate all the regressions for the three hypotheses. Again, we find consistent results with the scope of operations, monitoring and negotiation hypotheses. Finally, we use different proxies for the constraints on CEOs' influence, for example, the presence of VC

and the proportion of foreign directors on boards and obtain similar results with respect to the three hypotheses.[13]

7. Summary, conclusion and discussion

In this paper, we investigate the main board structure hypotheses namely the scope of operations, monitoring and negotiation hypotheses for a sample of Chinese IPOs floated in the SSE and SZSE. Our results are consistent with the scope of operations hypothesis and suggest that a higher degree of a company's complex operations results in greater board size and independence. We also find evidence of the scope of operations hypothesis with respect to the supervisory board size and that more complex companies may have larger supervisory boards. Moreover, we find that the larger the board size, the larger the supervisory board size and this implies that more supervisors might be required to oversee and monitor a larger board of directors. Interestingly, we find that the higher the proportion of INEDs, the smaller the supervisory board size and this implies that INEDs are perhaps a substituting mechanism for the supervisors' monitoring role.

The results show that there is a positive and significant relationship between the proportion of state share ownership and both board size and the supervisory board size. However, we find a negative and significant relationship between state share ownership and the proportion of INEDs. This suggests that the state – as a controlling shareholder – may influence and enforce the appointment of supervisors on the supervisory board to carry out the monitoring role rather than appointing INEDs on the board of directors. This argument is consistent with Dahya et al. (2003) as they argue that supervisors in reality act as the voice of the government and the ruling party. Therefore, we argue that there might be a conflict in the monitoring roles between the supervisory board and INEDs.

We also find evidence of the monitoring hypothesis for Chinese IPOs. Our results are consistent with Jensen (1986) and Boone et al. (2007) and show that the greater the directors' private benefits, the larger the board size. Moreover, directors in highly concentrated industries may have the power to consume private benefits as they are less subject to market discipline. In addition, we find that in noisy environments, for example, fast growth, the cost of monitoring tends to be higher. Therefore, Chinese IPOs' board structure is determined as a trade-off between directors' private benefits and the cost of monitoring.

Furthermore, we find evidence of the negotiation hypothesis as we find that longer tenured CEOs would tend to influence the appointment of INEDs and that the longer the CEO tenure the less the proportion of INEDs on the board of directors. On the other hand, we find that the greater the CEOs' political connections and the greater the proportion of shares owned by the supervisory board members, the greater the proportion of INEDs on the board of directors. Therefore, board structure for Chinese IPOs is an outcome of CEOs' influence and the constraints on this influence.

According to the Chinese Company Law, supervisory board members should be elected by shareholders to oversee and monitor the board of directors – mainly executive directors – to mitigate any agency conflict. However, the supervisory board has no actual power to exercise this role (Clarke 2006). On the other hand, the board of directors is comprised – in addition to executive directors – of INEDs to monitor and advise directors and to protect the overall interests of the company and minority shareholders in particular. The Chinese dual board mechanism was inspired by the German governance mechanism; however, there are fundamental differences between the two models (Wang 2008). The supervisory board in Germany has much more power

compared with the Chinese one including the appointment and removal of directors on the management board. Moreover, the German management board reports to the supervisory board as there is a hierarchical relationship between the two boards. In such a mechanism, the oversight role is deemed to be a function of the supervisory board due to the relationship between the two boards. Such a hierarchical relationship does not exist in China. Therefore, it is hard for a supervisory board without much power to exercise effective supervision of the board of directors in China (Wang 2008).

On the other hand, we argue that whilst the Chinese regulator (CSRC) issued guidelines on the introduction of independent directors (CSRC 2001b) to enhance the overall board effectiveness and monitoring role, more comprehensive reform is required. Lu (2005) argues that:

> In conclusion, in China so far, the introduction of independent directors does not guarantee the effective operation of boards. Since the establishment of the board of supervisors system has not been able to fully play a supervisory role in companies, sufficient conditions do not exist for the independent directors to play their roles. In this situation, listed companies have been able to invite independent directors who are independent in name only.

Furthermore, Clarke (2006) argues that the supervisory board in China plays no significant role in corporate governance and the vast majority of companies tend to maintain the supervisory board with the minimum required number of three supervisors (Clarke 2006). More importantly, the qualifications of the supervisory board members are another concern[14] as most of the supervisors are more politically connected, for example, leaders of unions and political officers (Tenev, Zhang, and Brefort 2002; Dahya et al. 2003). Li (2010) argues that there is no effective legal environment or effective governance mechanism to protect investor and minority shareholders in China. Berkman, Cole, and Fu (2014) conclude that enhancing the managerial expertise of controlling shareholders may result in a more effective corporate governance mechanism in China.

To sum up, the Chinese governance mechanism combines the German model with the Anglo-Saxon model. This may create a conflict between boards of directors and supervisory boards leading to an overlap of duties and the monitoring role in particular. More importantly, it dilutes the power of both boards and increases directors' and supervisors' compensation schemes (CFA Institute 2007). Therefore, the governance mechanism followed by Chinese companies is a quasi-two-tier structure (CFA Institute 2007). Our results reveal the need for the regulator to reconsider the roles of either INEDs or the supervisory board members for – at least – listed companies or non-state-owned companies within a comprehensive reform of the Chinese governance mechanism. This is due to the clear conflict in the monitoring role between the supervisory board and the INEDs on the board of directors.

Acknowledgements

We are grateful for the constructive comments from the anonymous referees, the discussant and the participants of the fifth Chinese Capital Market Conference at the University of Manitoba (July 2015), Canada.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes

1. http://www.ecgi.org/codes/documents/code_en.pdf.
2. There was a total of 414 IPOs made in China over the period 2001–2008 with a total of RMB 508.6 billion being raised. Moreover, 345 and 278 IPOs were launched in the SSE and SZSE, respectively, during 2010–2011. For more detail, see Ernst and Young (2012), 'Global IPO Trends Report 2010–2012: Prepare early, move fast', and the websites of the SSE and SZSE.
3. At the end of May 2013, 269 Chinese firms had withdrawn their IPO applications, whilst 666 firms had their IPO plans under review by the CSRC.
4. The main responsibilities of the board of directors according to Article 46 of the Chinese Company law revised in 2003 are:

   > to convene the general meeting and to report on its work to the board of shareholders; to implement the resolutions of the general meeting; to decide on the business plans and investment plans of the company; to formulate the company's proposed annual financial budgets and final accounts; to formulate the company's profit distribution plans and plans for making up losses; to formulate plans for the company's increase or reduction of the registered capital or for the issuance of corporate bonds; to formulate plans for the merger, division, dissolution or change of corporate form of the company; to decide on the establishment of the company's internal management organization; to decide on the employment or dismissal of the manager of the company and his remuneration, and to decide on the employment or dismissal of the deputy manager(s) and person(s) in charge of financial affairs of the company according to the recommendations of the manager and on their remuneration; to formulate the basic management system of the company; and other functions and powers specified in the articles of association of the company. (http://www.fdi.gov.cn/1800000121_39_4814_0_7.html#_Toc381707446).

5. http://www.fdi.gov.cn/1800000121_39_4814_0_7.html.
6. The System GMM estimator combines in a system the equation in first-differences with the same equation expressed in levels.
7. Although this may cause the problem of weak instruments as the number of lags increases (Wintoki, Linck, and Netter 2012). However, we used different lag lengths as an empirical trade-off.
8. The Guidelines for INEDs on the board of directors of listed companies states that 'By June 30th, 2002, at least two members of the board of directors shall be independent directors; and by June 30th, 2003, at least one third of board shall be independent directors.' For more details, see http://www.csrc.gov.cn/pub/csrc_en/newsfacts/release/200708/t20070810_69191.html.
9. We also control for the proportion of executive directors on the board of directors instead of INEDs as we believe that the monitoring role of the supervisory board may increase with the proportion of executive directors on the board of directors. We find that the proportion of executive directors on the board of directors is positively and significantly correlated with the supervisory board size.
10. We also find consistent results with the monitoring hypothesis with respect to the supervisory board, however, for brevity and to save space, we did not present the results.
11. We find similar results with respect to the monitoring and negotiation hypotheses.
12. We find similar results with respect to the monitoring and negotiation hypotheses.
13. We also use Newey West and random effects models and obtained similar results to those of the fixed effects models.
14. According to the CFA Institute, the results of a survey conducted in 1999 reveal that supervisory boards' members do not have the experience to supervise the board of directors. Moreover, they are not involved in the selection of board directors (CFA Institute 2007).

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