China Journal of Accounting Research 14 (2021) 25–42

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Contents lists available at ScienceDirect

China Journal of Accounting Research

journal homepage: www.elsevier.com/locate/cjar

Board faultlines and the value of cash holdings: Evidence from Chinese listed companies

Canyu Xu [a], Zhiying Hu [b], Shangkun Liang [a,*]

[a] School of Accountancy, Central University of Finance and Economics, China
[b] School of Economics and Management, University of Science and Technology Beijing, China

ARTICLE INFO

Article history:
Received 25 August 2020
Accepted 5 February 2021
Available online 3 March 2021

Keywords:
Board faultlines
Value of cash holdings
Deep-level attributes
Management shareholdings
State-owned enterprises (SOEs)

ABSTRACT

Faultlines can affect a board of director's effectiveness in supervising senior managers, which in turn affects the value of a company's cash holdings. Based on sample data from Chinese A-share listed companies from 2004 to 2016, we examine the relationship between board faultlines and the value of cash holdings. The empirical results indicate that board faultlines have a significant inhibitory effect on cash holding value. This inhibitory effect is stronger for board faultlines resulting from deep-level attributes. Furthermore, the inhibitory effect of board faultlines is stronger in state-owned enterprises (SOEs) than in non-SOEs. As an important governance mechanism, management shareholdings can reduce agency costs and mitigate the negative impact of board fissures on cash holdings. Overall, we enrich the literature on the economic consequences of board faultlines and their influence on cash holding value. We also offer companies practical suggestions for improving the supervisory mechanism of their board of directors.

1. Introduction

Cash is the "blood flow" of a company's daily production and operations. By holding cash, companies are able to guard against uncertainties precipitated by changes in the macro environment, industry competition, and financing constraints. However, as cash is highly liquid and difficult to trace, it is also easily pilfered and abused by company managers. Companies' senior managers often abuse cash through perks,

* Corresponding author.
E-mail address: liang_sk@126.com (S. Liang).

https://doi.org/10.1016/j.cjar.2021.02.001
1755-3091/

excessive salaries, and investments in projects that do not maximize shareholder interests, which can all ultimately damage company value (Yang et al., 2014; Ward et al., 2018). Therefore, exploring the impact of cash holdings on company value in various situations is an important issue for researchers and practitioners.

The effective operation of a board of directors, who represent a company's shareholders' interests, can alleviate management agency problems and facilitate the supervision of manager behavior. For example, the supervisory function of a board is weakened and principal–agent conflict is strengthened when the general manager and the board chairman are the same individual (Burns and Kedia, 2006). Board capital, such as educational background and work experience, can increase cash value and significantly reduce the agency cost of management (Wang et al., 2017). The studies cited focus on the effects of single or several characteristics of board of director members. In addition to considering individual characteristics, the interaction and comprehensive effects of various characteristics should not be ignored when examining the influence of boards of directors on agency problems. Compared with other board studies, faultline theory focuses on the overall effect of gender, age, tenure, financial experience and other characteristics on the board of directors. Therefore, we adopt board faultline theory, proposed by Lau and Murnighan (1998), to reconceptualize the various characteristics and combinations of characteristics of board members and analyze their overall impact on the value of cash holdings. We seek answers to the following questions. Do board faultlines affect the value of cash holdings? What is the direction of board faultlines' impact on the value of cash holdings? Does this effect differ under different conditions?

Using a sample of Chinese A-share listed companies from 2004 to 2016, we examine the relationship between board faultlines and the value of cash holdings. The empirical results indicate that board faultlines have a significant inhibitory effect on the value of cash holdings. This inhibitory effect becomes stronger when the board faultlines arise from deep-level attributes. Furthermore, the inhibitory effect of the board faultlines is stronger in state-owned enterprises (SOEs) than in non-SOEs. As an important governance mechanism, management shareholdings can reduce agency costs and mitigate the negative impact of board fractures on cash holdings. We adopt a fixed effects model with a company–year two-dimensional cluster, excluding years of financial crisis, and adjust the model and variables to address potential endogeneity. The above findings hold even after controlling for potential endogeneity.

We make three main contributions to the literature. First, we enrich the research on the economic consequences of board faultlines. The literature has mainly focused on the impact of board faultlines on company performance, strategic decisions, entrepreneurial issues, and investment returns (Tuggle et al., 2010; Li et al., 2014; Crucke and Knockaert, 2016; Van Peteghem et al., 2018). Few studies have explored the effect of board faultlines on the value of cash holdings. We examine how board faultlines affect the supervisory mechanism of the board of directors and, in turn, managers' abuse of funds and damage to the value of cash.

Second, we enrich the literature on the determinants of the value of cash holdings. Research has established that corporate governance, chief executive officer (CEO) compensation incentives, investor protection, and industry growth affect cash value (Pinkowitz et al., 2006; Dittmar and Mahrt-Smith, 2007; Liu and Mauer, 2011; Yang et al., 2016). Using principal–agent theory and the measurement principle of board faultlines, we measure the characteristics of the internal structure of the board of directors and further open the "black box" of internal board governance. We find that the existence of subgroups within a board of directors affects its supervisory function and reduces the value of cash holdings. Thus, we introduce heterogeneity of the board of directors as a determinant of the value of cash holdings.

Third, we provide suggestions for establishing an effective board of directors. The characteristics of directors determine their behavior. A board of directors represented by diverse member characteristics can give rise to quite divergent member behavior. Our findings indicate that the similarities and differences between directors' characteristics can lead to a board dividing into various subgroups. This division in turn affects the board's cohesion and governance efficiency and weakens its effectiveness. In constructing their board of directors, companies should reasonably match directors' characteristics, so that they can enjoy the benefits of diversity while preventing any internal fracturing of the board. They should also make rational use of institutional arrangements and goal-setting to mitigate the potential harm of internal subgroup identity. This would help improve governance efficiency at the board level.

2. Literature review and hypothesis development

2.1. Literature review

2.1.1. Value of cash holdings

Many studies have focused on the factors that affect a company's cash holding value. Three main factors have been identified. First, the existence of either a Type I agency problem (i.e., a conflict between shareholders and managers) or a Type II agency problem (i.e., a conflict between large shareholders and minority shareholders) may affect the value of cash holdings. Managers consume internal funds through on-the-job consumption and investment in negative net present value projects, whereas larger shareholders use related transactions to transfer a company's cash and infringe upon minor shareholders' benefits. This ultimately results in a reduction in the company's cash holding value. Dittmar and Mahrt-Smith (2007) established that good corporate governance is essential to preventing management from damaging company value. Companies with high levels of governance have greater cash holding value than companies with low levels of governance. By examining the impact of CEO compensation incentives on cash value, Liu and Mauer (2011) showed how CEO compensation incentives can adjust the interests of managers and shareholders and ease agency conflict. Second, due to internal and external information asymmetry and high external financing costs, internal cash, with its relatively low transaction costs, alleviates financing constraints (e.g., cash shortages) a timely and effective manner. Based on a sample of 35 countries, Pinkowitz et al. (2006) used the value regression model of Fama and French (1998) and discovered that countries with weak investor protection and information asymmetry have lower cash holding values. By distinguishing between financing-constrained companies and non-financing-constrained companies, Denis and Sibilkov (2010) examined and explained why cash is more valuable in the former. Third, recent studies have demonstrated that the degree of product market competition and industry growth affect the value of cash holdings. Exploring the relationship between cash holdings and a company's future product market share, Fresard (2010) found that a company's cash holdings are conducive to performance improvement in the product market. The number of external competitors and the degree of financing constraints have a positive regulatory effect on this relationship. Yang et al. (2016) discovered that industry growth can influence a company's external operating environment. For example, high external financing costs in high-growth industries may cause companies in those industries to increase the use value of internal cash.

2.1.2. Board faultlines

Lau and Murnighan first proposed team faultline theory in 1998. They defined a faultline as a virtual dividing line wherein a team breaks into multiple subgroups based on one or more characteristics. The existence of subgroups influences the effectiveness of the entire team. Scholars have since conducted case studies and large sample studies on faultline measurement and theoretical construction. Thatcher et al. (2003) and Bezrukova et al. (2009) proposed two dimensions for faultline measurement—the strength of faultlines (the degree of similarity of the characteristics of subgroup members) and the distance between faultlines (the degree of difference in multiple characteristics among subgroups). Faultline theory is based on social identity theory (Tajfel, 1978), self-categorization theory (Turner, 1985), and same-sex attraction theory (Byrne, 1971). It proposes that team members interact and communicate with others who have similar characteristics, thus leading to the formation of different subgroups. The existence of faultlines makes team members identify more strongly with their subgroups than with the entire team (Liu et al., 2019). Thus, faultlines exacerbate team conflict (Li and Hambrick, 2005; Bezrukova et al., 2009), reduce trust and respect among team members (Harrison and Klein, 2007), divert team attention away from the common goal of addressing the fragmentation caused by the faultlines (Li and Hambrick, 2005), and negatively affect team performance (Crucke and Knockaert, 2016).

A board of directors is a team. Yet board members may separate into different subgroups according to their various characteristics, affecting the overall functionality of the entire board. Since the introduction of faultline theory to the field of board governance, domestic and foreign scholars have also conducted studies on the influence of board faultlines. Kaczmarek et al. (2012) pointed out that faultlines weaken boards' ability and motivation to provide supervision and resources, thereby negatively affecting company performance. Tuggle et al. (2010) discovered that board faultlines are not conducive to companies reaching agreements on

entrepreneurial issues. Barkema and Shvyrkov (2007) and Li et al. (2014) found that strong faultlines are significantly negatively correlated with company expansion and cross-border mergers and acquisitions. The stronger a board's faultlines, the more difficult it is to unify its members' opinions. Some scholars have also argued that faultlines can enrich the information sources of a board of directors and improve its information processing capabilities. Hutzschenreuter and Horstkotte (2013) indicated that the existence of faultlines optimizes the information process within the board of directors and positively regulates the relationship between product sampling and company performance.

Summarizing the above literature, agency problems, corporate governance, internal and external financing constraints, and other factors all affect the value of cash holdings. As an important internal governance mechanism, the effectiveness of a board of directors undoubtedly has an important impact on restricting agency problems and increasing the value of a company's cash holdings. Although studies have focused on the impact of board capital (e.g., educational background and work experience) on the value of cash holdings (Wang et al., 2017), these studies have explored the impact of a single feature or a simple aggregation of feature indicators, not the internal structure of a board. In addition, studies have ignored the interaction between various board characteristics and their overall impact on the board. Therefore, we adopt faultline theory. We are the first to examine the overall governance efficiency and impact of boards of directors on companies' cash holding value from the perspective of board faultlines. According to faultline theory, a board whose directors have diverse characteristics can be divided into different subgroups based on similar in-group characteristics. As such, we examine how multiple subgroups affect boards' supervision and governance efficiency, and in turn companies' cash holding value.

2.2. Hypothesis development

In contrast with developed economies, such as Europe and the United States, China's economy is undergoing a period of transformation and rapid development. As a result, various aspects of its internal corporate governance mechanism are not yet fully developed. Type I agency conflicts are serious due to the lack of incentives and supervisory measures for senior managers. Due to agency conflict, strong liquidity, cashability, and the difficulty of tracking and ease of manipulating cash, senior managers frequently abuse company cash for self-interested motives (e.g., increasing their salaries and building their own businesses). This damages their company's usage value of cash. Researchers have found that under the modern corporate system, which entails the separation of management and governance, company managers often use their power to invade a company's assets and damage its value through perks (Chen and Liang, 2010) and excessive investment (Yang et al., 2014).

Board faultlines may have positive and negative effects on the value of a company's cash holdings. For example, they may reduce the value of the company's cash holdings. As the bridge connecting a company's shareholders and management team, the board of directors is an important institutional arrangement for solving the problem of entrusted agency and supervising manager behavior. The division of a board of directors into multiple subgroups directly affects the board's supervision (willingness and capability) of senior managers. From the perspective of supervisory willingness, a fracture within the board of directors intensifies distrust and conflict among subgroups. Subgroup members tend to identify with each other and exclude members from other groups. This reduces the harmony and cohesion of the board and diverts members' attention away from bridging the divides created by the faultlines, thereby decreasing the board's willingness to supervise (Li and Hambrick, 2005; Schölmerich et al., 2016). According to the perspective of supervisory capability, faultlines divide the board of directors into different subgroups. Great conflict and emotional disagreement among the subgroups weaken communication between the directors inside and outside of the subgroups and restrains private information within subgroups. The lack of information and increase in communication costs prevent directors from fully grasping information about managerial capabilities and behaviors, which eventually decreases their supervisory capability (Lau and Murnighan, 2005; Halevy, 2008; Meyer et al., 2011). In addition to discovering that the existence of board faultlines reduces CEOs' sensitivity to salary performance and drives them to grant themselves abnormally high compensation (Van Peteghem et al., 2018), studies have also confirmed that faultlines can hinder directors' supervision of senior managers. This increases the space for

senior managers to abuse cash and seek personal gain, ultimately reducing the value of the company's cash holdings.

Board faultlines may also promote the value of a company's cash holdings. Studies have pointed out that similar characteristics between managers and directors can significantly affect the discretionary power of the managers. Fracassi and Tate (2012) found that if a company's directors and managers work part time at other companies, institutions, or organizations simultaneously, the supervisory function of the board of directors is weakened and the managers have more space for rent-seeking. This ultimately damages the company's value. Lu and Hu (2014) argued that fellowship between the CEO and directors weakens the board of directors' supervision over managers, grants the CEO more power, and consequently increases the company's risk. Directors and managers sharing similar characteristics, such as professional experience, educational background, and hometown, facilitates the establishment of close contacts. In turn, this can damage the board's supervisory function. Furthermore, the existence of faultlines means that the board of directors is divided into subgroups with different characteristics. The greater the difference between the subgroups caused by strong faultlines, the more difficult it is for management to establish contact with multiple subgroups simultaneously. The company management team builds a close relationship with a certain subgroup based on common characteristics but at the same time shows greater difference from other subgroups. As a result, the management team faces stronger checks and supervision from other subgroups. Therefore, board faultlines can prevent a close relationship from developing between managers and the board of directors and make it more difficult for managers to capture the entire board. The power and space of the managers' rent-seeking is reduced, thereby improving the efficiency of the company's usage of cash.

It should be noted that board faultlines not only affect the supervisory function of the board of directors over senior managers but also the decision-making of the board. The existence of board faultlines indicates that the board is divided into multiple, distinct subgroups with their own interests and power centers. When a certain subgroup wants to embezzle and abuse the company's cash assets for its own interests, it is subject to checks and balances from other subgroups. This can restrain the board of directors' decision to encroach upon the company's cash assets and improve the value of cash holdings. Tang et al. (2016) explored the impact of larger shareholders on the value of cash holdings from the perspectives of checks and balances and dictatorships. From the perspective of checks and balances, the decision-making behavior of larger shareholders is restricted by other shareholders and tunneling behavior is reduced. From the perspective of dictatorship, when larger shareholders have sufficient decision-making space, tunneling motivation is enhanced, which ultimately reduces the value of cash holdings. Therefore, from the board of directors' own decision-making perspective, board faultlines also increase the company's cash holding value. Therefore, we propose the following set of competing hypotheses.

H1a: Board faultlines decrease the value of cash holdings.
H1b: Board faultlines increase the value of cash holdings.

3. Research design

3.1. Sample selection

The initial data comes from the China Stock Market and Accounting Research Database. We use A-share listed companies from 2004 to 2016 as the initial research sample. Excluding companies labeled as ST (i.e., those that have suffered losses for 2 consecutive years) and *ST (i.e., those that have suffered losses for 3 consecutive years), financial companies, and companies with missing or abnormal data yields 19,467 company–year observations.[1] For all of the tests, we winsorize all of the continuous variables at the bottom and top 1% levels to reduce the influence of extreme values on the findings.

[1] As some of the control variables in the regression model include changes in previous and subsequent years, the actual data period is from 2003 to 2017.

3.2. Empirical models

Based on the research of Fama and French (1998), we follow Pinkowitz and Williamson (2003), Dittmar and Mahrt-Smith (2007), and Yang and Zhang (2008) in adapting the following model to examine our hypothesis:

$$MV_{it} = a_0 + a_1 Cash_{it} * Faultline_{it} + a_2 Cash_{it} + a_3 Faultline_{it} + \sum Control_{it} + \sum Industry_{it} + \sum Year_{it} + \varepsilon_{it} \tag{1}$$

where MV is the company's market value variable, which equals the sum of the market value of tradable shares, non-tradable shares, and liabilities. Following prior studies, the market value of tradable shares is measured by the market price of the stock, the market value of non-tradable shares is measured by multiplying the number of non-tradable shares by the net assets per share, and the market value of liabilities is measured by the book value of liabilities (Yang and Zhang, 2008; Wang et al., 2014). *Cash* is the variable of the cash holding level, which equals the sum of the company's cash and short-term net investment.[2] *Faultline* is the variable of the board faultlines, including faultline strength (*Fstrength*), faultline distance (*Fdistance*), and the faultline intersection term (*Fau*) (Thatcher et al., 2003; Bezrukova et al., 2009).[3] *Fstrength* represents the similarity between the members of subgroups. It is calculated as the ratio of the sum of the squared variances between different subgroups to the total squared variance of the total. *Fdistance* represents the degree of difference between various subgroups. It is calculated as the Euclidean distance between different subgroups. *Fau* represents the similarity within subgroups and the difference between subgroups, which is the intersection of faultline strength and faultline distance. *Fstrength* is calculated using the following formula:

$$Fstrength_g = \frac{\sum_{j=1}^{p}\sum_{k=1}^{q} n_k^g (\bar{x}_{kj} - \bar{x}_j)^2}{\sum_{j=1}^{p}\sum_{k=1}^{q}\sum_{i=1}^{n_k^g} (x_{ijk} - \bar{x}_j)^2} \quad g = 1, 2, \ldots s \tag{2}$$

where $\bar{x}_{kj}$ represents the average value of feature j for the members of subgroup k, $\bar{x}_{kj}$ represents the average value of feature j for all group members, x_{ijk} represents the value of feature j for member i of subgroup k, and n_k^g represents the number of members in the kth subgroup under split g. The value range of *Fstrength* calculated based on this formula is (0, 1). The greater this value is, the more similar those within a given subgroup are. *Fdistance* is calculated using the following formula:

$$Fdistance_g = \sqrt{\sum_{j=1}^{p} (\bar{x}_{j1} - \bar{x}_{j2})^2} \tag{3}$$

where $\bar{x}_{j1}$ represents the average value of feature j for the members of Subgroup 1 and $\bar{x}_{j2}$ represents the average value of feature j for the members of Subgroup 2. The greater the value of *Fdistance* is, the greater the difference is between subgroups.

Following the literature (Luo and Qin, 2009; Wang et al., 2014; Yang et al., 2016; Liang et al., 2019), we control other variables that affect the value of cash holdings, namely cash flow and changes in cash flow (Cf_t, Dif_Cf_t, and Dif_Cf_{t+1}), changes in non-cash assets (Dif_Nocash_t and Dif_Nocash_{t+1}), cash dividends and changes in cash dividends (Div_t, Dif_Div_t, and Dif_Div_{t+1}), capital expenditure and changes in capital

[2] Short-term investment refers to a company's purchase of securities that can be realized at any time for which the holding time does not exceed 1 year (including 1 year) and other investments for which it does not exceed 1 year (including 1 year), including various stocks and bonds. The amount excludes the provision for decreasing prices. The short-term net investment data come from the China Stock Market and Accounting Research Database.

[3] The director characteristics for calculating board faultlines are independence, gender, financial experience, tenure, and shareholdings and whether the directors are part-time directors, retired directors, and internal directors. Based on these characteristics, we perform a cluster analysis of the annual directors of each company to determine whether faultlines exist in the companies' boards of directors and, if so, to identify their subgroup compositions.

Table 1
Variable definitions.

Variable	Definition
MV_t	The ratio of the sum of the market value of tradable shares, non-tradable shares, and liabilities to the total assets at the end of year t.
$Cash_t$	The ratio of cash to total assets at the end of year t.
$Fstrength_t$	The ratio of the sum of the squares of variance between different subgroups to the sum of the squares of the overall variance.
$Fdistance_t$	The Euclidean distance between different subgroups.
Fau_t	The intersection of faultline strength and faultline distance.
Cf_t	The ratio of the net cash flow from operating activities in year t to the total assets at the end of year t.
Dif_Cf_t	The ratio of the difference between the net cash flow of operating activities in year t and year $t-1$ to the total assets at the end of year t.
Dif_Cf_{t+1}	The ratio of the difference between the net cash flow of operating activities in year $t+1$ and year t to the total assets at the end of year t.
Dif_Nocash_t	The ratio of the difference between the non-cash assets at the end of year t and the end of year $t-1$ to the total assets at the end of year t.
Dif_Nocash_{t+1}	The ratio of the difference between the non-cash assets at the end of year $t+1$ and the end of year t to the total assets at the end of year t.
Div_t	The ratio of the cash dividends paid in year t to the total assets at the end of year t.
Dif_Div_t	The ratio of the difference between the cash dividends issued in year t and year $t-1$ to the total assets at the end of year t.
Dif_Div_{t+1}	The ratio of the difference between the cash dividends issued in year $t+1$ and year t to the total assets at the end of year t.
$Capex_t$	The ratio of the net expenditures on the acquisition, construction, and disposal of fixed assets, intangible assets, and other long-term assets in year t to the total assets at the end of year t.
Dif_Capex_t	The ratio of the difference between the capital expenditures in year t and year $t-1$ to the total assets at the end of year t.
Dif_Capex_{t+1}	The ratio of the difference between the capital expenditures in year $t+1$ and year t to the total assets at the end of year t.
Dif_MV_{t+1}	The ratio of the difference between the market value at the end of year $t+1$ and the end of year t to the total assets at the end of year t.

expenditure ($Capex_t$, Dif_Capex_t, and Dif_Capex_{t+1}), and changes in market value (Dif_MV_{t+1}).[4] $Control_t$ is the level of *Control* in year t, $Dif\_Control_t$ is the change in the value of *Control* from $t-1$ to year t, and $Dif\_Control_{t+1}$ is the change in the value of *Control* from t to $t+1$.

All of the variables in Model (1) are divided by total assets at the end of year t for standardization, with the exception of the board faultlines variable. We also control for the influence of industry (*Industry*) and year (*Year*). If the coefficient a_1 of the intersection variable (*Cash* * *Faultline*) is significantly negative, H1a holds and board faultlines decrease the value of cash holdings. If the coefficient a_1 of the intersection variable (*Cash* * *Faultline*) is significantly positive, H1b holds and board faultlines increase the value of cash holdings. Table 1 presents detailed definitions of the variables.

3.3. Descriptive statistics

Panel A of Table 2 presents the summary statistics of the final sample. The mean and median of the market value (MV_t) are 2.015 and 1.585, respectively, which is consistent with Dou and Lu (2016). The mean and median of cash holdings ($Cash_t$) are 0.178 and 0.144, respectively, which is consistent with Yang et al. (2014). The mean (standard deviation) of faultline strength ($Fstrength_t$), faultline distance ($Fdistance_t$), and faultline intersection (*Faut*) is 0.577 (0.123), 1.423 (0.181), and 0.830 (0.240), respectively. These results are similar to those of Li et al. (2014) and Van Peteghem et al. (2018), indicating that large differences exist between the board faultlines of the sample companies. The statistical description and distribution of the other variables are within a reasonable range.

[4] Cash flow (Cf_t) refers to a company's annual net cash flow from operating activities. Capital expenditures ($Capex_t$) are a company's annual net expenditures for the purchase and construction of fixed assets, intangible assets, and other long-term assets.

Table 2
Descriptive statistics and correlation matrix.

Panel A: Descriptive statistics

Variable	Obs.	Mean	P25	Median	P75	St. Dev.
MV_t	19,467	2.015	1.217	1.585	2.308	1.290
$Cash_t$	19,467	0.178	0.089	0.144	0.231	0.126
$Fstrength_t$	19,467	0.577	0.489	0.569	0.654	0.123
$Fdistance_t$	19,467	1.423	1.298	1.411	1.537	0.181
Fau_t	19,467	0.830	0.658	0.812	0.979	0.240
Cf_t	19,467	0.047	0.007	0.046	0.090	0.075
Dif_Cf_t	19,467	0.006	–0.031	0.006	0.043	0.079
Dif_Cf_{t+1}	19,467	0.006	–0.036	0.005	0.047	0.093
Dif_Nocash_t	19,467	0.110	0.020	0.097	0.186	0.156
Dif_Nocash_{t+1}	19,467	0.164	0.014	0.098	0.213	0.337
Div_t	19,467	0.011	0.000	0.005	0.016	0.016
Dif_Div_t	19,467	0.001	–0.001	0.000	0.003	0.011
Dif_Div_{t+1}	19,467	0.002	–0.001	0.000	0.004	0.013
$Capex_t$	19,467	0.053	0.014	0.038	0.076	0.054
Dif_Capex_t	19,467	0.005	–0.015	0.001	0.021	0.047
Dif_Capex_{t+1}	19,467	0.007	–0.016	0.000	0.021	0.057
Dif_MV_{t+1}	19,467	0.480	–0.106	0.215	0.763	1.376

Panel B: Correlation matrix

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)	(Q)
(A) MV_t	1.000																
(B) *Casht*	0.128***	1.000															
(C) $Fstrength_t$	−0.053***	−0.008	1.000														
(D) $Fdistance_t$	0.022**	0.021**	0.449***	1.000													
(E) Fau_t	−0.026***	0.003	0.912***	0.761***	1.000												
(F) *Cft*	0.082***	0.135***	0.016*	0.018*	0.020**	1.000											
(G) Dif_Cf_t	0.008	0.050***	0.004	0.018*	0.012	0.617***	1.000										
(H) Dif_Cf_{t+1}	−0.003	−0.087***	0.011	−0.000	0.007	−0.408***	−0.373***	1.000									
(I) Dif_Nocash_t	−0.077***	−0.062***	−0.011	0.007	−0.005	−0.193***	−0.106***	0.102***	1.000								
(J) Dif_Nocash_{t+1}	0.132***	0.083***	−0.012	0.012	−0.003	−0.008	−0.007	0.015*	0.113***	1.000							
(K) Div_t	0.108***	0.268***	0.013	0.045***	0.029***	0.333***	0.067***	0.010	0.058***	0.020**	1.000						
(L) Dif_Div_t	0.040***	0.029***	0.002	0.006	0.004	0.124***	0.081***	0.001	0.058***	−0.003	0.485***	1.000					
(M) Dif_Div_{t+1}	0.075***	0.001	−0.023**	−0.006	−0.018*	0.073***	0.045***	0.108***	0.008	0.156***	−0.184***	−0.241***	1.000				
(N) $Capex_t$	−0.087***	−0.056***	0.026***	0.004	0.018*	0.187***	0.042***	0.017*	0.317***	0.081***	0.117***	−0.015*	−0.015*	1.000			
(O) Dif_Capex_t	0.005	0.061***	0.006	−0.010	0.000	0.044***	0.033***	−0.015*	0.296***	0.074***	0.048***	0.018*	−0.009	0.547***	1.000		
(P) Dif_Capex_{t+1}	0.088***	0.075***	0.004	−0.003	0.001	0.050***	0.010	0.079***	−0.054***	0.334***	0.031***	0.032***	0.057***	−0.233***	−0.163***	1.000	
(Q) Dif_MV_{t+1}	−0.018*	0.052***	−0.019**	0.019**	−0.005	0.025***	0.038***	0.089***	−0.014*	0.442***	0.044***	0.013	0.106***	0.016*	−0.004	0.148***	1.000

Panel B of Table 2 presents the Pearson correlation coefficient matrix of the main variables. The correlation coefficients between $Fstrength_t$, $Fdistance_t$, and Fau_t are 0.449, 0.912, and 0.761, respectively. These values indicate the consistency of the three measures of board faultlines. The correlation coefficients between the other variables are generally lower than 0.5, indicating that the correlations between them are weak and that no serious multicollinearity problem exists.

4. Empirical analysis

4.1. Regression results

Table 3 reports the regression results for H1a and H1b. We conduct ordinary least squares regression, control the year- and industry-fixed effects, cluster them by company, and report the robust standard errors and adjusted t values. The dependent variable is market value (MV). Column (1) lists the regression results with only the control variables added. Columns (2) to (4) present the regression results for both the independent variables and the control variables.

As Column (1) shows, the coefficient of $Cash_t$ is 0.681, which is significant at the 1% level. This indicates that the market value of 1 yuan of cash held by the company is approximately 0.681 yuan during the sample period. The coefficients of Cf_t and Div_t are significantly positive and the coefficient of $Capex_t$ is significantly negative. This indicates that the greater the company's internal operating activity and cash dividend cash flow are, the lower its capital expenditures are and the greater its market value is. These findings are similar to those of Luo and Qin (2009), Wang et al. (2014), and Yang et al. (2016). The coefficients of the other control variables are also consistent with prior studies. As Columns (2) to (4) show, the coefficient of $Fstrength_t * Cash_t$ is −1.725, which is significant at the 5% level; the coefficient of $Fdistance_t * Cash_t$ is −0.746, which is not significant; and the coefficient of $Fau_t * Cash_t$ is −0.793, which is significant at the 5% level. These results demonstrate that board faultlines negatively affect the value of cash holdings. Thus, the existence of board faultlines weakens the supervisory function of the board, intensifies Type I agency conflict within the company, and damages the value of cash holdings. These results validate H1a but not H1b.[5]

4.2. Robustness testing

4.2.1. Firm-fixed effects model

To alleviate endogeneity problems caused by unobservable variables that do not change over time, we use the firm-fixed effects model to regress our samples. Columns (1) to (3) of Panel A of Table 4 show the regression results. The coefficients of $Fstrength_t * Cash_t$, $Fdistance_t * Cash_t$, and $Fau_t * Cash_t$ are significantly negative at the 5% level, indicating that the conclusion is valid when controlling for firm-fixed effects.

4.2.2. Firm–year two-dimensional cluster

The results may have some problems related to the residual sequence at the firm and time levels from the panel data, leading to ordinary least squares model bias.[6] To solve the problem of intra-group correlation, we use the firm–year two-dimensional cluster to re-test and improve the robustness of the results. This method considers the correlation between the residuals, making the coefficient and standard deviation more effective. Columns (4) to (6) of Panel A of Table 4 report the results. The coefficients of $Fstrength_t * Cash_t$, $Fdistance_t * Cash_t$, and $Fau_t * Cash_t$ are negative. With the exception of $Fdistance_t$ ($t = -1.54$), the coefficients are significant at the 10% level. Therefore, the results are robust.

4.2.3. Excluding years of financial crisis

The volatility of the business cycle and changes in macroeconomic policies significantly affect companies' micro behavior. Wang et al. (2014) found that the uncertainty of a company's external environment affects

[5] The regression result holds after removing the market value change item, thus supporting H1a.

[6] Company-level serial correlation: the residuals of the same companies at different times are correlated. Time-level serial correlation: the residuals of different companies at the same time are correlated.

Table 3
Board faultlines and the value of cash holdings.

	(1)	(2)	(3)	(4)
DepVar =	*MV*	*MV*	*MV*	*MV*
Fstrength$_t$ * Cash$_t$		**−1.725****		
		(−2.38)		
Fstrength$_t$		0.398***		
		(2.80)		
Fdistance$_t$ * Cash$_t$			**−0.746**	
			(−1.46)	
Fdistance$_t$			0.072	
			(0.72)	
Fau$_t$ * Cash$_t$				**−0.793****
				(−2.12)
Fau$_t$				0.156**
				(2.14)
Cash$_t$	0.681***	1.670***	1.743**	1.337***
	(5.07)	(3.69)	(2.31)	(3.78)
Cf$_t$	1.180***	1.171***	1.178***	1.171***
	(3.28)	(3.25)	(3.27)	(3.25)
Dif_Cf$_t$	−0.552***	−0.551***	−0.551***	−0.551***
	(−3.14)	(−3.14)	(−3.13)	(−3.13)
Dif_Cf$_{t+1}$	0.505***	0.496***	0.504***	0.499***
	(3.55)	(3.49)	(3.55)	(3.51)
Dif_Nocash$_t$	−0.822***	−0.822***	−0.822***	−0.822***
	(−9.32)	(−9.34)	(−9.32)	(−9.33)
Dif_Nocash$_{t+1}$	0.433***	0.432***	0.432***	0.432***
	(7.53)	(7.53)	(7.52)	(7.52)
Div$_t$	6.128***	6.181***	6.207***	6.190***
	(5.07)	(5.14)	(5.16)	(5.15)
Dif_Div$_t$	−0.848	−0.812	−0.873	−0.827
	(−0.99)	(−0.95)	(−1.02)	(−0.97)
Dif_Div$_{t+1}$	3.770***	3.832***	3.767***	3.814***
	(4.37)	(4.44)	(4.37)	(4.42)
Capex$_t$	−1.953***	−1.954***	−1.947***	−1.953***
	(−6.17)	(−6.19)	(−6.16)	(−6.18)
Dif_Capex$_t$	1.945***	1.947***	1.939***	1.944***
	(8.14)	(8.16)	(8.12)	(8.15)
Dif_Capex$_{t+1}$	0.148	0.151	0.148	0.148
	(0.70)	(0.72)	(0.71)	(0.71)
Dif_MV$_{t+1}$	−0.002	−0.002	−0.002	−0.002
	(−0.09)	(−0.11)	(−0.09)	(−0.10)
Constant	1.411***	1.175***	1.304***	1.280***
	(12.43)	(8.24)	(6.88)	(9.68)
Industry & Year	Yes	Yes	Yes	Yes
Obs.	19,467	19,467	19,467	19,467
Adj. R^2	0.246	0.246	0.246	0.246

Note: The *t* values reported in parentheses are adjusted based on robust standard errors and clustered by firm, where *, **, and *** denote significance levels of 1%, 5%, and 10%, respectively.

its cash holding behavior and manager opportunism, which in turn reduces the marginal value of cash. Therefore, to reduce the interference of the external economic environment, we exclude years of financial crisis from our sample and conduct our analysis again. After excluding the observations from 2008 and 2009, our sample is reduced to 16,938 from 19,467. Columns (7) to (9) of Panel A of Table 4 present the results. The coefficients of *Fstrength$_t$ * Cash$_t$*, *Fdistance$_t$ * Cash$_t$*, and *Fau$_t$ * Cash$_t$* are significantly negative at the 1% or 10% level. This indicates that the negative impact of board faultlines on the value of cash holdings remains significant even after excluding the impact of the financial crisis. The results are robust.

Table 4
Robustness testing.

Panel A: Robustness tests 1 to 3

	Firm-fixed effects model			Firm–year two-dimensional cluster			Excluding years of financial crisis		
DepVar =	(1) *MV*	(2) *MV*	(3) *MV*	(4) *MV*	(5) *MV*	(6) *MV*	(7) *MV*	(8) *MV*	(9) *MV*
Fstrength$_t$*Cash$_t$	**−1.346****			**−1.725***			**−2.049*****		
	(−2.16)			**(−1.92)**			**(−2.82)**		
Fstrength$_t$	0.161			0.398**			0.488***		
	(1.42)			(2.29)			(3.29)		
Fdistance$_t$*Cash$_t$		**−0.919****			**−0.746**			**−0.963***	
		(−2.06)			**(−1.54)**			**(−1.86)**	
Fdistance$_t$		0.079			0.072			0.106	
		(0.93)			(0.82)			(1.00)	
Fau$_t$*Cash$_t$			**−0.746****			**−0.793***			**−0.981*****
			(−2.42)			**(−1.80)**			**(−2.61)**
Fau$_t$			0.084			0.156*			0.199***
			(1.46)			(1.89)			(2.60)
Cash$_t$	−0.267	0.259	−0.426	1.670**	1.743*	1.337**	1.887***	2.088***	1.525***
	(−0.67)	(0.39)	(−1.38)	(2.19)	(1.91)	(2.14)	(4.14)	(2.72)	(4.26)
Cf$_t$	2.148***	2.141***	2.145***	1.171**	1.178**	1.171**	1.094***	1.099***	1.094***
	(6.49)	(6.47)	(6.49)	(2.06)	(2.07)	(2.06)	(2.81)	(2.82)	(2.81)
Dif_Cf$_t$	−0.712***	−0.708***	−0.710***	−0.551**	−0.551**	−0.551**	−0.424**	−0.423**	−0.424**
	(−4.97)	(−4.94)	(−4.96)	(−2.12)	(−2.11)	(−2.12)	(−2.22)	(−2.21)	(−2.22)
Dif_Cf$_{t+1}$	0.706***	0.705***	0.705***	0.496*	0.504*	0.499*	0.482***	0.492***	0.486***
	(5.77)	(5.76)	(5.76)	(1.77)	(1.80)	(1.78)	(2.99)	(3.05)	(3.01)
Dif_Nocash$_t$	−0.687***	−0.687***	−0.687***	−0.822***	−0.822***	−0.822***	−0.851***	−0.852***	−0.851***
	(−9.92)	(−9.92)	(−9.92)	(−4.41)	(−4.41)	(−4.42)	(−8.57)	(−8.56)	(−8.56)
Dif_Nocash$_{t+1}$	0.834***	0.834***	0.834***	0.432	0.432	0.432	0.519***	0.519***	0.519***
	(18.97)	(18.95)	(18.97)	(1.32)	(1.32)	(1.32)	(8.02)	(8.02)	(8.02)
Div$_t$	6.373***	6.388***	6.380***	6.181***	6.207***	6.190***	5.995***	6.039***	6.008***
	(4.86)	(4.86)	(4.86)	(4.18)	(4.22)	(4.20)	(4.75)	(4.79)	(4.77)
Dif_Div$_t$	−0.330	−0.355	−0.336	−0.812	−0.873	−0.827	−1.181	−1.263	−1.200
	(−0.41)	(−0.44)	(−0.42)	(−0.61)	(−0.66)	(−0.62)	(−1.21)	(−1.29)	(−1.23)
Dif_Div$_{t+1}$	3.876***	3.835***	3.865***	3.832**	3.767**	3.814**	3.865***	3.789***	3.839***
	(5.07)	(5.02)	(5.05)	(2.49)	(2.45)	(2.48)	(4.20)	(4.11)	(4.17)
Capex$_t$	−0.158	−0.154	−0.157	−1.954***	−1.947***	−1.953***	−1.966***	−1.957***	−1.966***
	(−0.45)	(−0.44)	(−0.45)	(−4.47)	(−4.45)	(−4.47)	(−5.78)	(−5.74)	(−5.77)
Dif_Capex$_t$	0.902***	0.898***	0.900***	1.947***	1.939***	1.944***	1.926***	1.917***	1.922***
	(4.18)	(4.16)	(4.17)	(4.99)	(4.99)	(4.99)	(7.39)	(7.35)	(7.38)
Dif_Capex$_{t+1}$	0.718***	0.721***	0.718***	0.151	0.148	0.148	0.282	0.275	0.277
	(3.89)	(3.90)	(3.89)	(0.60)	(0.58)	(0.58)	(1.15)	(1.12)	(1.13)
Dif_MV$_{t+1}$	−0.222***	−0.222***	−0.222***	−0.002	−0.002	−0.002	−0.037	−0.037	−0.037
	(−15.77)	(−15.75)	(−15.76)	(−0.01)	(−0.01)	(−0.01)	(−1.58)	(−1.57)	(−1.58)
Constant	1.504***	1.477***	1.525***	1.175***	1.304***	1.280***	1.109***	1.241***	1.230***
	(4.09)	(3.79)	(4.15)	(6.91)	(6.86)	(8.39)	(7.43)	(6.19)	(8.86)
Industry & Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	19,467	19,467	19,467	19,467	19,467	19,467	16,938	16,938	16,938
Adj. R^2	0.371	0.371	0.371	0.246	0.246	0.246	0.239	0.239	0.239

Panel B: Robustness tests 4 to 5

	Changing control variables			Adding control variables			Changing variable measurement		
DepVar =	(1) *MV*	(2) *MV*	(3) *MV*	(4) *MV*	(5) *MV*	(6) *MV*	(7) *MV*	(8) *MV*	(9) *MV*
Fstrength$_t$*Cash$_t$	**−1.476****			**−1.541****			**−1.664****		
	(−2.12)			**(−2.10)**			**(−2.29)**		
Fstrength$_t$	0.321**			0.290**			0.420***		
	(2.32)			(2.04)			(2.88)		
Fdistance$_t$*Cash$_t$		**−0.497**			**−0.608**			**−0.603**	
		(−1.00)			**(−1.19)**			**(−1.12)**	
Fdistance$_t$		0.007			0.009			0.069	
		(0.07)			(0.09)			(0.66)	

Fau_t*$Cash_t$			**−0.632***			**−0.677***			**−0.722***
			(−1.75)			**(−1.80)**			**(−1.89)**
Fau_t			0.110			0.096			0.161**
			(1.53)			(1.32)			(2.14)
$Cash_t$	1.317***	1.177	0.993***	0.826*	0.803	0.501	2.213***	2.117***	1.856***
	(3.05)	(1.60)	(2.92)	(1.80)	(1.06)	(1.39)	(4.72)	(2.65)	(4.95)
Cf_t	6.106***	6.138***	6.116***	1.319***	1.332***	1.323***	1.089***	1.099***	1.090***
	(9.23)	(9.27)	(9.24)	(3.62)	(3.66)	(3.63)	(3.00)	(3.03)	(3.00)
Dif_Cf_t	−0.171	−0.191	−0.180	−0.584***	−0.585***	−0.584***	−0.497***	−0.496***	−0.497***
	(−0.47)	(−0.53)	(−0.49)	(−3.26)	(−3.26)	(−3.26)	(−3.50)	(−3.48)	(−3.50)
Dif_Cf_{t+1}	2.168***	2.173***	2.167***	0.489***	0.496***	0.492***	−0.081	−0.068	−0.076
	(7.44)	(7.45)	(7.43)	(3.49)	(3.53)	(3.50)	(−0.45)	(−0.37)	(−0.42)
Dif_Nocash_t	−1.194***	−1.195***	−1.194***	−1.001***	−1.002***	−1.001***	0.063	0.065	0.063
	(−16.35)	(−16.33)	(−16.34)	(−11.02)	(−11.02)	(−11.01)	(0.53)	(0.55)	(0.53)
Dif_Nocash_{t+1}	0.310***	0.309***	0.310***	0.426***	0.425***	0.426***	−1.241***	−1.236***	−1.238***
	(5.65)	(5.64)	(5.65)	(7.44)	(7.44)	(7.44)	(−6.73)	(−6.70)	(−6.71)
Div_t	−2.817*	−2.830*	−2.822*	1.957	1.967	1.962	5.819***	5.814***	5.816***
	(−1.88)	(−1.88)	(−1.88)	(1.50)	(1.51)	(1.50)	(4.62)	(4.62)	(4.63)
Dif_Div_t	−0.114	−0.151	−0.122	1.717*	1.672*	1.704*	−2.276***	−2.320***	−2.286***
	(−0.12)	(−0.16)	(−0.13)	(1.92)	(1.87)	(1.91)	(−3.10)	(−3.16)	(−3.12)
Dif_Div_{t+1}	−0.241	−0.304	−0.258	3.015***	2.955***	2.995***	1.731*	1.669*	1.715*
	(−0.27)	(−0.34)	(−0.29)	(3.45)	(3.38)	(3.43)	(1.95)	(1.88)	(1.94)
$Capex_t$	−1.780***	−1.772***	−1.779***	−2.008***	−2.003***	−2.009***	−2.066***	−2.065***	−2.067***
	(−5.83)	(−5.80)	(−5.82)	(−6.28)	(−6.26)	(−6.28)	(−6.54)	(−6.52)	(−6.54)
Dif_Capex_t	1.813***	1.804***	1.810***	2.040***	2.034***	2.039***	1.293***	1.284***	1.290***
	(7.48)	(7.44)	(7.46)	(8.85)	(8.82)	(8.84)	(6.58)	(6.53)	(6.56)
Dif_Capex_{t+1}	−0.039	−0.040	−0.042	0.257	0.258	0.256	0.117	0.108	0.111
	(−0.20)	(−0.20)	(−0.21)	(1.24)	(1.24)	(1.23)	(0.52)	(0.48)	(0.50)
Dif_MV_{t+1}	−0.010	−0.009	−0.010	−0.011	−0.011	−0.011	−0.320***	−0.320***	−0.320***
	(−0.51)	(−0.49)	(−0.50)	(−0.58)	(−0.57)	(−0.58)	(−14.61)	(−14.60)	(−14.60)
Fin_t	–	–	–	−20.633***	−20.746***	−20.676***	–	–	–
				(−10.83)	(−10.88)	(−10.84)			
Dif_Fin_t	–	–	–	8.789***	8.929***	8.862***	–	–	–
				(5.07)	(5.15)	(5.11)			
Dif_Fin_{t+1}	–	–	–	−7.614***	−7.538***	−7.559***	–	–	–
				(−5.08)	(−5.03)	(−5.05)			
Constant	1.353***	1.528***	1.451***	1.683***	1.834***	1.773***	1.040***	1.190***	1.154***
	(9.83)	(8.24)	(11.36)	(11.45)	(9.54)	(12.92)	(7.04)	(6.03)	(8.42)
Industry & Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	19,467	19,467	19,467	19,466	19,466	19,466	19,466	19,466	19,466
Adj. R^2	0.269	0.269	0.269	0.263	0.263	0.263	0.277	0.277	0.277

Note: The *t* values reported in parentheses are adjusted based on robust standard errors and clustered by firm, where *, **, and *** denote significance levels of 1%, 5%, and 10%, respectively.

4.2.4. Changing the model and variables

When testing the cash holding value regression model, Luo and Qin (2009) replaced cash flow and the changes in cash flow in Model (1) with return on assets and the changes in return on assets to control for the impact of profitability on cash value. Therefore, we change some of the control variables and re-test the model. Columns (1) to (3) of Panel B of Table 4 show that the coefficients of $Fstrength_t$ * $Cash_t$, $Fdistance_t$ * $Cash_t$, and Fau_t * $Cash_t$ are negative. However, of the three interaction terms, only $Fstrength_t$ * $Cash_t$ and Fau_t * $Cash_t$ are significant (at the 5% and 1% levels, respectively). Following Dou and Lu (2016), we add financial expenses and changes in financial expenses to our model. Columns (4) to (6) of Panel B of Table 4 present the regression results, which show that the coefficients of $Fstrength_t$ * $Cash_t$, $Fdistance_t$ * $Cash_t$, and Fau_t * $Cash_t$ are negative. Again, only $Fstrength_t$ * $Cash_t$ and Fau_t * $Cash_t$ are significant (at the 5% and 1% levels, respectively).

4.2.5. Changing the method of variable measurement

We use the total non-cash asset deflator at the end of year t or the total asset deflator at the end of the corresponding year to re-test the regression model. Columns (7) to (9) of Panel B of Table 4 report the results, which are consistent with previous findings.

5. Additional analysis

5.1. Types of board faultlines

Following Van Peteghem et al. (2018), we distinguish between the different types of board faultlines and divide them into those formed by surface-level attributes and those formed by deep-level attributes. The impact of board faultlines formed by deep-level attributes is more profound and lasting. Surface board faultlines are formed based on gender and age and deep board faultlines are formed based on tenure, director independence, part-time directors, internal directors, shareholding, and financial experience.

Table 5 reports the results based on the type of board faultlines. Columns (1) to (3) report the results for surface board faultlines and Columns (4) to (6) report the results for deep board faultlines. The coefficients of $Fstrength1_t * Cash_t$, $Fdistance1_t * Cash_t$, and $Fau1_t * Cash_t$ are negative and not significant. The coefficient of $Fstrength2_t * Cash_t$ is significantly negative at the 5% level. The coefficient of $Fdistance2_t * Cash_t$ is positive and not significant. The coefficient of $Fau2_t * Cash_t$ is significantly negative at the 10% level. The above results indicate that different types of board faultlines have different effects on the value of cash holdings. Deep board faultlines are adverse to the performance of the board's supervisory function and weaken the supervision of management, thereby damaging the value of cash holdings.

5.2. Management shareholdings

The analysis of the impact of board faultlines on the value of cash holdings from the perspective of the board supervisory function indicates that a fracture within a board of directors weakens its supervisory ability, promotes management opportunism, and increases management agency costs, thereby reducing the value of cash holdings. However, as Jensen and Meckling (1976) pointed out, aside from board supervision, another fundamental source of agency problem is the inconsistency of interests between managers and owners and the lack of appropriate incentive mechanisms for management. Appropriate incentives can effectively alleviate agency conflict between managers and shareholders. The "coordination of interests" can encourage managers to work hard and reduce behavior that seeks private gain and damages company value. Equity and monetary compensation incentives are the most common methods for listed companies. Equity incentives are more compelling than monetary compensation incentives. Only by holding shares and enjoying a residual claim to the company can management fundamentally solve the agency problem between managers and owners (Jensen and Murphy, 1990). Therefore, we predict that if managers hold shares of a listed company, the coordination of interests can alleviate the negative impact of board faultlines on the value of cash holdings.

We divide the sample according to whether managers hold shares and re-test our model. Table 6 reports the results. Columns (1) to (3) report the results of board faultlines on the value of cash holdings when managers hold shares. The coefficients of $Fstrength_t * Cash_t$, $Fdistance_t * Cash_t$, and $Fau_t * Cash_t$ are negative and not significant. Columns (4) to (6) report the impact of board faultlines on the value of cash holdings when managers do not hold shares. The coefficients of $Fstrength_t * Cash_t$, $Fdistance_t * Cash_t$, and $Fau_t * Cash_t$ are negative. With the exception of the coefficients in Column (5), the other coefficients are significant at the 5% level.[7] These results support the previous inference that managers shareholding promotes the coordination of interests, which partially compensates for the supervisory failures caused by board faultlines.

[7] The coefficient of $Fdistance_t * Cash_t$ in Column (5) is negative but not significant. This means that the similarity (i.e., fault line strength) of the subgroups within the board has a greater impact than the difference between the subgroups represented by the fault line distance.

Table 5
Additional analysis: Types of board faultlines.

	Surface board faultlines			Deep board faultlines		
DepVar =	(1) *MV*	(2) *MV*	(3) *MV*	(4) *MV*	(5) *MV*	(6) *MV*
Fstrength1$_t$*Cash$_t$	**−0.077**					
	(−0.23)					
Fstrength1$_t$	−0.029					
	(−0.45)					
Fdistance1$_t$*Cash$_t$		**−0.223**				
		(−0.55)				
Fdistance1$_t$		−0.085				
		(−1.11)				
Fau1$_t$*Cash$_t$			**−0.106**			
			(−0.33)			
Fau1$_t$			−0.017			
			(−0.27)			
Fstrength2$_t$*Cash$_t$				**−1.443****		
				(−1.98)		
Fstrength2$_t$				0.220		
				(1.60)		
Fdistance2$_t$*Cash$_t$					**0.026**	
					(0.05)	
Fdistance2$_t$					−0.059	
					(−0.63)	
Fau2$_t$*Cash$_t$						**−0.491***
						(−1.79)
Fau2$_t$						0.058
						(0.96)
Cash$_t$	0.733***	0.887**	0.756***	1.255***	0.651	0.928***
	(2.67)	(2.10)	(2.71)	(3.70)	(1.08)	(6.00)
Cf$_t$	1.186***	1.186***	1.184***	1.170***	1.179***	1.173***
	(3.29)	(3.29)	(3.29)	(3.25)	(3.27)	(6.73)
Dif_Cf$_t$	−0.556***	−0.556***	−0.555***	−0.549***	−0.549***	−0.550***
	(−3.16)	(−3.16)	(−3.16)	(−3.12)	(−3.12)	(−4.03)
Dif_Cf$_{t+1}$	0.505***	0.505***	0.505***	0.503***	0.505***	0.504***
	(3.55)	(3.55)	(3.55)	(3.54)	(3.55)	(4.92)
Dif_Nocash$_t$	−0.822***	−0.824***	−0.822***	−0.823***	−0.821***	−0.822***
	(−9.32)	(−9.35)	(−9.32)	(−9.35)	(−9.34)	(−13.91)
Dif_Nocash$_{t+1}$	0.433***	0.433***	0.433***	0.433***	0.434***	0.433***
	(7.53)	(7.52)	(7.53)	(7.52)	(7.55)	(14.52)
Div$_t$	6.105***	6.176***	6.113***	6.222***	6.173***	6.209***
	(5.06)	(5.11)	(5.06)	(5.17)	(5.15)	(9.38)
Dif_Div$_t$	−0.844	−0.904	−0.846	−0.887	−0.870	−0.886
	(−0.99)	(−1.05)	(−0.99)	(−1.04)	(−1.02)	(−1.03)
Dif_Div$_{t+1}$	3.737***	3.731***	3.741***	3.782***	3.783***	3.782***
	(4.32)	(4.29)	(4.32)	(4.39)	(4.39)	(5.61)
Capex$_t$	−1.950***	−1.929***	−1.950***	−1.955***	−1.944***	−1.951***
	(−6.17)	(−6.12)	(−6.16)	(−6.19)	(−6.15)	(−9.15)
Dif_Capex$_t$	1.940***	1.931***	1.940***	1.945***	1.938***	1.941***
	(8.12)	(8.09)	(8.12)	(8.17)	(8.14)	(9.16)
Dif_Capex$_{t+1}$	0.145	0.151	0.146	0.146	0.146	0.145
	(0.69)	(0.72)	(0.70)	(0.70)	(0.70)	(0.90)
Dif_MV$_{t+1}$	−0.002	−0.002	−0.002	−0.002	−0.002	−0.002
	(−0.10)	(−0.11)	(−0.10)	(−0.10)	(−0.10)	(−0.24)
Constant	1.431***	1.480***	1.423***	1.325***	1.478***	1.383***
	(11.93)	(10.86)	(11.83)	(10.34)	(9.10)	(17.95)
Industry & Year	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	19,467	19,467	19,467	19,467	19,467	19,467
Adj. R^2	0.246	0.247	0.246	0.246	0.246	0.246

Note: The *t* values reported in parentheses are adjusted based on robust standard errors and clustered by firm, where *, **, and *** denote significance levels of 1%, 5%, and 10%, respectively.

Table 6
Additional analysis: Management shareholdings.

	Management shareholdings > 0			Management shareholdings = 0		
DepVar =	(1) *MV*	(2) *MV*	(3) *MV*	(4) *MV*	(5) *MV*	(6) *MV*
Fstrength$_t$*Cash$_t$	**−1.209**			**−2.573****		
	(−1.35)			**(−2.23)**		
Fstrength$_t$	0.325*			0.512**		
	(1.85)			(2.35)		
Fdistance$_t$*Cash$_t$		**−0.634**			**−1.116**	
		(−1.17)			**(−1.24)**	
Fdistance$_t$		0.151			0.102	
		(1.41)			(0.59)	
Fau$_t$*Cash$_t$			**−0.602**			**−1.239****
			(−1.39)			**(−1.98)**
Fau$_t$			0.166*			0.207*
			(1.93)			(1.77)
Cash$_t$	1.420***	1.647**	1.233***	2.129***	2.197*	1.652***
	(2.68)	(2.10)	(3.20)	(2.85)	(1.66)	(2.72)
Cf$_t$	2.126***	2.131***	2.129***	0.259	0.267	0.254
	(5.18)	(5.19)	(5.18)	(0.48)	(0.50)	(0.47)
Dif_Cf$_t$	−0.888***	−0.889***	−0.892***	−0.131	−0.135	−0.130
	(−4.16)	(−4.17)	(−4.18)	(−0.49)	(−0.50)	(−0.49)
Dif_Cf$_{t+1}$	0.558***	0.564***	0.560***	0.499**	0.510**	0.501**
	(3.03)	(3.06)	(3.04)	(2.37)	(2.42)	(2.38)
Dif_Nocash$_t$	−0.241**	−0.238**	−0.239**	−1.326***	−1.328***	−1.327***
	(−2.30)	(−2.28)	(−2.29)	(−10.48)	(−10.45)	(−10.47)
Dif_Nocash$_{t+1}$	0.507***	0.507***	0.507***	0.376***	0.377***	0.377***
	(8.86)	(8.86)	(8.87)	(4.00)	(4.00)	(4.00)
Div$_t$	8.000***	7.969***	7.984***	3.999**	4.056**	4.042**
	(5.80)	(5.78)	(5.79)	(2.00)	(2.02)	(2.02)
Dif_Div$_t$	−2.178**	−2.194**	−2.169**	0.852	0.809	0.829
	(−2.24)	(−2.25)	(−2.23)	(0.56)	(0.53)	(0.55)
Dif_Div$_{t+1}$	3.850***	3.809***	3.845***	4.320***	4.277***	4.311***
	(3.85)	(3.81)	(3.85)	(2.74)	(2.70)	(2.73)
Capex$_t$	−1.196***	−1.198***	−1.197***	−2.639***	−2.630***	−2.634***
	(−3.29)	(−3.30)	(−3.30)	(−5.23)	(−5.19)	(−5.21)
Dif_Capex$_t$	0.820***	0.819***	0.819***	2.853***	2.839***	2.843***
	(3.16)	(3.16)	(3.16)	(7.51)	(7.46)	(7.48)
Dif_Capex$_{t+1}$	−0.223	−0.228	−0.225	0.564	0.559	0.560
	(−0.98)	(−1.01)	(−0.99)	(1.63)	(1.61)	(1.62)
Dif_MV$_{t+1}$	−0.075***	−0.075***	−0.075***	0.053*	0.054*	0.054*
	(−3.74)	(−3.73)	(−3.74)	(1.85)	(1.87)	(1.86)
Constant	0.987***	0.964***	1.038***	1.295***	1.446***	1.427***
	(6.73)	(5.24)	(8.13)	(5.50)	(4.42)	(6.42)
Industry & Year	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	11,262	11,262	11,262	8,205	8,205	8,205
Adj. R^2	0.285	0.285	0.285	0.240	0.239	0.240

Note: The *t* values reported in parentheses are adjusted based on robust standard errors and clustered by firm, where *, **, and *** denote significance levels of 1%, 5%, and 10%, respectively.

5.3. Types of ownership

We divide the sample into SOEs and non-SOEs and further examine the impact of various types of ownership. Compared with non-SOEs, such as private enterprises, the absence of the pyramidal ownership structure among SOEs weakens the supervisory function of the board. Operational decision-making and manager appointments are generally determined by high-level government departments, which serve as an external board of directors. The external board significantly weakens the power and functions of the company's inter-

Table 7
Additional analysis: Types of ownership.

	SOEs			Non-SOEs		
DepVar =	(1) *MV*	(2) *MV*	(3) *MV*	(4) *MV*	(5) *MV*	(6) *MV*
Fstrength$_t$*Cash$_t$	**−2.180****			**−0.844**		
	(−2.32)			**(−0.81)**		
Fstrength$_t$	0.432***			0.114		
	(2.84)			(0.47)		
Fdistance$_t$*Cash$_t$		**−1.073**			**0.269**	
		(−1.42)			**(0.40)**	
Fdistance$_t$		0.156			−0.287*	
		(1.26)			(−1.80)	
Fau$_t$*Cash$_t$			**−1.158****			**−0.122**
			(−2.21)			**(−0.24)**
Fau$_t$			0.205**			−0.060
			(2.46)			(−0.50)
Cash$_t$	2.215***	2.463**	1.903***	0.783	−0.097	0.400
	(3.79)	(2.30)	(4.03)	(1.22)	(−0.09)	(0.82)
Cf$_t$	0.191	0.204	0.192	2.307***	2.307***	2.307***
	(0.47)	(0.50)	(0.47)	(4.14)	(4.13)	(4.13)
Dif_Cf$_t$	−0.020	−0.018	−0.019	−1.192***	−1.188***	−1.190***
	(−0.11)	(−0.10)	(−0.10)	(−4.30)	(−4.28)	(−4.28)
Dif_Cf$_{t+1}$	0.470***	0.477***	0.469***	0.604***	0.609***	0.608***
	(2.70)	(2.75)	(2.70)	(2.86)	(2.88)	(2.88)
Dif_Nocash$_t$	−0.626***	−0.624***	−0.625***	−1.166***	−1.170***	−1.167***
	(−6.25)	(−6.22)	(−6.24)	(−8.57)	(−8.58)	(−8.57)
Dif_Nocash$_{t+1}$	0.410***	0.410***	0.410***	0.398***	0.397***	0.398***
	(4.93)	(4.92)	(4.93)	(5.38)	(5.38)	(5.38)
Div$_t$	10.884***	10.887***	10.900***	1.956	2.074	1.976
	(7.44)	(7.43)	(7.46)	(1.09)	(1.15)	(1.10)
Dif_Div$_t$	−0.437	−0.450	−0.431	−0.593	−0.741	−0.640
	(−0.37)	(−0.38)	(−0.36)	(−0.49)	(−0.61)	(−0.53)
Dif_Div$_{t+1}$	6.963***	6.915***	6.957***	1.273	1.219	1.236
	(5.50)	(5.43)	(5.49)	(1.13)	(1.08)	(1.09)
Capex$_t$	−1.055***	−1.050***	−1.051***	−2.632***	−2.601***	−2.627***
	(−2.97)	(−2.94)	(−2.95)	(−5.34)	(−5.29)	(−5.33)
Dif_Capex$_t$	1.366***	1.354***	1.358***	2.506***	2.482***	2.501***
	(4.88)	(4.84)	(4.85)	(6.76)	(6.72)	(6.75)
Dif_Capex$_{t+1}$	0.059	0.054	0.057	0.257	0.266	0.257
	(0.23)	(0.21)	(0.23)	(0.78)	(0.80)	(0.78)
Dif_MV$_{t+1}$	−0.068**	−0.068**	−0.068**	0.023	0.023	0.023
	(−2.21)	(−2.21)	(−2.22)	(0.93)	(0.94)	(0.94)
Constant	0.993***	1.020***	1.078***	1.468***	1.932***	1.586***
	(5.04)	(4.04)	(5.64)	(7.69)	(7.35)	(9.92)
Industry & Year	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	9,681	9,681	9,681	9,434	9,434	9,434
Adj. R^2	0.261	0.261	0.261	0.243	0.243	0.243

Note: The *t* values reported in parentheses are adjusted based on robust standard errors and clustered by firm, where *, **, and *** denote significance levels of 1%, 5%, and 10%, respectively.

nal board. Therefore, for SOEs, the presence of an external board diminishes and undermines the supervision of management, further damaging the value of cash holdings.

Table 7 reports the results based on ownership. Columns (1) to (3) report the results for the SOEs. The coefficients of *Fstrength$_t$* * *Cash$_t$*, *Fdistance$_t$* * *Cash$_t$*, and *Fau$_t$* * *Cash$_t$* are negative. With the exception of the coefficients in Column (2), the other coefficients are significant at the 5% level. Columns (4) to (6) report the results for the non-SOEs; the coefficients of *Fstrength$_t$* * *Cash$_t$*, *Fdistance$_t$* * *Cash$_t$*, and *Fau$_t$* * *Cash$_t$* are negative and not significant. These results indicate that for SOEs, the board's ability to supervise managers is weaker and the negative impact of the board on the value of cash holdings is more significant.

6. Conclusion

Board faultlines influence a board of directors' effectiveness in supervising senior managers, which in turn affects the value of cash holdings. Using Chinese listed A-share company data from 2004 to 2016 as the research sample, we systematically investigate the impact of board faultlines on the value of cash holdings from the agency theory perspective. The empirical results indicate that board faultlines are negatively correlated with the value of cash holdings. Furthermore, board faultlines formed from deep-level attributes have a greater inhibitory effect. Finally, the inhibitory effect of the board faultlines is stronger in SOEs than in non-SOEs. The results hold after conducting a number of robustness checks. As an important governance mechanism, management shareholdings can reduce agency costs and mitigate the negative impact of board fissures on cash holdings.

We make contributions of both theoretical and practical significance. First, we enrich the literature on board faultlines and the value of cash holdings. From the perspective of the diminishing value of cash holdings amid faultlines, we further confirm the subsequent weakening of the board of directors' ability to supervise managers on the basics of previous studies. From the perspective of manager's agency problems, we expand the research on the factors affecting the value of cash holdings. We also provide certain practical insight for listed companies on how to construct their boards of directors. For example, we establish that the existence of subgroups within a board of directors is not conducive to its harmony or cohesion and reduces its supervisory ability. This indicates that a company should choose appropriate directors according to a combination of specific characteristics. When pursuing director diversification, companies must avoid the formation of board faultlines. This would ultimately have practical significance for improving the governance structure of listed companies.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

We acknowledge the financial support of the National Natural Science Foundation of China (71872196, 71402198), the National Social Science Foundation of China (19ZDA098), the MOE Project of Humanities and Social Sciences of China (19YJA790032), and the Beijing Social Foundation of China (15JGC176). We are also grateful for the support of the Program for Innovation Research of the Central University of Finance and Economics and the Graduate Student Research Grant awarded by the Graduate School of the Central University of Finance and Economics (20182Y005). We recognize the executive editor and the anonymous reviewers for their useful comments, but stress that we are completely responsible for the content presented in this paper.

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