Dynamic Adjustment of Board Structure: Evidence from China's Public Listed Companies

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ABSTRACT: Using data of China's listed companies, the paper investigates how companies (both SOEs and POEs) adjust their board structure in China. We find that 45 percentage firms changed their board size or board independence during every two-year interval from 2007 to 2013. The adjustment speed in board structure is different between the state-owned enterprises (SOEs) and privately-owned enterprises (POEs). Moreover, the board independence changes are dominated by the monitoring-driven adjustment for SOEs, and by the advisory-driven adjustment for POEs. The board size changes are dominated by the advisory-driven adjustment for SOEs, and by the monitoring-driven adjustment for POEs. We further find that firm performance for SOEs are improved only by the monitoring-driven adjustment toward target board structure, while that for POEs are improved only by the advisory-driven adjustment. The findings offer insight into the dynamic adjustment of board structure in an emerging economy of China where companies achieve economic efficiency in response to their environment.

Keywords: Corporate Governance, Board Structure, Board Adjustment, SOE, POE, China

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INTRODUCTION

As the focus of many attempts to improve corporate governance efficiency, board structure is one of the main debated issues. Some researchers argued that the larger board size and more independent board is beneficial for decision making, since such board structure engaged talents to advise and monitor the firm (Fama and Jensen,1983; Lehn et al., 2003; Adams and Ferreira, 2007; Raheja, 2005; Coles, Daniel, and Naveen, 2007). Other scholars found that a board with larger size and more independent board members is costly and inefficient because of high coordination costs and a free riding problem (Lipton and Lorsch, 1992; Jensen, 1993). The inconclusive results imply how firms dynamically adjust their board structure is an important issue, alongside the state status of board structure changes.

Board structure is a trade-off by the costs and benefits arising from directors' monitoring and advising functions, based on the particular business environment of a firm (Adams and Ferreira, 2007; Harris and Raviv, 2008; Linck et al, 2008; Wintoki et al., 2012). The benefits are usually generated by monitoring managerial or controlling shareholder's self-interest behaviors, and by offering valuable advices/resources for firms. The benefits could increase with board size. While the costs usually consist of coordinating costs, information transferring costs, disruptive costs and free-riding costs. The costs may increase with board size. As the firm's business environment changes, the marginal benefits/ costs coming from directors' monitoring and advisory functions will also change. Therefore, a firm's board structure is the responses to its both internal fundamentals and external environments (Linck et al., 2008; Wintoki et al., 2012; Cicero etc, 2013). Cicero, Wintoki and Yang (2013) provide the evidence that corporate board changes are associated with changes in firm-specific fundamentals, and they further comprehensively estimate the optimal board structure and its adjustment speed in the U.S setting.

Compared to the developed countries like U.S, it is not clear how firms adjust their board structure in emerging market countries, especially in China who is characterized with a special institutional environments and listed firms. One of the prominent features is that Chinese government has overwhelming power on economics activities. For instance, board of directors are usually appointed by government for state-owned enterprises (SOEs), and the external governance environment is weak in

China where investor protection is poor (Jiang and Kim, 2015). Another important institutional factor of China is that the SOEs enjoy a priority status in accessing external resources, but the privately-owned enterprises (POEs) experience an inferior status (Poncet et al., 2010). Moreover, firms in China have a concentrated corporate ownership structure that may result serious agency (insiders control) problem (Jiang et al., 2010).

The paper investigates the dynamic adjustment of board structure for listed companies in China. We then extend to separately examine the dynamic adjustment of corporate board for SOEs and POEs. Our evidence shows that the board structure adjustment in China is different between SOEs and POEs. Moreover, by sorting the board of directors into two functions separately labeled with monitoring and advising, we also study the mechanisms of board monitoring and advisory through which drive the dynamic adjustment of board structure. In complementary to prior studies (Linck et al, 2008; Wintoki et al., 2012; Cicero et al, 2013; etc), we further estimate the effects of the monitoring-driven and advisory-driven adjustment toward the target board structure on firm performance. Using data of China's listed firms over the period from 2007 to 2013, we first examine the changes (a state variable) and the adjustment speed (a flow variable) of board structure for China's listed companies. The findings indicate that there are frequent and significant changes in board structure for China's listed firms. Within any two-year period, between 33% and 42% of firms change their board size and between 34% and 45% of our sample firms experience a change in board independence. Moreover, the adjustment speed toward the target board size which is determined by firm characteristics is 0.381 and the speed toward the target board independence is 0.452. There are different findings between the two sub-samples of SEOs and POEs. For instance, the adjustment speed toward the target board size for SOEs is 0.294 and for POEs is 0.404. The adjustment speed toward the target board independence for SOEs is 0.569 and for POEs is 0.365.

The paper investigates the mechanism through which forces firms to adjust their board structure. The results show that the speed of monitoring-driven adjustments is 0.387 and that of advisory-driven is 0.374 for all firms. Furthermore, we find that the two adjustment speeds in board size for POEs are higher than that for SOEs, while the two adjustment speeds in board independence for POEs are lower than that for SOEs. The asymmetric finding of board adjustments between POEs and SOEs is a reflection of their different needs in their pursuit of their own economic efficiency.

Finally, the paper examines the effects of monitoring-driven and advisory-driven adjustments toward the target board structure on firm performance. The results show that firm performance (proxied by ROA and ROE)is negatively related to the deviation from the optimal board structure, and significantly affected by the monitoring-driven adjustment from the target board size, but not by the advisory-driven adjustment for SOEs. Firm performance is significantly influenced by the advisory-driven deviation from the target board size, but not by the monitoring-driven deviation for POEs. This study contributes to the knowledge of board structure dynamic adjustments in emerging market settings as China. Prior literature mainly focus on board structure evolution over time (Boone et al,2007; Lehn et al; 2009; Gillan et al, 2011) or across firm lifecycle (Filatotchev and Wright, 2005; Roche, 2009). They find that board structure is frequently and quickly adjusting toward target board structure in developed countries. Our results suggest a less frequent and slower adjustment in board structure of China's listed companies. Our findings further show that the adjustment speeds of board structure for SOEs is slower than POEs. These results are consistent with common understanding of China's institutional environments and unique characteristics of listed companies. The study contributes the literature on the determinants of board structure adjustment. Most theoretical studies suggest that board structure is determined by trading off on the benefits and costs from advisory or monitoring functions (Raheja, 2005; Adams and Ferreira, 2007; Harris and Raviv, 2008; Baldeniusa et al, 2014); while some empirical studies relate board structure to firm fundamentals and external environments (Coles et al, 2008; Linck et al, 2008; Chen et al, 2012).Complementary to the existing work, we investigate whether board structure adjustment mainly relies on the firms' need for directors' monitoring or advisory function, , by sorting the board of directors into two separate functions To our knowledge, it is the first paper to simultaneously examine the effects of directors' monitoring and advisory mechanism on board structure adjustment. The study also contributes to the studies on board structure and corporate performance. Existing literature (Fama and Jensen, 1983; Lipton and Lorsch 1992; Yermack, 1996; Coles, Daniel, and Naveen, 2008; Chen et al, 2012) only demonstrate that changing the number or the ratio in board structure can improve corporate performance. However, they have not pointed out the direct mechanism through which the deviation from the target board structure on firm performance. We extend the current literature by investigating the effects of monitoring-driven and advisory- driven deviation from the target board structure on firm performance.

The rest of the paper is arranged as follows, section 2 discusses the institutional environments and theoretical analysis, section 3 reviews literature and develop hypotheses, section 4 introduces the methodology including variables construction, sample and empirical methods, section 5 reports the empirical results, and section 6 concludes our paper.

INSTITUTIONAL ENVIRONMENTS

Institutional Environments

As the largest emerging economy, China has launched the market-oriented reform for over 30 years. Since 1990s, the majority of the SOEs experienced the decreasing of state ownership to improve their performance and vitality, and part of SOEs was transformed to privately controlled firms. Meanwhile, with the protection of private property rights approved by the National People's Congress in 2004, the POEs characterized with concentrated ownership are growing rapidly. Although economic marketization level in China has been greatly improved, Chinese government still controls the economy by owning a controlling stake for many key enterprises to protect public ownership, and has powerful influences on business affairs in all kinds of companies by state-owned institutions. The SOEs enjoy a priority status in obtaining governmental resources while POEs experience an inferior status (Poncet *et al.*, 2010). As such, the SOEs suffer much more intervention from the Chinese government, whereas the POEs enjoy more market oriented self-democracy, therefore, SOEs have less right to make their own decisions in response to firm's internal or external environment changes, whereas POEs would do.

The board of directors of China's listed companies was established during the 1990s with the corporatization of SOEs. As the basis for the corporatization of Chinese firms, the Chinese Company Law which implemented in 1994 articulates the responsibilities, rights and liabilities of the board of directors, managers, and the board of supervisors. In 2001, the China Securities Regulatory Commission issued "the guidance of establishment of independent directors for listed companies," which required the listed companies to adopt the independent directors in board of directors, the Board of directors should at least include two members, and the proportion of independent directors of listed companies shall not be less than 1/3. In January 2002, China Securities Regulatory Commission, the State Economic and Trade Commission jointly issued the "Corporate Governance Codes", the "Codes" clearly declared once again that listed companies should establish an independent director system, which serves as a milestone of the subsequent corporate governance reforms in China. However, the board of directors in SOEs is appointed by the State-Owned Assets Supervision and Administration Commission (SASAC) who is a representative of the State of Council to ensure state asset preservation and appreciation. This is different from that selected by shareholders in other firms.

China characterized with a weak external corporate governance system. Chinese Criminal Law, Company Law, and Securities Law relatively neglect civil liability and compensation, and has not provided a procedure and specific clauses for enforceable civil actions. Because of undeveloped professional management, the market for corporate control is weak (Lin, 2001). Moreover, the institutional investors in China are not as active as in the U.S to monitor (Tenev and Zhang, 2002). Although the corporate governance efficiency has been improved after split share reform launched during the period from 2005 to 2007, the concentrated ownership for listed companies in China is not changed (Jiang and Kim, 2015). In such weak external governance settings, as born with the absence of owner, the SOEs would suffer from serious interest conflict between shareholders and mangers. Mostly operated and controlled by founders, the POEs could experience the agency problems led by large shareholders and minority shareholders.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Board Formation and Adjustment

In a complete marketization environment, board structure is the responses to the trade-offs of the benefits and costs associated with board changes (Adams and Ferreira, 2007; Raheja, 2005). There are two main theories for explaining the formation of corporate board and its changes. One is agency cost theory, which is rooted in the separation of ownership and control of firms, and argue that the agents could tack an action to sacrifice the owners' interest for maximization their own interest when there are interest conflicts between them, then the agency cost emerges (Jensen and Meckling,1976). Board of directors is set up for representing all shareholders to monitor managers or controlling shareholders, leading to lower agency costs. Accordingly, the higher the representativeness of the board, the more efficient would be in monitoring. However, as firms' ownership becomes dispersed, the real representativeness of board is weakening, and then inviting independent directors to join the board would be more efficient. That is, a larger or more independent board representing higher representativeness could efficiently play a role of monitoring. The other is resource dependence theory, which argues that firms will try to exert control over their contingent environment by co-opting the resources needed for development (Pfeffer and Salancik 1978). Accordingly, adding internal directors to the board indicates the firm may reassign control power among directors for taking advantage of the new directors' expertise; while inviting independent directors to the board implies the firm would transfer parts of firms' informing and deciding rights to the outsiders for accessing to external resources. The two theories above interpret two roles of monitoring and advising that directors would play in the firms, emphasizing the expansion of board would bring benefits for firms. However, the expansion of board could also bring with costs, according to transaction cost theory (Coase, 1937), the information transferring costs and coordination costs among larger board are becoming higher with board size or independence increasing. Therefore, Board structure would be trade-offs by the costs and benefits coming from directors' monitoring and advising (Adams and Ferreira, 2007; Harris and Raviv, 2008; Linck et al, 2008; Wintoki et al., 2012).

By recognizing the two roles of board of directors, recent scholars have suggested that the trade-offs above are related with board structure. Theoretical literatures indicate that the mix of insider and outside directors would be traded off by information transferring costs among outside directors and benefits of advising or resources provided by them (Raheja, 2005). Independent director dominated board for firms suffering severe agency problems and insider directors dominated board for firms with higher private information are all optimal (Harris and Raviv, 2008). Then empirical literatures provide evidences that board structure are determined by the costs and benefits related to directors, using firm's specific fundaments to capture such costs and benefits. For example, Fama and Jensen (1983) provide evidence that board structure is determined by firm's segments, and they further show that firms with more segments should invite more independent directors to sit on the board. Hermalin and Weisbach (1998) find that board structure is also determined by firms past performance and CEO tenure. Knoeber (2001) suggest that it is better for large firms expand their board size for executing monitoring. In addition, Lehn et al (2009) show that internal directors of the firms are becoming large with growth opportunity increasing, while it becomes small with firm size increasing. Sur et al (2013) further indicate that board structure is effect by ownership structure. Therefore, board structure/characteristics could be the function of the specific underlying fundamentals of firms (Williamson, 1988). Based on the analysis above, we propose the hypothesis as follow:

Hypotheses 1a: Board structure is determinate by firms' underlying fundamentals.

The trade-off theory of board formation and adjustment above is also suggest there are target/optimal board structure for a firm, and the target board structure is determined by the specific fundamentals (Jensen and Meckling,1976; Pfeffer and Salancik, 1978). Any deviation induced by the changes of some fundamentals of firm from target board structure would imply the loss of economic efficiency (Cicero et al, 2012). Then firms will adjust their board structure toward target board structure from sub-optimal status in pursue of economic efficiency. Therefore, we propose the following hypothesis:

Hypothesis 1b: Firms could speedily adjust their board structure toward target board structure.

There are two main kinds of firms, SOEs and POEs in China. Undoubtedly, the theories of board formation above can be applied to both SOEs and POEs, but the director nomination of them is not the same each other, which may lead to the differences in their adjustment speed of board structure. In China, the SOEs are usually controlled by government or government representatives (Jiang and Kim, 2015). According to the Chinese company law, board of directors should be appointed by the national or local SASAC who is a representative of the State of Council, thus the adjustment of board structure for SOEs must be intervened by government (Dickson 2003; Gao and Tian 2006). Relatively, the POEs that are more market-oriented can make their own decision in response to business environment, and the board for POEs is selected by shareholder meeting. It is no doubt that either the adjustment of board for SOEs or for POEs would be responses to the benefits and costs of changing in directors to pursue economic efficiency. However, the government's response to business environment must be less quick than market-oriented firms, as government is commonly considered to be less efficient in market ( ). Therefore, we expect that the adjustment speed of combined both insider directors and independent directors (board structure/size) for SOEs could be less rapidly than that for POEs. In addition, the different status in the Chinese economy between SOEs and POEs could also lead to the differences in their adjustment speed of board structure. SOEs in China are enjoying a superior status than POEs in accessing to external resources (Poncet *et al*., 2010), which can also be applied to the supply market of directors. The SOEs in China could select and introduce independent directors to the board from more vast scope than POEs by their powerful influence and good social image. Meanwhile, the director candidates may also be more willing to be appointed as SOEs' independent directors than POEs', so that they can establish more valuable relationship with government. These all indicate the cost of adjustment for board independence may be less for SOEs than that for POEs. Therefore, we expect that the adjustment speed of board independence for SOEs could be more rapidly than that for POEs.

Hypothesis 1c: the adjustment speed of board size for SOEs could be slower than that for POEs.

Hypothesis 1d: the adjustment speed of board independence for SOEs could be quicker than that for POEs.

Drivers of Board Structure Adjustment

The board of directors is expected to play important roles in company with advisory and monitoring (Jensen, 1983).Theories of board structure from agency perspective suggested that board of directors is established for monitoring manager, and independent director can play an active part in preventing managerial private benefits (Jensen, 1983; MacAvoy and Millstein, 1999), so the severity of agency problem that firm confronted are one of the main determinants of board adjustment. Theories of friendly board proved that firms could gain much valuable resources and advising from outside directors with different backgrounds (Adams and Ferreira, 2007; Adams and Mehran, 2003; Agrawal and Knoeber, 2001), thus, the changeable needs for external resources of the firm is the other important determinants of board adjustment. Therefore, the adjustment of board structure would be driven by both monitoring and advisory.

Considering the different characteristics and their status In Chinese settings, the dominant drivers of board adjustment for the SOEs could be different from that for POEs. In terms of the SOEs in China, they are born of lack of real owner and characterized with concentrated government ownership, which may cause them to be controlled by insider group; such then would result in serious agency problems. At the same time, the SOEs enjoy a superior status in accessing to social resources (Poncet *et al*., 2010), as they dominated the economy and controlled by government. Consequently, their need for monitoring may outweigh that for advisory/resources. Where the monitoring may not be mainly from insider directors, but from independent directors, because of the absence of real owners. Therefore, we expect that the monitoring-driven adjustment would outweigh advisory-driven adjustment in board independence for SOEs. When it comes to POEs in China, they are still experiencing inferior status, especially in accessing to resources from government. Some researches show that POEs is always resources constraint in China (Poncet *et al*., 2010). Meanwhile, the POEs are usually operated and controlled by the founders or founders' family, even though there is possible agency problem between large shareholders and minority shareholders in weak governance settings, the motivation for monitoring themselves may be weaker. Thus, their need for resources may outweigh that for monitoring, and the resources could mainly from introducing external independent directors, because of their resource constraints. Therefore, we expect that the advisory-driven adjustment would outweigh monitoring-driven adjustment in board independence for POEs.

As for the drivers of board size, according to the Chinese law and corporate practice about board of directors, the insider directors on board are dominant for almost all of the listed companies (both SOEs and POEs), and the independent directors account for about 1/3 or a bitter above of the board. Thus, the adjustment of board size must be dominant by insider directors' changes. According to the roles of monitoring and advisory rooted in agency theory and resource dependence theory, SOEs are born of absence of real owner, any changes in insider directors could not inevitably lead to weaken agency problems, thus, changes in insider directors could mostly be considered to introduce to resources/advisory (eg: introducing more talent decision makers to company). Whereas, POEs are usually controlled by private founders or large shareholders, the insiders would exert their own resources to support company growth. Thus, any changes in insider directors could mainly aim to improve agency problem to care for minor shareholders. Therefore, we can expect that advisory-driven adjustment would outweigh monitoring-driven adjustment in board size for SOEs; and we can also expect that the monitoring-driven adjustment would outweigh advisory-driven adjustment in board size for POEs. Based on the analyses above, we proposed the following hypotheses:

Hypothesis 2: the adjustment of board structure would be driven by both monitoring and advisory.

Hypothesis2a: the monitoring-driven adjustment would outweigh the advisory-driven adjustment in board independence for SOEs; inversely, the advisory-driven adjustment would outweigh the monitoring-driven adjustment in board independence for POEs.

Hypothesis2b: the advisory-driven adjustment would outweigh the monitoring-driven adjustment in board size for SOEs; inversely, the monitoring-driven adjustment would outweigh the advisory-driven adjustment in board size for POEs;

METHODOLOGY

Models

We will employ partial adjustment model to estimate the dynamic adjustment toward target board structure, the partial adjustment model that has been widely used in the capital structure literature (e.g., Flannery and Rangan, 2006; Faulkender et al., 2012) and emerged in estimating board structure (Cicero et al, 2013). A typical partial target board structure adjustment model can be written as:

$$Y_{i,t} - Y_{i,t-2} = \delta(Y^*_{i.t} - Y_{i,t-2}) + \varepsilon_{i,t} \qquad (1)$$

Where $Y_{i,t}$ is time varying and could represent either board size or board independence for firm *i* at time *t*, δ is the adjustment speed toward the target level, $\varepsilon_{i,t}$ is the residual, and $Y^*_{i.t}$ is the optimal level represent either board size or board independence for firm *i* at time *t*, which can be predicted as the following model:

$$Y^*_{i,t} = \alpha + \beta X_{i,t-2} + v_i \qquad (2)$$

Where $X_{i,t-2}$ represents the variable vector of firm characteristics (that would specify as following) that can predict for the determinants of board structure. v_i is the variable not changing with time, which can be interpreted as industry for firm at time *t* belonged to. Substituting Equation (1) in equation (3), we can obtain:

$$Y_{i,t} = (1-\delta)Y_{i,t-2} + \delta\beta X_{i,t-2} + v_i + \varepsilon_{i,t} \qquad (3)$$

The specification in Equation (1) and (3) assumes that firms have the same speed of adjustment. The key empirical question centers on the magnitude and significance of δ. But these adjustment models are too simple to capture the adjustment speed that can vary due to changing monitoring or advisory directors. By allowing the differential adjustment speed to vary between monitoring and advising directors, we specify the target adjustment model as follows:

$$\Delta BS_{i,t} = \delta_1 TBSD * D^{Monitoring} + \delta_2 TBSD * D^{Advisory} + \varepsilon_{i,t} \qquad (4)$$

Where $\Delta BS_{i,t} = Y_{i,t} - Y_{i,t-2}$, which indicates the changing in board structure (including board size or board independence) between time t-1 and time t; $TBSD_{i,t} = Y^*_{i,t} - Y_{i,t-2}$ captures the deviation from target board structure (including board size or board independence) at time t-1. $D^{Monitoring}$ is a dummy variable, which represents the board structure changing only with monitoring directors, similarly, $D^{Advisory}$ is also a dummy variable that represents the board structure changing only with advisory directors.

We also specify the following equation (5) to evaluate the effects of the deviation from target board structure on corporate performance both for SOEs and POEs.

$$CorpPerfm = \alpha + \gamma_1 TBSD + + \gamma_2 TBSD * BS_{i,t}^{monitoring} / TBSD * BS_{i,t}^{advisory} + \gamma_3 BS_{i,t}^{monitoring} / BS_{i,t}^{advisory}$$

$$+ \eta Controls_{i,t} + \pi_{i,t} \quad (5)$$

Where *CorpPerfm* represents corporate performance, which includes RNT, ROA and ROE. *Contronls* is the control variables, including firm size, leverage, firm risk, dual, growth opportunities, ownership concentration, large investor's ownership and managerial ownership, etc.

And π is the residual. The other variables in this equation are defined as above.

Considering the nature of the model, we can estimate equation (1) and (4) using OLS estimation. While given the partial adjustment model in Equation (3) is a typical dynamic model, the methodology of dynamic system GMM is expected to be a more proper econometric method than OLS estimation method, as it can limit the biases caused by both unobserved heterogeneity and dynamic endogeneity (Wintoki et al., 2012; Flannery and Hankins, 2013), so we employ the estimation methodology of dynamic system GMM proposed by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998) to estimate equation (3).

Variables Construction

In the regressions for estimating the optimal board structure, we use board size and board independence to descript board structure, where board size is defined as the number of board members, and board independence is the ratio of independent directors on the board. We also use several variables as the main determinants of board structure according to prior related literatures (Coles et al, 2008; Linck et al, 2008; Guest, 2009; Cicero, Wintoki and Yang, 2013), such as firm size, firm age, business segments of firm, leverage, firm risk, and growth opportunities, we measure firm size as the logarithm of firm's total asset, Firm age is the firm's age computed from the time the firm went public, and business segments are the number of business segments, then firm risk is measured by standard deviation of the past twelve months of the firm's stock returns, Leverage is the ratio of the firm's long-term debt to total assets, and growth opportunities is defined the ratio of market-to-book value. Besides, we also include ownership concentration, large investor's ownership, managerial ownership and the nature of firm's ultimate controller, because such variables are different from U.S companies (Liu, 2006; Jiang and Kim, 2015). We define ownership concentration as the proportion of the top three major shareholders, large investor's ownership is the proportion of outside institutional investors, and managerial ownership is measured by the proportion of the CEO's shareholdings, then, the nature of firm's ultimate controller is a dummy variable, its value is equal to 1 if the controller is the nation or state, otherwise 0.

In order to separately measure the roles of directors acting as monitoring or advisory, consistent with Reeb and Upadhyay (2010), we classify several kinds of directors turnover in committees that a firm may have as monitoring, including the audit, nominating, compensation committees, corporate governance, and executive committees (Klein, 1998). And similarly, directors turnover in committees such as finance, investment, public issues, diversity, mergers and acquisition, ethics, environment, technology advisory and employee development are categorize as advising. The dummy variables of $D^{Monitoring}$ is equal to 1 if board structure changing by directors with background like accounting, law or other background but changing in monitoring committees listed above, otherwise 0; The dummy variables of $D^{Advisory}$ is equal to 1 if board structure changing by directors with background like finance, technology and working experience in government or other background but changing in advising committees above, otherwise 0; and if the above two simultaneously take place, the one function between advisory and monitoring relative larger changing is defined as such function changes, and it equals to 1, otherwise 0.

As industry and time have impacts on board structure, so we take them as control variables. We define Industry variables as dummy variable; the industry the company belonged to equals 1, while other industries equal 0. Similarly, we define time variable as year dummies, the annual year equals 1, while the others equal 0.

The main determinants of board structure are defined in detail as the following Table 1:

Insert Table 1 here

Data

The initial data of our study consists of all available China's A share listed companies from CSMAR dataset for the period from 2007 to 2013. As prior researches pointed that board structure changes slowly and the year to year sample may have high serial correlation, that would be result in severe validity problem when using dynamic system GMM estimates. So we choose the sample at two internals in accordance with the existing literature (Hermalin and Weisbach, 1988; Boone et al., 2007; Wintoki et al., 2012; Cicero, Wintoki and Yang, 2013). We eliminate financial firms from the sample, because firms in such industry have many special characteristics that substantially differ from other industries. After that, we classified the sample into 22 industries including 10 sub-industries in manufacture industry based on the standard industrial classification of China Securities Regulatory Commission. We drop observations with key variables missing. After filtering, the total sample finally for the study included 6227 firm-year observations in 20 industries with 2007, 2009, 2011 and 2013 years.

Besides, we hand collect director turnover data by reviewing the annual financial report and directors' CV. We identify director turnover as monitoring director turnover if we find evidence in accordance with the turnover directors being of accounting/auditing, law and worked in audit, nominating, compensation committees, corporate governance, and executive committees; and We consider director turnover as advising director turnover if that happened in committees such as finance, investment, public issues, diversity, mergers and acquisition, ethics, environment, technology advisory and employee development. The changes in board committee are shown in the following table 2. From the table we find a total of 557 firms have experienced changes in board committee in 2009, among of them, 183 firms have changed in monitoring committee and 193 firms have changed in advising committee, which are all contributed to board changes; while 181 firms that changed board committee but not board structure. There are more firms experiencing board committee changes in 2011, that is, 160 firms have changed in monitoring committee and 220 firms have changed in advising committee, which are all contributed to board changes; but the rest 268firms that changed board committee but not board structure. Similarly, 172 firms have changed in monitoring committee and 292 firms have changed in advising committee, which are all contributed to board changes; but the rest 352 firms that changed board committee but not board structure.

Insert Table 2 here

ESTIMATION AND RESULTS

Descriptive Statistics of Main Variables

Table 3 presents summary statistics on the main variables for the year 2007, 2009, 2011, and 2013 as well as the full sample of 6227 firm-year observations. In panel A, the average number of board size is 9.33, 9.11, 8.97 and 8.82 in the year of 2007, 2009, 2011 and 2013 respectively, which shows a decreasing trend during the above period. While, the average value for board independence is 0.359, 0.364, 0.369 and 0.373 for the above interval years with an increasing trend during the period. These suggest that board structure in our sample could be changing. In Panel B, the average value of dual shows an increasing trend across the internal years, which implies the CEO power could be stronger for China's listed firms; the average value of MStckH and LgStckH across the year of 2007 and 2013 evidenced an increasing trend, even though the proportion of managerial shareholdings and large institutional shareholdings in China's listed firms is relatively small. However, for the variables of RetnStd and Debt, the average value is decreasing during that period, which means the stock volatility and firm leverage is being lower. The changing trend for some other variables is not linear and significant.

Insert Table 3 here

Table 4 presents the summary statistics for China's listed firms experiencing changes in board structure (including board size and independence) from the year of 2007 to 2013. Within a two-year interval, there are 352 firms changing in board size, 358 firms changing in board independence and 376 firms changing either in board size or board independence between 2007 and 2009; which respectively account for 0.336, 0.341 and 0.358 in observations of 2009. Similarly, 355 firms experience a change in board size, 369 firms experience a change in board independence and 380 firms experience a change either in board size or board independence between 2009and 2011; which account for 0.338, 0.352 and 0.362 in observations of 2011, respectively. Compared with the above two period, the changes in board structure is increasing relatively bigger, as it shows that changes in board size with 440 firms, changes in board independence with 454 firms and changes in board size or board independence with 464 firms, which takes up 0.419, 0.433 and 0.442 respectively in observations of 2013. The changes in board structure is relatively less frequent and slower than that in the U.S, as Cicero et al (2013) pointed that within any two-year period, between 40% and 60% of firms change the size of their boards over a two-year period, with an average of 48% doing so, and between 50% and 70% of sample firms experience a change in the level of board independence.

Thus, the changes in board structure for China's listed firms are prominent, but the frequency for them is less frequent than that for the U.S firms, which are consistent with the notion that an appropriate board structure is economically important to firms and they actively adjust to it, but the changes may be influenced by government intervene and weak external governance environments.

Insert Table 4 here

Optimal Board Structure

As indicated by equation (2), the target board structure can be predicted by the determinants, which includes not only firm characteristics suggested by the studies using western counties' data (Coles et al., 2008; Linck et al., 2008), but also characteristics about corporate governance, because such are different from the western countries, so it may have significant effect on board structure. The results of our estimation are reported in Table 5, as expected, both board size and board independence are significantly related by most of the determinant variables. Specially, board size is significantly and positively related to firm size, debt ratio and state, significantly and negatively relatively to firm age, the number of business segments, dual and ownership concentration. Whereas board independence is positively and significantly affected by firm size, stock return volatility, dual and ownership concentration, negatively and significantly affected by state. It is worth emphasized that the variable of state is positively significant with board size, and negatively significant with board independence, which suggests not only that SOEs are likely to have larger board size and less independent board, but also the adjustment of may be different between SOEs and POEs. So the results above are not fully consistent with the determinants of board structure used in the work by Cicero et al (2013) with the U.S environment, because of different firm characteristics shared with in China and in the U.S, but it could provide a strong evidence for the validity of the proxies used in our partial adjustment model of board structure.

Insert Table 5 here

Do firms actively adjust toward their optimal board structures? Fig. 1 directly shows how board changes relate to the distance from the predicted optimal board structure. We can see from Fig.1a that there is a monotonic relationship between changes in both size and the deviation from the predicted optimal board size, which imply that firms whose boards are smaller than the predicted board size tend to increase their board size, while those with larger boards than predicted tend to reduce board size. It also reflects that the bigger the deviation from the predicted board size, the larger the adjustment that firms make. Fig. 1b displays a similar pattern for board independence. Therefore, the results above provide strong support for our proposition that firms actively adjust toward optimal board structures. However, the board structure adjustment is not toward one direction but from both extreme deviations to the optimal target structure. So, Firms may not own a much larger or smaller board size or independence, but will tend to keep a more mediate board structure in consistent with their peers.

Insert Fig.1a here

Insert Fig.1b here

Speed of Board Structure Adjustment

Till now, we have estimated the optimal board structure, but how do firms adjust toward their target board structure. By employing the partial adjustment model specified in equation (3), we estimate board structure adjustment in this Section. As prior researches shown, the ordinary method(for example, Fixed Effects and Random Effect) used for estimating dynamic panel data can not capture the unobserved firm heterogeneity, simultaneity and reverse causality, which would result in biased estimation, so we employ the method of system dynamic panel GMM to estimate equation (3).

The results are presented in table 6; from the first part about board size estimation in table 5, we find that the coefficient of the lag board size is positive statistically significant with a value of 0.619, which implied the adjustment speed toward target board size is 0.381 (it equals to 1-0.619) over two-year period to close about 0.619 gap between actual and predicted board size. We also find that the board structure is significantly affected by most of firm characteristics and corporate governance variables, which is consistent with our expectation. From the second part of table 5 about board independence, we can see that the coefficient of lag independence is also positive and statistically significant with a value of 0.548, which implied the adjustment speed toward target board independence is 0.452 (it equals to 1-0.548) over any two-year period to close about 0.548 gap between actual and predicted board independence. Compared with the results from Cicero et al (2013), the adjustment speed for board size and board independence in Chinese settings is much less quicker than that in the U.S settings. Which is consistent with our notion that such adjustment speed in China could be blocked by government intervene and weak external governance environments.

At the end of the table 6, we also report specification tests for the SYS-GMM estimation to justify the validity of our estimation. Because the choice of instrument variables are is important for our estimation results, under the hypothesis of instrument validity, the two related test of Hansen test and Sargen test all can not be rejected, which evidenced that the choice of instrument variables in SYS-GMM estimation both for board size and board independence regressions are all validity.

Insert Table 6 here

The above results about the adjustment speed of board structure implied that all sample firms have one adjustment speed. However, do all companies share the same adjustment speed in China? As indicated in the section of institutional environment, there are two main significantly different kinds of firms in China's listed companies, SOEs and POEs. Then, we divide the full sample into two sub-samples of SOEs and POEs, and carry out the SYS-GMM estimation for the sub-samples.

Table 7 presents the results about the adjustment speed of board structure both for SOEs and POEs. from the board size estimation in table 7, we find that the coefficient of the lag board size both for SOEs and POEs is positive statistically significant, and the coefficient value of board size for SOEs is 0.706, while the coefficient value for POEs is 0.596; which implied the adjustment speed toward target board size for SOEs is 0.294 (it equals to 1-0.706) and for POEs is 0.404 (it equals to 1-0.596) over two-year period respectively, and it is about 0.706 for SOEs and 0.596 for POEs close the gap of between actual and predicted board size, so the adjustment speed in board size of SOEs is slower than that of POEs, which can be explained by more intervene from government in changes of board size for SOEs than for POEs, or more market oriented changes on board for POEs than for SOEs. And most of the other determinant variables of board size are also significant, which are consistent with our expectation.

From the board independence estimation in table 7, we find that the coefficient of the lag board independence both for SOEs and POEs is positive statistically significant, and the coefficient value of board independence for SOEs is 0.431 and for POEs is 0.635; which implied the adjustment speed toward target board independence for SOEs is 0.569 (it equals to 1-0.431) and for POEs is 0.365 (it equals to 1-0.635) over two-year period respectively, and it is about 0.431 for SOEs and 0.635 for POEs close the gap of between actual and predicted board independence, so the adjustment speed in board independence of SOEs is faster than that of POEs, which suggest that SOEs are more desired to introduce outside directors to monitor or advise than POEs, because of absence of the real owner in SOEs, while the changes in board dependence for POEs may be more costly than SOEs with a large possible opposition from internal powerful owner group. The results are also indicating that the adjustment in board size for SOEs is mostly determinant by independent (outside) directors changes, while for POEs that are attributed to the changes in internal directors, which is in accordance with our expectation.

At the end of the table 7, we also report specification tests for the SYS-GMM estimation to justify the validity of our estimation for each regression. Under the hypothesis of instrument validity, the two related test of Hansen test and Sargen test all can not be rejected, which evidenced that the SYS-GMM estimation both for board size and board independence regressions are all validity .

Insert Table 7 here

Whether Board Structure Adjustments is Driven by Advisory or Monitoring?

To provide evidence on the mechanisms through which drive board structure adjustment, we explore to what extent the adjustment speed of board structure can be explained by monitoring-driven and advisory-driven adjustment toward target board structure. A large number of literatures have theoretically analyzed either the advisory function or monitoring function of board, but prior researches rarely study on that by separately measuring the roles of directors acting as monitoring or advisory. Consistent with Reeb and Upadhyay (2010), we classify several kinds of directors turnover in committees that a firm may have as changes in monitoring function, including the audit, nominating, compensation committees, corporate governance, and executive committees (Klein, 1998). And similarly, directors turnover in committees such as finance, investment, public issues, diversity, mergers and acquisition, ethics, environment, technology advisory and employee development are categorize as changes in advising function. Then we test how the board structure adjustment can be explained by board changes in monitoring function or advisory function.

We carry out our estimation in this section by mixed effects model (MEM), as it allows for a cross-sectional heteroskedastic and time-wise autoregressive covariance as well as firm and year fixed effects, which we may mostly solve the problem about the effects of unobserved variables varying systematically across firms and over time in the estimation.

Table 8 reports the estimation results for the target board structure adjustment model specified by equation (4). Panel A shows the estimation for board size and Panel B shows the estimation for board independence respectively with all samples, sub-sample of SOEs and POEs. In Panel A, the board size adjustment coefficient estimates are 0.382 for all samples, 0.306 for SOEs and 0.402 for POEs. When we turn to the different impacts of monitoring-driven and advisory-driven adjustment on the adjustment speed of board structure, the coefficients for monitoring-driven variable becomes 0.374 and for advisory-driven variable is 0.387 for all samples. Similarly, the coefficients for monitoring-driven variables is 0.288 and for advisory-driven variable is 0.319 for SOEs, and the coefficients for monitoring-driven variable is 0.439 and for advisory-driven variable is 0.383 for POEs. The differences in the estimates between advisory and monitoring are highly significant as indicated by F-test p-values across the three samples, which suggest that the adjustment speed of board size is mostly driven by advisory induced adjustment other than monitoring induced adjustment for SOEs; conversely, it is mainly driven by monitoring induced adjustment other than advisory induced adjustment for POEs. The results are consistent with our expectation.

In Panel B, the board independence adjustment estimates are 0.453 for all samples, 0.572 for SOEs and 0.366 for POEs. When we allows for the different impacts on adjustment speed between monitoring-driven and advisory-driven adjustment, the coefficients for monitoring-driven variable becomes 0.460 and for advisory-driven variable is 0.448 for all samples, similarly, the coefficients for monitoring-driven variable is 0.579 and for advisory-driven variable is 0.567 for SOEs, and the coefficients for monitoring-driven variable is 0.335 and for advisory-driven variable is 0.389 for POEs. The differences in the estimates between advisory and monitoring are also highly significant as indicated by F-test p-values across the three samples, which suggest that the adjustment speed of board independence is mostly driven by monitoring induced adjustment other than advisory induced adjustment for SOEs; conversely, it is mainly driven by advisory induced adjustment other than monitoring induced adjustment for POEs. The results are also consistent with our expectation.

Insert Table 8 here

How Does the Adjustment Toward the Rarget Board Structure Affect Firm Performance?

We have provided evidence that how do firms adjust their board structure for China's SOEs and POEs. In this section we study how the monitoring-driven and advisory-driven board structure adjustment affect firm performance. We employ ROA (Return on Asset) and ROE (Return on Equity) measure corporate performance. Namely, ROA can be calculated by the ratio of EBIT (earnings before interest and tax) on shareholders equity, which shows the ratio of how profitable a company's assets (including debt and equity) are in generating revenue. Similarly, ROE is calculated by the ratio of net income on shareholders equity, which measures a corporation's profitability by revealing how much profit a company generates with the money shareholders have invested.

Table 9 presents the results for the effect of Deviation from Target Board Structure on Performance for SOEs specified by equation (5). Panel A shows the results for the effects of deviation in board size on performance and Panel B shows the results for the effects of deviation in board independence on performance respectively with dependent variables of ROA and ROE. In Panel A, as dependent variables is ROA, in Column 1 we introduce an interaction term of dummy variable of changing in advisory directors and the deviation from target board size, we get a significant and negative correlation between TBSD and ROA, and the interaction variable of $TBSD*D^{dvisory}$ is negative but not significantly related with ROA, which indicates that firm performance could be improved as the adjustment of board size toward their target board size from such deviation, but the improvement of firm performance is not influenced by advisory-driven adjustment toward target board size. In Column 2 we introduce an interaction term of dummy variable of changing in monitoring directors and the deviation from target board size, the coefficients of TBSD is insignificant, while the coefficients of interaction variable of $TBSD*D^{monitoring}$ is negatively and significantly related with ROA, which indicates that the improvement of firm performance is influenced by monitoring-driven adjustment toward target board size. When dependent variables is ROE, we get the similar results as the above, that is, in Column 1 we also get a significant and negative correlation between TBSD and ROE, While the interaction variable of $TBSD*D^{dvisory}$ is negative but not significantly related with ROE; In Column 2, the coefficients of TBSD is not significant, but the coefficients of interaction variable of $TBSD*D^{monitoring}$ is negatively and significantly related with ROE, which indicates that firm performance could be improved by the adjustment of board size toward their target board size from such deviation, and the improvement of firm performance is affected by monitoring-driven adjustment in board size, but not advisory-driven adjustment toward target board size.

In Panel B, When dependent variables is ROA, In Column 1 we introduce an interaction term of dummy variable of changing in advisory directors and the deviation from target board independence, we also get a insignificant and positively correlation between TBSD and ROA, But the interaction variable of $TBSD*D^{dvisory}$ is positive but not significantly related with ROA, which indicates that firm performance could not be improved by the adjustment toward target board independence from the deviation, and the improvement of firm performance is not influenced by advisory-driven adjustment in board independence. In Column 2 we introduce an interaction term of dummy variable of changing in monitoring directors and the deviation from target board independence, the coefficients of TBSD is not significant, and the coefficients of interaction variable of $TBSD*D^{monitoring}$ is also negatively and insignificantly related with ROA. However, the coefficients of $D^{monitoring}$ is positive and significant, which indicates that the improvement of firm performance is not influenced by monitoring-driven adjustment or advisory-driven adjustment toward target board independence, but that can be improved by changing in monitoring directors in board independence. As dependent variables is ROE, we get the similar results as the above, that is, in Column 1 we also get a insignificant and positive correlation between TBSD and ROE, While the interaction variable of $TBSD*D^{dvisory}$ is negative and insignificantly related with ROE; In Column 2, the coefficients of TBSD is insignificant, and the coefficients of interaction variable of $TBSD*D^{monitoring}$ is positively and insignificantly related with ROE, but the coefficients of $D^{monitoring}$ is positive and significant, which indicates that the improvement of firm performance could not be effected by monitoring-driven adjustment or advisory-driven adjustment toward target board independence, but that can be improved by changing in monitoring directors in board independence.

In sum, for SOEs, corporate performance could be improved by the adjustment toward target board size from the deviation, and the improvement of firm performance is influenced by monitoring-driven adjustment, but not advisory-driven toward target board size. While, firm performance could not be improved by monitoring-driven adjustment or advisory-driven adjustment toward target board independence, but that can be improved by changing in monitoring directors in board independence.

Insert Table 9 here

Table 10 reports the results for the effect of Deviation from Target Board Structure on Performance for POEs specified by equation (5). Panel A shows the results for the effects of deviation in board size on performance and Panel B shows the results for the effects of deviation in board independence on performance respectively with dependent variables of ROA and ROE.

In Panel A, as dependent variables is ROA, in Column 1 we introduce an interaction term of dummy variable of changing in advisory directors and the deviation from target board size, we also get a insignificant and negative correlation between TBSD and ROA, But the interaction variable of $TBSD*D^{dvisory}$ is negative and significantly related with ROA, which indicates that the improvement of corporate performance is influenced by advisory-driven adjustment toward target board size. In Column 2 we introduce an interaction term of dummy variable of changing in monitoring directors and the deviation from target board size, the coefficients of TBSD is not significant, and the coefficients of interaction variable of $TBSD*D^{monitoring}$ is not significant yet, which indicates that the improvement of firm performance can not be affected by monitoring-driven adjustment toward target board size. When dependent variables is ROE, we get the similar results as the above, that is, in Column 1 we also get a insignificant and negative correlation between TBSD and ROE, While the interaction variable of $TBSD*D^{dvisory}$ is significant and negatively related with ROE; In Column 2, the coefficients of TBSD is insignificant, and the coefficients of interaction variable of $TBSD*D^{monitoring}$ is insignificant yet, which indicates that the improvement of corporate performance is influenced by advisory-driven adjustment toward target board size, but not by monitoring-driven adjustment toward target board size.

In Panel B, When dependent variables is ROA, in Column 1 we introduce an interaction term of dummy variable of changing in advisory directors and the deviation from target board independence, we also get a insignificant and positive correlation between TBSD and ROA, But the interaction variable of $TBSD*D^{dvisory}$ is negatively and significantly related with ROA, which indicates that the improvement of firm performance can be affected by advisory-driven adjustment toward target board independence. In Column 2 we introduce an interaction term of dummy variable of changing in monitoring directors and the deviation from target board independence, the coefficients of TBSD is not significant, and the coefficients of interaction variable of $TBSD*D^{monitoring}$ is also insignificantly related with ROA, which indicates that the improvement of firm performance can not be influenced by monitoring-driven adjustment toward target board independence. As dependent variables is ROE, the results show that, in Column 1 we also get a insignificant and positive correlation between TBSD and ROE, and the interaction variable of $TBSD*D^{dvisory}$ is negative and insignificantly related with ROE; and the similar results In Column 2, which indicates that the improvement of firm performance is not effected by monitoring-driven adjustment or by advisory- driven adjustment toward target board independence.

In sum, for POEs, the improvement of firm performance can be influenced by advisory-driven adjustment toward target board size, but not by monitoring-driven adjustment toward target board size. While, firm performance measured by ROA not ROE can be improved by advisory-driven adjustment toward target board independence.

Insert Table 10 here

CONCLUSIONS AND IMPLICATIONS

We investigate how firms adjust their board structure in China. Using the determinants of board structure that widely evidenced in the literature and characterized with China's setting, we have first estimated the optimal board structure of listed firms, and investigated the deviation and adjustment speed to target board structure for China's listed companies. Furthermore, by sorting board directors into two function separately labeled with monitoring and advising according to which committee they belonged to or the background of new changing directors, we have also studied whether and to what extent the dynamic adjustments of board structure are driven by the firms' need for monitoring or advising. Finally, we have extended our research to examine what kinds of firms intend to adjust their board structure by certain board functions, and the effects of such adjustments in these firms.

We document the changes in board structure for China's listed firms: within any two-year period, between 33% and 42% of firms change the size of their boards and between 34% and 45% of our sample firms experience a change in the level of board independence. The SOEs are likely to have larger board size and less independent board. We show that the adjustment speed toward the target board size is 0.381over two-year period, the adjustment speed toward the target board independence is 0.452, and the adjustment speed for the board independence is much faster than that for board size for all sample firms. Moreover, the adjustment speed toward the target board size for SOEs is 0.294 and for POEs is 0.404 over a two-year period respectively. The finding presents that the adjustment speed in board size for SOEs is slower than that for POEs. The adjustment speed toward the target board independence for SOEs is 0.569 and for POEs is 0.365 over a two-year period respectively; which indicate that the adjustment speed in board independence for SOEs is faster than that for POEs. We also show that the adjustment speed of board size is significantly driven by the firm's needs for monitoring and advisory functions across all samples, sub-sample of SOEs and POEs. The adjustment speed for monitoring-driven adjustment is 0.374 and for advisory-driven adjustment is 0.387 for all samples, the adjustment speed for monitoring-driven is 0.288 and for advisory-driven is 0.319 for SOEs, and adjustment speed for monitoring-driven is 0.439 and for advisory-driven is 0.383 for POEs. The adjustment speed of board size for POEs is higher than SOEs no matter for monitoring-driven or advisory-driven. As for board independence, the adjustment speed for monitoring -driven is 0.460 and for advisory-driven is 0.448 for all samples, similarly, that for monitoring-driven is 0.579 and for advisory-driven is 0.567 for SOEs, while for monitoring-driven is 0.335 and for advisory-driven is 0.389 for POEs. The adjustment speed of board independence for POEs is lower than SOEs no matter for monitoring or advisory. Our results suggest that the adjustment is not only partial but also asymmetric between POEs and SOEs, which reflect their different needs in pursuit of their own economic efficiency.

We further find the performance for SOEs could be improved by monitoring-driven adjustment toward target board size, but not by advisory-driven adjustment. While the performance for the POEs can be improved by advisory-driven adjustment toward target board size, but not by monitoring-driven adjustment. Moreover, the performance for the SOEs could not be improved by monitoring-driven adjustment or by advisory-driven adjustment toward target board independence, but that can be improved by changing in monitoring directors in board independence. As for POEs, the performance measured by ROA not ROE can be improved by advisory-driven adjustment toward target board independence.

Our findings have important implications for managerial practitioners. Given the board structure dynamics in China's listed companies, managers have to timely adjust board structure to a proper level to improve company's competition ability. As board structure adjustment, our study suggests that it may be more helpful for POEs to admit directors who occupied much resource, while it may be more beneficial for SOEs to introduce directors who can effectively act as monitors.

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TABLE 1
The Main Variables Definition

Variable	**Definition**
Dsize	the number of board of directors
Indpd	the proportion of outside directors on the board
$D^{Monitoring}$	It equals to 1 if board structure changing by directors with background like accounting, law or other background but changing in monitoring committees listed above, otherwise 0.
$D^{Advisory}$	It equals to 1 if board structure changing by directors with background like finance, technology and working experience in government or other background but changing in advising committees above, otherwise 0.
Size	logarithm of the total asset of firm
Segments	the number of business segments.
MTB	The ratio of market-to-book value. This is obtained as market value of equity plus book value of assets minus book value of equity, divided by book value of assets
RetnStd	Standard deviation of the past twelve months' of the firm's stock returns
FirmAge	It is computed since firm going public
Debt	the ratio of the firm's long term debt to total assets
Dual	it equals 1 if the chairman of board is CEO, 0 otherwise
Concentr1	the ratio of the largest shareholder's stake
MStckH	the proportion of managerial shareholdings
LgStckH	Proportion of institutional shareholdings
State	It equal to 1 if the extreme controller is state,0 otherwise

TABLE 2

The Changes in Board Committees

Year	2009	2011	2013
Board structure changed by changes in advisory committee	193	220	292
Board structure changed by changes in monitoring committee	183	160	172
Firms that changed board committee but not board structure	181	268	352
Board committee changed in all	557	648	816

This table reports the summary statistics of changes in board structure including board size and board independence over any two-year period between 2007 and 2013.

TABLE 3

Summary Statistics for the Main Variables

Year	2007	2009	2011	2013
Panel A the Mean value of board structure				
Dsize	9.33	9.11	8.97	8.82
IndpD	0.359	0.364	0.369	0.373
Panel B the Mean value of the determinants of board structure				
Dual	0.14	0.16	0.23	0.24
Debt	0.544	0.598	0.480	0.444
Size	21.542	21.674	21.885	21.981
Segments	2.82	2.61	2.45	2.73
MTB	2.454	2.706	1.925	2.021
RetnStd	0.231	0.146	0.106	0.130

Firmage	8.63	9.38	9.13	9.48
Concentr1	0.356	0.363	0.364	0.364
MStckH	0.002	0.014	0.069	0.101
LgStckH	0.001	0.009	0.008	0.056
Observations	1155	1355	1672	2045

The table describes the board and firm characteristics of our sample. Dsize is the total number of directors on the board. IndpD is the proportion of outside directors on the board. Dual equals 1 if the chairman of board is CEO, 0 otherwise. Debt is the ratio of long-term debt to total assets. Size is the book value of total asset. Segments is the number of business segments the firm operates in. MTB is the ratio of market-to-book value, and it is obtained as market value of equity plus book value of assets minus book value of equity, divided by book value of assets. RetnStd is Standard deviation of the past twelve months' of the firm's stock returns. Firmage is computed since firm going public. Concentr1 is the ratio of the largest shareholder's stake. MStckH represents the proportion of managerial shareholdings. LgStckH is the Proportion of institutional shareholdings.

TABLE 4

Summary Statistics of Change in Board Structure

Year	2009		2011		2013	
	Sample	Ratio	Sample	Ratio	Sample	Ratio
Changes in board size	352	0.336	355	0.338	440	0.419
Changes in board independence	358	0.341	369	0.352	454	0.433
Changes in board size or in board independence	376	0.358	380	0.362	464	0.442
Firms that changed board members but not board structure	181	0.173	268	0.220	352	0.240
Observations	1049		1217		1468	

This table reports the summary statistics of changes in board structure including board size and board independence over any two-year period between 2007 and 2013. Board size is the total number of directors on the board. Board independence is the proportion of outside directors on the board.

TABLE 5

The Determinants of Optimal Board Structure

Dependent Variable	Board Size		Board Indpd	
	Coefficients	T value	Coefficients	T value
(Constant)	0.007	0.011	0.310***	16.681
Dual	-0.300***	-3.968	0.0068**	2.368
Size	0.444***	16.409	0.0027***	2.804
Debt	0.163*	1.879	-0.002	-0.699
Segments	-0.032*	-1.875	-0.0001	-0.129
MTB	-0.003	-0.368	0.0005*	1.755
RetnStd	-0.358	-1.614	0.023***	3.332
Firmage	-0.035***	-5.129	0.00004	0.188
Concentr1	-1.223***	-6.256	0.017***	2.820
MStckH	-0.443	-1.51	0.01	1.093
LgStckH	0.071	0.358	-0.006	-0.88
State	0.479***	7.613	-0.005***	-2.5801
Adj-R^2	0.152		0.021	
F Test	28.918***		4.277***	
Observations	3734		3734	

The results in the table from the OLS estimation of the model: $Y_{i,t}^{*} = \alpha + \beta X_{i,t-2} + v_i$. Y is either board size (Dsize) or board independence (IndpD). X is the independent variables, where Dual equals 1 if the chairman of board is CEO, 0 otherwise. Debt is the ratio of long-term debt to total assets. Size is the book value of total asset. Segments is the number of business segments the firm operates in. MTB is the ratio of market-to-book value, and it is obtained as market value of equity plus book value of assets minus book value of equity, divided by book value of assets. RetnStd is Standard deviation of the past twelve months' of the firm's stock returns. Firmage is computed since firm going public. Concentr1 is the ratio of the largest shareholder's stake. MStckH represents the proportion of managerial shareholdings. LgStckH is the Proportion of institutional shareholdings.

***p < .01
**p < .05
*p < .1

TABLE 6

The Adjustment Speed of Board Structure

Dependent Variable	Board size		Board independence	
	Coef.	T	Coef.	T
L_dsize	0.619***	10.43		
L_indpd			0.548***	9.79
Dual	-0.229***	-4.45	0.082*	1.81
Debt	0.02	1.09	-0.001	-1.07
Size	0.139***	4.31	0.003*	1.92
Segments	0.011	0.97	-0.0006*	-1.71
MtB	-0.001	-0.66	0.0002*	1.74
RetnStd	-0.815**	-2.19	0.036*	1.84
Firmage	-0.011**	-2.22	0.0005	1.61
Concentr1	-0.24	-1.43	0.01	1.42
MStckH	-0.161	-0.77	-0.014	-0.85
LgStckH	0.244	0.77	-0.013	-0.97
State	0.232***	4.48	0.004	0.83
Constant	0.433	0.83	0.073	2.04**
Implied speed	0.381		0.452	
Hansen'Jstatistics (p value)	0.350		0.677	
Sargen Test (p value)	0.201		0.164	
Observations	3734		3734	

We use the sys-GMM method to estimate all models with bias-corrected robust standard errors; t-statistics in parentheses. The dependent variable is either board size (Dsize) or board independence (IndpD). L_dsize is the number of board of directors at time t-2, L_indpd is the proportion of outside directors on the board at time t-2. Dual equals 1 if the chairman of board is CEO, 0 otherwise. Debt is the ratio of long-term debt to total assets. Size is the book value of total asset. Segments is the number of business segments the firm operates in. MTB is the ratio of market-to-book value, and it is obtained as market value of equity plus book value of assets minus book value of equity, divided by book value of assets. RetnStd is Standard deviation of the past twelve months' of the firm's stock returns. Firmage is computed since firm going public. Concentr1 is the ratio of the largest shareholder's stake. MStckH represents the proportion of managerial shareholdings. LgStckH is the Proportion of institutional shareholdings.

***p < .01

**p < .05

*p < .1

TABLE 7

The Adjustment Speed of Board Structure for Both SOEs and POEs

Dependent Variable	Board size		Board independence	
	SOEs	POEs	SOEs	POEs
L_dsize	0.706***	0.596***		
	(8.45)	(4.81)		
L_indpd			0.431***	0.635***
			(5.56)	(5.95)
Dual	-0.217**	-0.21***	0.015	0.069
	(-2.20)	(-2.67)	(0.46)	(1.36)
Debt	-0.031	0.012	0.002	-0.001
	(-0.22)	(0.43)	(0.48)	(-0.62)
Size	0.113**	0.112*	0.003*	0.0035
	(2.23)	(1.92)	(1.86)	(1.41)
Segments	0.013	-0.003	-0.0007**	-0.0006
	(1.24)	(-0.09)	(-2.28)	(-0.75)
MtB	-0.071	-0.005	0.002*	0.0006
	(-1.01)	(-0.58)	(1.85)	(0.76)
RetnStd	-0.576	-0.138	-0.002	0.046
	(-1.13)	(-0.21)	(-0.11)	(1.56)
Firmage	-0.011	-0.01	-0.0001	0.0005
	(-1.60)	(-0.96)	(-0.38)	(1.09)
Concentr1	-0.178	-0.497	0.011	-0.003
	(-0.78)	(-1.55)	(1.18)	(-0.18)
MStckH	-1.444	-0.239	-0.021	0.004

	(-0.82)	(-0.87)	(-0.21)	(0.25)
LgStckH	0.088	0.46	-0.022	-0.01
	(0.13)	(1.15)	(-1.14)	(-0.56)
constant	0.732	1.27	0.118^{***}	0.045
	(0.68)	(1.29)	(3.00)	(0.67)
Implied speed	0.294	0.404	0.569	0.365
Hansen'Jstatistics (p value)	0.974	0.124	0.48	0.739
Sargen Test (p value)	0.895	0.119	0.228	0.243
Observations	1690	1419	1690	1419

We use the sys-GMM method to estimate all models with bias-corrected robust standard errors; t-statistics in parentheses. The dependent variable is either board size (Dsize) or board independence (IndpD). L_dsize is the number of board of directors at time t-2, L_indpd is the proportion of outside directors on the board at time t-2. Dual equals 1 if the chairman of board is CEO, 0 otherwise. Debt is the ratio of long-term debt to total assets. Size is the book value of total asset. Segments is the number of business segments the firm operates in. MTB is the ratio of market-to-book value, and it is obtained as market value of equity plus book value of assets minus book value of equity, divided by book value of assets. RetnStd is Standard deviation of the past twelve months' of the firm's stock returns. Firmage is computed since firm going public. Concentr1 is the ratio of the largest shareholder's stake. MStckH represents the proportion of managerial shareholdings. LgStckH is the Proportion of institutional shareholdings.

***p < .01 **p < .05 *p < .1

TABLE 8

Is Board Structure Adjustment driven by Monitoring or Advisory?

Panel A Board Size as Dependent Variable

	All Sample		SOEs		POEs	
(Constant)	0.158	0.157	0.266	0.275	0.104	0.116
	(0.46)	(0.46)	(0.49)	(0.51)	(0.19)	(0.21)
TSBD	0.382^{***}		0.306^{***}		0.402^{***}	
	(14.81)		(11.30)		(9.33)	
$TSBD*D^{monitor}$		0.374^{***}		0.288^{***}		0.439^{***}
		(9.08)		(6.92)		(5.91)
$TSBD*D^{advisory}$		0.387^{***}		0.319^{***}		0.383^{***}
		(11.69)		(8.95)		(7.21)
Adjust-R^2	0.406	0.156	0.173	0.172	0.163	0.162
F-Test	19.818^{***}	18.284^{***}	12.145^{***}	11.212^{***}	8.703^{***}	8.051^{***}
F-test (p value) in differences		0.000		0.000		0.000

Panel B Board Independence as Dependent Variable

	All Sample		SOEs		POEs	
(Constant)	-0.017	-0.017	-0.017	-0.017	-0.012	-0.012
	(-1.18)	(-1.19)	(-0.76)	(-0.75)	(-0.56	(-0.54)

TSBD	0.453***		0.572***		0.366***	
	(18.11)		(12.78)		(11.88)	
*TSBD*D^monitor^*		0.460***		0.579***		0.335***
		(11.89)		(8.35)		(7.42)
*TSBD*D^advisory^*		0.448***		0.567***		0.389***
		(13.68)		(9.69)		(9.28)
Adjust-R^2	0.214	0.213	0.203	0.202	0.235	0.234
F-Test	28.591***	26.373***	14.551***	13.412***	13.159***	12.146***
F-Test (p value) in differences		0.000		0.000		0.000

We use the OLS method to estimate all models with bias-corrected robust standard errors; t-statistics in parentheses. The dependent variable is either board size (Dsize) or board independence (IndpD). TBSD captures the deviation from target board structure (including board size or board independence) at time t-2. $D^{monitoring}$ is a dummy variable, which represents the board structure changing only with monitoring directors. $D^{advisory}$ is also a dummy variable that represents the board structure changing only with advisory directors.

***p < .01

**p < .05

*p < .1

TABLE 9

The Effect of Deviation from Target Board Structure (Board Size and Board Independence) on Performance for State-owned Firms

Panel A the effect of Deviation from Target Board Size on Performance for State-owned firms

Dependent Variable	ROA		ROE	
	1	2	1	2
$D^{sdvisory}$	-0.006		-0.085	
	(-0.749)		(-1.328)	
$D^{monitoring}$		0.012		0.187***
		(1.470)		(2.685)
TBSD$D^{sdvisory}$*	0.005		0.039	
	(1.331)		(1.219)	
TBSDD^{moni}*		-0.026		-0.141

Panel B the effect of Deviation from Target Board independence on Performance for State-owned firms

Dependent Variable	ROA		ROE	
	1	2	1	2
$D^{Advisory}$	-0.006		-0.084	
	(-0.711)		(-1.320)	
$D^{monitoring}$		0.014*		0.197***
		(1.688)		(2.813)
TBSD$D^{sdvisory}$*	0.102		1.341	
	(0.760)		-1.211	
TBSDD^{moni}*		0.031		-0.48

toring		***		***
		(-5.976)		(-3.922)
TBSD	-0.006***	-0.001	-0.031**	0.001
	(-3.363)	(-0.473)	(2.017)	(0.047)
FCF	0.075***	0.071***	0.497**	0.462**
	(2.944)	(2.781)	(2.358)	(2.198)
Debt	0.009	0.007	0.221**	0.206*
	(0.653)	(0.503)	(2.026)	-1.896
Size	0.001	0.002	-0.032	-0.033
	-0.492	-0.584	(-1.321)	(-1.384)
MtB	0.010***	0.010***	0.005	0.004
	-3.755	-3.679	-0.238	-0.173
RetnStd	-0.008	-0.008	-0.047	-0.047
	(-0.351)	(-0.362)	(-0.264)	(-0.267)
Concentr1	0.004	0.009	-0.26	-0.212
	-0.185	-0.44	(-1.522)	(-1.249)
Dual	0.033***	0.032***	0.316***	0.307***
	-3.179	-3.115	-3.698	-3.611
MStckH	0.316	0.28	0.425	0.262
	-1.114	-0.999	-0.182	-0.113
LgStckH	0.075***	0.078***	0.157	0.176
	-3.466	-3.597	-0.874	-0.988
(Constant)	-0.045	-0.056	0.528	0.485

toring				9
		(0.201)		(-0.391)
TBSD	0.061	0.091	0.033	0.615
	-0.869	-1.38	-0.058	-1.129
FCF	0.076***	0.074***	0.503**	0.481**
	-2.949	-2.881	-2.383	-2.281
Debt	0.008	0.008	0.220**	0.213*
	-0.611	-0.569	-2.017	-1.953
Size	0.002	0.001	-0.032	-0.034
	-0.554	-0.507	(-1.325)	(-1.432)
MtB	0.010***	0.010***	0.007	0.007
	-3.846	-3.817	-0.337	-0.296
RetnStd	-0.007	-0.006	-0.051	-0.039
	(-0.334)	(-0.296)	(-0.289)	(-0.220)
concentr1	0.004	0.006	-0.253	-0.228
	-0.197	-0.27	(-1.479)	(-1.333)
Dual	0.035***	0.034***	0.324***	0.315***
	-3.319	-3.269	-3.79	-3.689
MStckH	0.285	0.296	0.217	0.348
	-1.003	-1.042	-0.093	-0.149
LgStckH	0.073***	0.074***	0.144	0.157
	-3.342	-3.385	-0.803	-0.878
(Constant)	-0.05	-0.051	0.522	0.509

	(-0.679)	(-0.844)	-0.965	-0.89		(-0.745)	(-0.764)	-0.95	-0.927
Adjust R2	0.024	0.043	0.007	0.017	Adjust R2	0.02	0.021	0.006	0.008
F	2.900***	4.394***	1.529*	2.337*	F	2.543***	2.616***	1.446*	1.645*

We use the OLS method to estimate all models with bias-corrected robust standard errors; t-statistics in parentheses. The dependent variable is either return on asset (ROA) or return on equity (ROE). TBSD captures the deviation from target board structure (including board size or board independence) at time t-2. $D^{monitoring}$ is a dummy variable, which represents the board structure changing only with monitoring directors. $D^{advisory}$ is also a dummy variable that represents the board structure changing only with advisory directors. FCF equals to (earnings before interest and after taxation + depreciation and amortization – the net operating capital – capital expenditure)/total asset. Dual equals 1 if the chairman of board is CEO, 0 otherwise. Debt is the ratio of long-term debt to total assets. Size is the book value of total asset. Segments is the number of business segments the firm operates in. MTB is the ratio of market-to-book value, and it is obtained as market value of equity plus book value of assets minus book value of equity, divided by book value of assets. RetnStd is Standard deviation of the past twelve months' of the firm's stock returns. Firmage is computed since firm going public. Concentr1 is the ratio of the largest shareholder's stake. MStckH represents the proportion of managerial shareholdings. LgStckH is the Proportion of institutional shareholdings.

***p < .01

**p < .05

*p < .1

TABLE 10

The Deviation from Target Board Structure and Performance for POEs

Panel A the effect of Deviation from Target Board Size on Performance for POEs

Dependent Variable	ROA		ROE	
$D^{sdvisory}$	0.002		0.017	
	-0.175		-0.885	
$D^{monitoring}$		-0.016		-0.008
		(-1.332)		(--0.315)
$TBSD*D^{sdvisory}$	-0.006**		-0.007*	
	(-2.033)		(-1.672)	
$TBSD*D^{monitoring}$		0.003		0.002
		(0.435)		(0.112)
TBSD	0	-0.001	0.001	-0.003
	(-1.153)	(-1.528)	(-1.207)	(-1.561)
FCF	0.173***	0.172***	-0.078*	-0.078*
	-7.905	-7.892	(-1.671)	(-1.678)
Debt	0.050***	0.051***	-0.102***	-0.102***

Panel B the effect of Deviation from Target Board independence on Performance for POEs

Dependent Variable	ROA		ROE	
$D^{sdvisory}$	-0.016		-0.008	
	(-1.36)		(-0.325)	
$D^{monitoring}$		-0.001		-0.016
		(-0.064)		(-0.809)
$TBSD*D^{sdvisory}$	-0.326*		-0.229	
	(-1.876)		(-0.552)	
$TBSD*D^{monitoring}$		0.015		-0.108
		-0.087		(-0.293)
TBSD	0.081	0.026	0.09	0.072
	-1.021	-0.319	-0.531	-0.407
FCF	0.173***	0.172***	-0.078*	-0.079*
	-7.905	-7.868	(-1.670)	(-1.697)
Debt	0.050***	0.051***	-0.102***	-0.101***

	-4.774	-4.814	(-4.523)	(-4.512)
Size	0.001	0	0.016*	0.016*
	-0.125	-0.117	-1.811	-1.792
MtB	0.001	0.001	0.012***	0.011***
	-0.635	-0.549	-3.058	-2.993
RetnStd	0.005	0.009	-0.067	-0.065
	-0.176	-0.297	(-1.010)	(-0.977)
concentr1	0.011	0.01	0.109*	0.108*
	-0.411	-0.356	-1.883	-1.864
Dual	-0.020**	-0.020**	0.007	0.006
	(-2.350)	(-2.422)	-0.366	-0.356
MStckH	-0.001	-0.003	-0.033	-0.036
	(-0.060)	(-0.106)	(-0.626)	(-0.678)
LgStckH	0.130***	0.130***	0.207***	0.207***
	-5.122	-5.1	-3.803	-3.791
(Constant)	-0.018	-0.016	-0.333*	-0.332*
	(-0.196)	(-0.170)	(-1.687)	(-1.675)
Adjust R2	0.091	0.091	0.035	0.034
F	6.821	7.861	3.118	3.077

	-4.796	-4.807	(-4.510)	(-4.491)
Size	0	0	0.016*	0.016*
	-0.086	-0.081	-1.752	-1.751
MtB	0.001	0.001	0.011***	0.012***
	-0.567	-0.609	-3.006	-3.041
RetnStd	0.011	0.006	-0.064	-0.066
	-0.355	-0.181	(-0.963)	(-1.007
concentr1	0.011	0.01	0.108*	0.108*
	-0.413	-0.388	-1.871	-1.861
Dual	-0.020**	-0.020**	0.006	0.006
	(-2.416)	(-2.371)	-0.352	-0.346
MStckH	-0.003	-0.001	-0.035	-0.032
	(-0.116)	(-0.059)	(-0.670)	(-0.605)
LgStckH	0.128***	0.131***	0.206***	0.207***
	-5.043	-5.135	-3.773	-3.804
(Constant)	-0.014	-0.014	-0.325	-0.323
	(-0.155)	(-0.152)	(-1.641)	(-1.630)
Adjust R2	0.093	0.09	0.034	0.035
F	6.979***	6.774***	3.080***	3.094***

We use the OLS method to estimate all models with bias-corrected robust standard errors; t-statistics in parentheses. The dependent variable is either return on asset (ROA) or return on equity (ROE). TBSD captures the deviation from target board structure (including board size or board independence) at time t-2. $D^{monitoring}$ is a dummy variable, which represents the board structure changing only with monitoring directors. $D^{advisory}$ is also a dummy variable that represents the board structure changing only with advisory directors. FCF equals to (earnings before interest and after taxation + depreciation and amortization – the net operating capital – capital expenditure)/total asset. Dual equals 1 if the chairman of board is CEO, 0 otherwise. Debt is the ratio of long-term debt to total assets. Size is the book value of total asset. Segments is the number of business segments the firm operates in. MTB is the ratio of market-to-book value, and it is obtained as market value of equity plus book value of assets minus book value of equity, divided by book value of assets. RetnStd is Standard deviation of the past twelve months' of the firm's stock returns. Firmage is computed since firm going public. Concentr1 is the ratio of the largest shareholder's stake. MStckH represents the proportion of managerial shareholdings. LgStckH is the Proportion of institutional shareholdings.

***$p < .01$

**$p < .05$

*$p < .1$

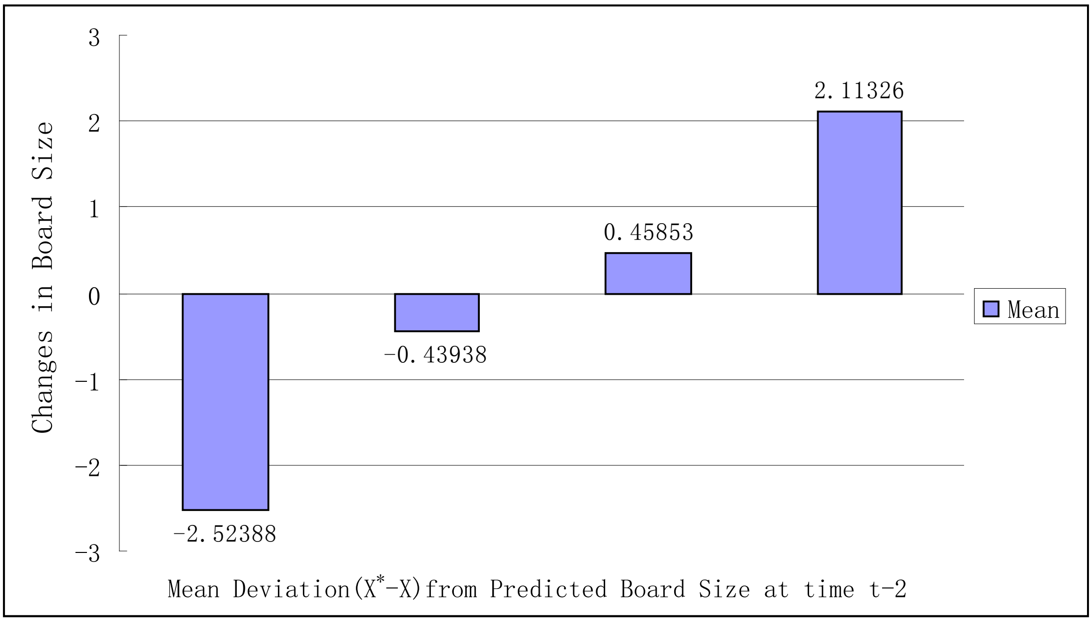

Fig. 1a Mean Deviation (X-X*) from Predicted Board Size

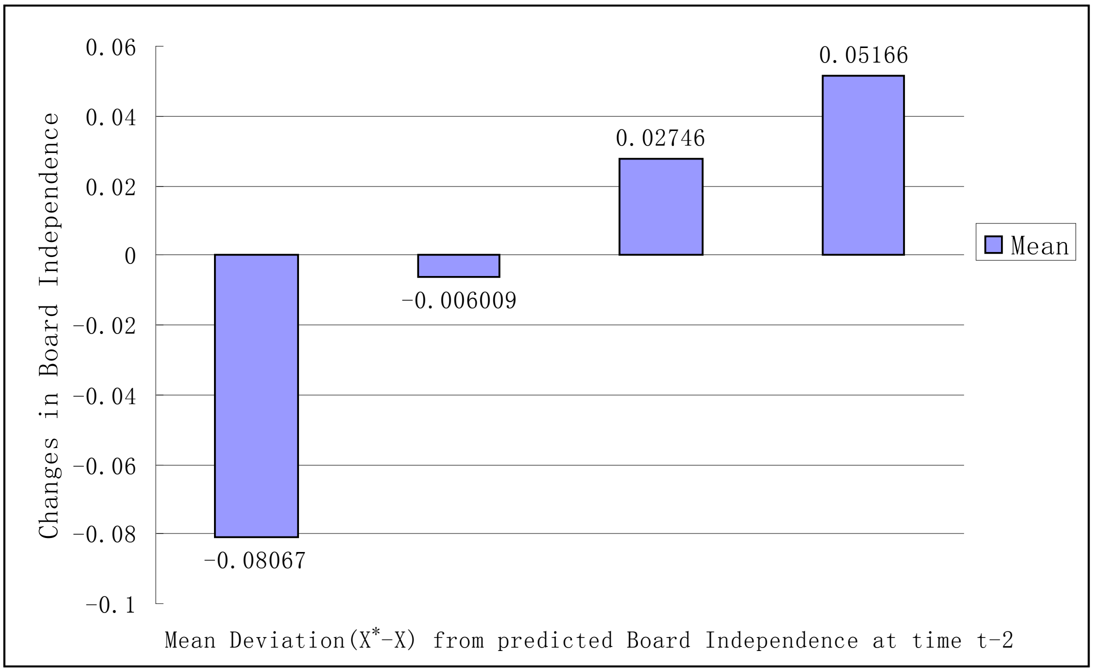

Fig. 1b Mean Deviation (X-X*) from Predicted Board Independence

Fig. 1. Changes in board structure and the distance from predicted board structure between 2007 and 2013. Fig. 1(a) and (b) compare the changes in board structure, from time t−2 to t, to the mean distance to the predicted board structure at time t-2. X∗, which is either predicted board independence or board size, are fitted values from an OLS regression (see Table 5) of board independence or board size on: Dual, Debt, Size, Segments, MTB, RetnStd, Firmage, Concentr1, MStckH, LgStckH. The firms in the sample are divided into quartiles based on their distances from the benchmark. X∗-X is the difference between the fitted values and actual values. Board independence is the percentage of directors who are not employees of the firm. Board size is the log of the total number of directors on the board. a. Change in board independence from t-2 to t. b. Change in board size from t-2 to t.