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Multiple large shareholders and corporate fraud: evidence from China

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Abstract

This study tests the effect of multiple large shareholders on the level of corporate fraud using the data of Chinese listed companies from 2010 to 2018. We find lower probabilities and lower corporate fraud frequencies when there are multiple large shareholders in Chinese listed companies, indicating that their presence plays a supervisory role in internal governance. These results persist after we control for endogeneity. Moreover, the effect of multiple large shareholders on corporate fraud is strengthened with the separation of control right and cash flow right. Further analyses reveal that companies with multiple large shareholders experience considerably reduced information disclosure fraud but no reduction in operating or leader frauds. Additionally, information asymmetry and the capital occupation of controlling shareholders both play a mediating role in the relationship between multiple large shareholders and the level of corporate fraud. This study enriches the literature on the determinants of corporate fraud and the effects of multiple large shareholders. Our findings also provide implications for companies and regulators regarding ways to reduce fraud.

Keywords: Multiple large shareholders, Corporate fraud, Separation of control right and cash flow right, Information asymmetry, Capital occupation

Introduction

Corporate fraud causes a series of destructive economic consequences for companies, including damage to their reputation, decreased investor confidence, increased financing costs, and company value reductions (Yu and Yu 2011). Therefore, an analysis underlying corporate fraud mechanism is of great significance to protecting investors' interests and promoting healthy development of capital market.

There is a considerable amount of research on multiple large shareholders in the existing literature. Some literature indicates that large shareholders who are not controlling shareholders have the motivation and ability to participate in corporate affairs (Shleifer and Vishny 1986, 1997) and influence shareholder decisions. Furthermore, they can vote or impose "quit threats" on the board of directors (Admati and Pfleiderer 2009; Edmans 2009; Edmans and Manso 2011) and limit controlling shareholders' self-interests. These shareholders bring positive results, such as reducing related-party transactions (Jiang and Kim 2015) and increasing asset liquidity (Bharath et al. 2013).

Some other studies find that multiple large shareholders are not more efficient than a single controlling shareholder (Zhu et al. 2018). However, limited research has been conducted directly on the influence of multiple large shareholders on the level of corporate fraud.

It is necessary to empirically test whether multiple large shareholders impact the level of corporate fraud. The monitoring effect of their presence could decrease the fraud occurring within a company. However, multiple large shareholders may also tunnel a company, thus reducing the effectiveness of corporate governance and leading to an increase in corporate fraud. Hence, this issue represents an empirical question to be tested.

Based on a sample of Chinese listed companies during 2010–2018, we examine the impact of multiple large shareholders on the level of corporate fraud. The empirical results show that compared with companies without multiple large shareholders, there are lower probabilities and lower corporate fraud frequencies in companies with multiple large shareholders. The association between multiple large shareholders and corporate fraud is more pronounced with higher ownership and control separation. Further analysis shows that multiple large shareholders could considerably reduce information disclosure fraud for two major reasons. First, multiple large shareholders can monitor the self-interest behaviors of controlling shareholders and reduce their capital occupation, thereby mitigating against information disclosure fraud caused by concealing behaviors mentioned above. Second, multiple large shareholders can ensure that monitoring controlling shareholders disclose more information. Additionally, changes in the number of shares held by multiple large shareholders could also convey information to other investors, reducing the degree of information asymmetry. Consistent with this reasoning, we find that information asymmetry and capital occupation both mediate the relationship between multiple large shareholders and the level of corporate fraud.

We conduct several robustness tests to confirm the reliability of our results. First, we use the difference-in-differences (DID) model to alleviate endogeneity problems. Second, we use the propensity score matching method. Third, we rerun the regression using alternative measures of the independent variables. Fourth, we consider other influencing factors that may affect the results, and the conclusion still holds.

Our study makes several important contributions to the extant literature. First, the extant research on corporate fraud does not pay enough attention to companies' shareholding structure, especially with multiple large shareholders. This article expands the study of the factors that affect corporate fraud from the perspectives of multiple large shareholders. Second, this study shows that an ownership arrangement that includes multiple large shareholders can improve the governance of listed companies in China and reduce the probability and frequency of corporate fraud. Third, this article explores the types and specific mechanisms underlying the influence of multiple large shareholders on corporate fraud and contributes to an understanding of the governance effects of multiple large shareholders. Finally, this study illustrates the mediating roles of information asymmetry and capital occupation.

The remainder of this paper is organized as follows. Section 2 reviews the relevant literature and develops our hypotheses. Section 3 outlines the research design and

describes the data and sample. Section 4 presents the empirical results. Section 5 - contains robustness tests, and section 6 presents additional tests. Section 7 concludes this paper.

Literature review and hypothesis development

Economic effects of multiple large shareholders

The extant literature contains different views on the role of multiple large shareholders in the context of corporate governance.

Multiple large shareholders may exert a positive impact on corporate governance by reducing agency costs. In emerging market economies such as that of China, conflicts between large and minority shareholders are much more important than the traditional principal-agent conflicts between shareholders and managers because of the highly concentrated shareholding structure (Li et al. 2004; Luo et al. 2013). Conflicts between large and minority shareholders are manifested by large shareholders acquiring private interests at the expense of minority shareholders, called "tunneling" (Johnson et al. 2000). Tunneling includes selling the assets of a company to affiliated companies at low prices, paying high salaries to managers (controlling shareholders act as managers in companies that they control), intercorporate loans, and even theft. Capital occupation, which refers to controlling shareholders illegally occupying companies' funds, is a more direct means for controlling shareholders to tunnel listed companies than earnings management and related-party transactions (Jiang et al. 2010; Ye et al. 2007), because it is generally considered an unreasonable business practice for listed companies to transfer capital to their controlling shareholders. When a company has multiple large shareholders, its noncontrolling large shareholders can effectively supervise its controlling shareholders and reduce their infringement on the interests of minority shareholders (Boateng and Huang 2017), such as by reducing related-party transactions and capital occupation (Bloch and Hege 2003). Extant empirical studies provide much evidence for the supervisory role of multiple large shareholders. For example, they could ease agency conflicts, reduce corporate debt costs (Wang and Jiang 2017), and reduce financing constraints (Jiang et al. 2017). Moreover, scholars have also found that companies with multiple large shareholders have fewer related-party transactions (Chen and Wang 2005), higher dividend payments (Faccio et al. 2001; Wei and Chen 2020), higher-quality earnings information (Boubaker and Sami 2011), higher-quality internal control (Ma et al. 2019) and higher company value (Laeven and Levine 2008) than those that do not. In China, controlling shareholders' ownership percentages are relatively high; thus, tunneling is more common, and a reasonably balanced shareholding structure is needed (Jiang and Kim 2015). Multiple large shareholders may limit the power of controlling shareholders and thus alleviate the abovementioned problems.

However, multiple large shareholders may also reduce the level of corporate governance and exacerbate agency problems. Prior theoretical foundations have shown that the presence of multiple large shareholders has an entrenchment effect (Attig et al. 2009; Bennedsen and Wolfenzon 2000; Luo et al. 2013), which is also known as the "collusion hypothesis." The collusion hypothesis is that multiple large shareholders may collude to obtain private benefits while damaging other stakeholders' interests. When the multiple large shareholders of a firm are related parties, these shareholders are

more inclined to collude to empty the company (Cheng et al. 2015). As Zwiebel (1995) and Gomes and Novaes (2006) note, multiple large shareholders may conspire together to infringe on the interests of others by means of private information. Crisóstomo and Brandão (2019) also propose that agreements among a few large shareholders negatively affect corporate governance. Maury and Pajuste (2005) further find that when the multiple large shareholders of a firm are all family-owned companies, they will be more inclined to conspire to tunnel the company, thereby harming its value. Jara-Bertin et al. (2008) also find that a second family shareholder in a family firm could reduce the firm's value. Emerging market economies implement relatively weak protections for investors. The cost incurred when large shareholders collude with one another is low (Ma et al. 2019), thus, the risk that multiple large shareholders will collude still exists.

Among the literature that studies the effects of multiple large shareholders, there is little research on their impact on the level of corporate fraud. Our paper supplements the literature from the perspective of fraud.

Determinants of corporate fraud

The internal and external governance characteristics of a company affect corporate fraud. In internal governance, local independent directors decrease the likelihood and severity of fraud in listed companies (Zhou and Liu 2017). The largest shareholder in a company holds multitudes of shares, conducive to restricting illegal behaviors (Chen et al. 2005). Chen et al. (2006) note that certain characteristics of a company's board are related to the frequency of fraud. Particularly, the proportion of outside directors, the number of board meetings held, and the chairman's tenure are related to the occurring probability of fraud. Additionally, executive compensation structures are related to the level of corporate fraud, incentive payments in the form of options increase the likelihood of fraud, and abnormal upward manipulations of earnings occur during the execution of fraudulent activities (Peng and Röell 2008). From the perspective of external governance, the existing literature finds that a company's institutional ownership, media attention, and analyst following all affect its level of corporate fraud. Lu et al. (2012) find that a company's institutional ownership level reduces its tendency to violate regulations. Similarly, media attention (Zhou et al. 2016) and analyst following (Chen et al. 2016) can play a role in external governance and significantly reduce the frequency of corporate fraud.

The financial characteristics of a company also affect its level of corporate fraud. Pressures from debt-related issues in avoiding delisting and loss are positively related to the probability of illegal disclosure behaviors. However, there is no significant relationship between cash flow pressure and such behaviors (Wu and Ma 2010). The financial situation is the main cause of fraud among listed companies in China because the top management teams of firms whitewash performance to ease financial pressures (Zhang and Jian 2008).

Scholars have studied the determinants and governance mechanisms underlying corporate fraud from many perspectives. However, little research examines the presence of multiple large shareholders as an internal governance mechanism to test its governance effect on the level of corporate fraud.

The effect of multiple large shareholders on the level of corporate fraud

Corporate fraud occurs when insiders (i.e., controlling shareholders, company directors, or management) of listed companies take opportunistic actions to obtain private benefits (Lei et al. 2020). Previous literature finds that a company's ownership structure may influence firms' various aspects (Wang and Salas 2020). Therefore, we suggest that the presence of multiple large shareholders will impact the level of corporate fraud.

First, multiple large shareholders may lead to fewer instances of corporate fraud. The presence of multiple large shareholders can play a direct supervisory role. These shareholders can induce controlling shareholders to reduce their related-party transactions and capital occupation (Zhao 2019). In addition, the presence of multiple large shareholders can play an indirect supervisory role. They can restrict managers and controlling shareholders' self-interest behavior through "quit threats," thus prompting them to work hard (Edmans and Manso 2011) and internal information can be given to external investors through the changes in the shareholding of large shareholders, which may reduce information asymmetry.

Second, the presence of multiple large shareholders may lead to an increase in corporate fraud. According to the collusion hypothesis, multiple large shareholders may conspire to harm the interests of minority shareholders and commit fraud jointly. They may disclose false information to conceal their behavior, thus engaging in information disclosure fraud. Moreover, multiple large shareholders may reduce the efficiency of the supervisory effect of controlling shareholders on executives. For example, the inconsistencies in the interests of the various large shareholders of a company will result in higher communication costs. Management may use its information advantage to provide misleading information, thus weakening their supervisory effect (Cheng et al. 2015).

Based on this discussion, we propose two opposing hypotheses:

Hypothesis 1a: *The presence of multiple large shareholders has a negative correlation with the level of corporate fraud. That is, the presence of multiple large shareholders decreases the probability and frequency of corporate fraud.*

Hypothesis 1b: *The presence of multiple large shareholders has a positive correlation with the level of corporate fraud. That is, the presence of multiple large shareholders increases the probability and frequency of corporate fraud.*

The moderating role of the separation of cash flow right and control right

Multiple large shareholders may influence corporate fraud through information asymmetry and capital occupation, according to H1a and H1b. We suppose that multiple large shareholders may play different roles in different degrees of separation between control and cash flow right. This separation increases the possibility of capital occupation. Controlling shareholders with different cash flow and control rights have an incentive to tunnel companies. This is because the profit they gain from control right is more than the loss that they bear in proportion to cash flow rights (La Porta et al. 1999; Zhu et al. 2014). However, the separation between control and cash flow rights increases the possibility of information asymmetry. The controlling shareholder has the

motivation and ability to falsely disclose the information to cover up the tunneling behavior (La Porta et al. 2002). Therefore, if multiple large shareholders can influence the company's fraudulent behavior through supervision, their monitoring effect is more obvious for companies with a high degree of separation of cash flow and control rights. If multiple large shareholders can increase corporate fraud, their collusion effect is more obvious because it is easier for multiple major shareholders to conspire. Above discussions lead to following hypotheses:

Hypothesis2a: *When the separation of controlling shareholder's control and cash flow rights is greater, the negative effect of multiple large shareholders on corporate fraud is more pronounced.*

Hypothesis2b: *When the separation of controlling shareholder's control and cash flow rights is greater, the positive effect of multiple large shareholders on corporate fraud is more pronounced.*

Research design

Sample and data

The sample used in this paper contains all of China's A-share listed companies from 2010 to 2018. We obtained the financial and fraud data of these companies from the CSMAR database and manually collected information on persons acting in concert[1] and the separation of cash flow and control rights. We selected this sample based on the following principles: First, we dropped 395 observations showing that the largest shareholder has less than 10% ownership. Then, we dropped 5141 observations because they contained missing data required to measure firm-specific control variables. Therefore, we were left with a final sample of 24,704 firm–year observations. This sample selection procedure and the distribution of the observations by year are presented in panels A and B of Table 1, respectively. The yearly percentage of fraud firms ranges from 7.80% to 22.75% across the nine years examined and exhibits an inverted U-shaped trend.

Main variable definitions

Dependent variable: corporate fraud (Fraud & Fre)

Following Lu et al. (2012), we use two variables to measure corporate fraud: (1) *Fraud* equals 1 if the company was involved with one or more fraud incidents during a year, and 0 otherwise. (2) *Fre* is the total number of fraud events that the company was involved with during a year. If the regulatory agencies or the listed company issued a fraud announcement or relevant media reports, we determine that the listed company had committed fraud. Specifically, corporate fraud includes information disclosure, operating, and leader frauds.[2]

[1]Persons acting in concert: This term refers to alliances among investors, established through agreements and other arrangements, which jointly expand the number of voting rights of a listed company. The actions of persons acting in concert are deemed to be the actions of one person under the law, and the number of their shares must be combined. When the total number of shares held reaches the legal shareholding ratio, the information disclosure obligation applies.

[2]According to the regulations of the China Securities Regulatory Commission, information disclosure fraud includes the following seven subcategories: fictional profits, fictional assets, false records, delayed disclosure, major information omissions, false disclosures, and improper general accounting treatment. Operating fraud includes illegal investment, illegal guarantees and other fraudulent activities; leader fraud includes insider trading, illegal stock trading, and manipulation of stock prices.

Table. 1 Sample selection and distribution

Panel A: Sample selection process							Observations		
Initial firm–year sample from 2010 to 2018							30,240		
Observations without large shareholders							(395)		
Observations with missing values or unmatched values							(5141)		
Final sample for testing							24,704		
Panel B: Distribution by fiscal year									
	2010	2011	2012	2013	2014	2015	2016	2017	2018
# of firm–years	2003	2294	2462	2464	2588	2809	3036	3472	3576
# of fraud firms	322	470	560	525	483	588	480	400	279
% of fraud firms	16.08	20.49	22.75	21.31	18.66	20.93	15.81	11.52	7.80

Independent variable: multiple large shareholders (Multi)

La Porta et al. (1999) first propose that shareholders holding 10% of the shares of a company would have the ability to influence that company's operating decisions. In China, shareholders who hold more than 10% of a company's shares could appoint at least one of the board's directors and may even select executives (Jiang et al. 2017; Zhu et al. 2018). Additionally, the Company Law of the People's Republic of China provides that shareholders with an ownership of 10% or more can apply to convene a shareholders' meeting. Following the extant literature (Jiang et al. 2015; Laeven and Levine 2008; Maury and Pajuste 2005), we define large shareholders as those who hold more than 10% of a company's shares. Furthermore, from the annual reports of listed companies individually, we determine persons acting in concert and combine the number of shares held by these parties to be counted as one shareholder. *Multi* equals 1 if the company has two or more large shareholders in a year, and 0 otherwise.

Moderator: separation of cash flow rights from control rights (Scfc)

The ultimate controlling shareholder with the separation of cash flow and control right has the motivation to tunnel listed companies as controlling shareholders could benefit from tunneling listed companies by control rights compared with the proportional losses matched with cash flow right. Thus, in the environment of information asymmetry, to cover up the tunnel behavior, the ultimate controlling shareholder has the motivation and ability to choose the content of information disclosure or even fiction (Yang and Liu 2018). The CSMAR database identifies a single ultimate controlling shareholder for each firm and provides a measure of ownership and control. Ownership carries cash flow right while voting determine control right. For owners that hold shares directly, ownership and control rights are equal. Indirect holding of shares could occur through a pyramid and cross-holding schemes that cause these rights to diverge, divergence compounded by the layering of shareholding relationships. There are many ownership and control separations, such as the difference between cash flow and control rights divided by control rights (Yan and He 2018), the difference between the controlling shareholder's cash flow and control rights (Chen et al. 2018), and so on. We define *Scfc* as the difference between cash flow right and control right divided by control right because it shows the relative difference of separation of cash flow right from control right.

Mediator: Information asymmetry (Info)

We use analyst forecasting dispersion to measure information asymmetry because it is easier for analysts to reach a consensus if information asymmetry is lower. Therefore, we use the analyst forecast dispersion to reflect the degree of information asymmetry (Li and Hu 2016).

Mediator: Capital occupation (Occ)

Capital occupation refers to controlling shareholders illegally occupying companies' funds (Jiang et al. 2010; Ye et al. 2007). Jiang and Yue (2005) find that the capital occupation of controlling shareholders is the main component of other receivables in the accounting context. Therefore, this study uses *Occ* (other receivables divided by total assets) to measure controlling shareholders' capital occupation.

Empirical models

To test Hypotheses 1a and 1b, we estimate the following regressions:

$$Fraud_{i,t} = \alpha_0 + \alpha_1 Multi_{i,t} + \alpha_i Controls_{i,t} + Fixed\ Effect + e_{i,t}. \quad (1-\mathrm{a})$$

$$Fre_{i,t} = \beta_0 + \beta_1 Multi_{i,t} + \beta_i Controls_{i,t} + Fixed\ Effect + e_{i,t}. \quad (1-\mathrm{b})$$

The dependent variables *Fraud* and *Fre* are measures of corporate fraud that denote whether fraud events exist and the number in a year, respectively. We use the Logit fixed effect model to test the impact of multiple large shareholders on the propensity for corporate fraud (1-a), and we use the Poisson fixed effect model to test the impact of multiple large shareholders on the frequency of corporate fraud (1-b). α_i and β_i represent the regression coefficients. If the presence of multiple large shareholders restrains (increases) corporate fraud, the estimated coefficient of *Multi* is expected to be significantly negative (positive) in both models.

We include the following control variables that are considered potential predictors of corporate fraud. First, we control for the financial characteristics of the companies. We control firm size (*Size*) measured as the natural logarithm of total assets. Large companies are more likely to attract the investors' attention, consequently increasing the likelihood of fraud being detected (Lu and Li 2016; Wang et al. 2010). Additionally, we also control for the firm leverage (*Lev*) because companies facing debt pressure will increase financing costs. To avoid worsening the financing environment, companies would attempt to avoid disclosing information with excessive debt repayment pressure or even disclose false information, leading to fraudulent behaviors (Wu and Ma 2010). Moreover, we control for the firm profitability (*Roa*) because delisting of listed companies depends on it (Bentley et al. 2013; Wu and Ma 2010). Second, we control the internal governance characteristics of the companies. We control for *Lnboard* because the larger the size of the board of directors, the more likely they tend to be free-riders and do not criticize the inappropriate practices of the managers, or no longer directly evaluate their work performance (Cai and Wu 2007; Jensen 1993; Yermack 1996). We control for *Dual* because if a company's CEO concurrently serves as the board's chair, the CEO is more likely to appoint his/her board of directors. Therefore, the board of directors may only access information beneficial to the CEO and cannot perform monitoring duties (Boyd 1994; Cai and Wu 2007; Crystal 1991). Finally, external supervisors

also play a role in restraining corporate fraud (Chen et al. 2016; Deli and Gillan 2000), and thus we include *Ana* (denoting the number of financial analysts) and *Big10* (whether the audit firms are top 10 or not, according to the ranking table annually published by the Chinese Institute of Certified Public Accountants [CICPA]). Additionally, we control the stock turnover variable *Turnover* (Lu and Li 2016). The industry and year effects are also included. For the manufacturing industry, we use two-digit industry codes.

To test Hypotheses 2a and 2b, we estimate the following models respectively:

$$Fraud_{i,t} = \alpha_0 + \alpha_1 Multi_{i,t} + \alpha_2 Scfc_{i,t} \times Multi_{i,t} + \alpha_3 Scfc_{i,t} + \alpha_i Controls_{i,t} + Fixed\ Effect + e_{i,t}. \quad (2-a)$$

$$Fre_{i,t} = \beta_0 + \beta_1 Multi_{i,t} + \beta_2 Scfc_{i,t} \times Multi_{i,t} + \beta_3 Scfc_{i,t} + \beta_i Controls_{i,t} + Fixed\ Effect + e_{i,t}. \quad (2-b)$$

In comparison with model (1), we include interaction terms in model (2). *Scfc* represents the separation of cash flow right from control right. The higher the degree of separation of cash flow right from control right, the stronger the motivation of the controlling shareholder to tunnel. *Scfc*×*Multi* is the interaction term of independent and moderating variables. According to Hypothesis 2a, we expect that the coefficient of this interaction term would be significantly negative. According to Hypothesis 2b, we expect that the coefficient of this interaction term would be significantly positive. Other control variables in model (2) have the same definitions as in model (1). The definitions for all variables are presented in Table 2.

Main results

Descriptive statistics

Panel A of Table 3 reports the descriptive statistics for the main variables. All continuous variables are winsorized at the top and bottom 1% to address outliers. The mean of the dummy variable, *Fraud* is 0.166, suggesting that 16.6% of the firm-year observations are also fraudulent. The mean value of *Fre* is 0.249, while its maximum and minimum values are 11 and 0, respectively, suggesting that there is a considerable difference between the numbers of fraud events in different observations. The average value of *Multi* is 0.368, indicating that 36.8% of the companies observed have large shareholders. The statistical results of the control variables are generally consistent with the previous literature and are not repeated here.

Panel B of Table 3 reports a detailed distribution of the large shareholders. Specifically, observations with a single large shareholder (15,233 observations) accounted for 61.66%, observations with two large shareholders (7249 observations) for 29.34%, and observations with three or more large shareholders (1849 observations) for 7.48% of the total sample respectively.

Table 4 shows the Pearson and Spearman correlations among the variables. *Fraud* and *Fre* have a highly positive correlation, indicating that they have a high degree of consistency. Additionally, *Fraud* and *Fre* are negatively correlated with *Multi*, providing preliminary support for Hypothesis 1a, such that companies with multiple large shareholders can reduce corporate fraud. *Ana* is significantly negatively correlated with

Table. 2 Variable definitions

Variable	Definition
Panel A: Dependent variable	
Fraud	Propensity for corporate fraud equals 1 if the company is involved with one or more fraud incidents in a year, and 0 otherwise.
Fre	Frequency of corporate fraud, denoting the total number of fraud events the company is involved with within a year.
Panel B: Independent variable	
Multi	A dummy variable. If the company has two or more large shareholders with more than 10% ownership, the variable equals 1; otherwise, it equals 0.
Panel C: Control variable	
Size	Firm size equals to the natural logarithm of total assets.
Lev	Firm leverage equals to total assets divided by total liabilities.
Roa	Return on assets, which equals net profit divided by total assets.
Big10	Audit office. If the auditing company is one of the ten largest audit firms according to the ranking table of China's top 100 accounting firms annually published by the CICPA, this variable equals 1; otherwise, it equals 0.
Ana	Number of analysts. This variable equals the natural logarithm of the number of analysts plus 1.
Ln*borad*	Board size. This variable equals the natural logarithm of the number of directors on a company's board.
Dual	A dummy variable. If the company's CEO concurrently serves as the chair of its board, this variable equals 1; otherwise, it equals 0.
Turnover	The average daily total share turnover ratio equals the average value of the daily turnover rate of the total number of shares during the year.
Scfc	Separation of cash flow right from control right equals the difference between cash flow right and control right divided by control right.
Year_Effect	Yearly dummy variable.
Industry_Effect	Industrial dummy variable.
Panel D: Mediating variable	
Info	Information asymmetry is measured by analyst forecasting dispersion. This variable is calculated as ln(1 + standard deviation of analyst forecast EPS divided by the absolute value of the actual earnings per share of the companies).
Occ	Capital occupation is calculated as other receivables divided by total assets.

Fraud and *Fre*, indicating that analysts can act as external supervisors and reduce the possibility of corporate fraud; analysts play an effective role in corporate governance.

Similarly, the variable *Big10* is negatively correlated with *Fraud* and *Fre*, suggesting that auditors are an important factor in external governance. Additionally, there is no serious multicollinearity problem, as the absolute values of the correlation coefficients between all the variables (except that of *Fraud* and *Fre*) are mostly below 0.5.

Empirical results: multiple large shareholders and corporate fraud

Table 5 reports the results of models (1-a) and (1-b). Column (1) shows the results of model (1-a), and column (2) shows the results of model (1-b). These empirical results show that *Multi* negatively correlates with *Fraud* at a significance level of 5%, indicating that listed companies with multiple large shareholders have a reduced probability of fraud. Compared to other companies, companies with multiple large shareholders have

Table. 3 Descriptive statistics

Variable	*N*	Mean	Std.	Min.	Median	Max.	P25	P75
Panel A: Descriptive statistics of key variables								
Fraud	24,704	0.166	0.372	0.000	0.000	1.000	0.000	0.000
Fre	24,704	0.249	0.691	0.000	0.000	11.000	0.000	0.000
Multi	24,704	0.368	0.482	0.000	0.000	1.000	0.000	1.000
Size	24,704	22.088	1.421	19.290	21.879	27.062	21.088	22.826
Lev	24,704	0.436	0.224	0.047	0.423	0.965	0.255	0.602
Roa	24,704	0.037	0.060	−0.258	0.037	0.196	0.014	0.066
L*nboard*	24,704	2.142	0.205	1.609	2.197	2.708	1.946	2.197
Big10	24,704	0.566	0.496	0.000	1.000	1.000	0.000	1.000
Ana	24,704	1.522	1.157	0.000	1.609	3.738	0.693	2.485
Dual	24,704	0.264	0.441	0.000	0.000	1.000	0.000	1.000
Turnover	24,704	1.671	1.275	0.124	1.323	6.293	0.727	2.263
Scfc	24,704	0.135	0.206	0.000	0.000	0.790	0.000	0.245
Panel B: Distribution of large shareholders								
Number of large shareholders		1	2	3	4	5		
Freq.		15,233	7249	1609	213	27		
Percent (%)		61.66	29.34	6.51	0.86	0.11		

an 11.13% lower probability of fraud.[3] Similarly, *Multi* is negatively correlated with the number of fraud events (*Fre*) at a significance level of 5%, meaning fewer fraud events occur in listed companies with multiple large shareholders. Considering that the estimated coefficient of *Multi* in column (2) is − 0.0930, companies with multiple large shareholders experience a 9.30% decrease in the fraud events. Columns (1) and (2) of Table 5 show that the presence of multiple large shareholders reduces the probability and frequency of corporate fraud, indicating their monitoring and governance effects, supporting Hypothesis 1a. The coefficients of control variables are generally consistent with our expectations and Zou et al. (2019).

Empirical results: the moderating effect of the separation of cash flow right and control right

Columns (3) and (4) of Table 5 present the results of model (2) which examines the moderating effect of *Scfc*. Therefore, we are interested in the coefficients of the interaction term *Scfc*×*Multi*. The coefficients are significantly negative when the dependent variables are *Fraud* and *Fre* (− 0.2795, $z = -1.96$;−0.3359, $z = -1.96$). Consistent with our prediction, the results suggest that the inhibitory effect of multiple large shareholders on corporate fraud is even more pronounced in companies with high separation of cash flow and control rights, supporting Hypothesis 2a. Additionally, *Scfc* significantly increases the probability and frequency of corporate fraud, consistent with extant literature.

[3]According to Logit model, we find that ln(*Multi*/(1-*Multi*)) = − 0.1180, so odds(*Multi* = 1)/odds(*Multi* = 0) = exp.(− 0.1180) = 0.8887. And we can say that compared to other companies, companies with multiple large shareholders have an 11.13% (= 0.8887–1) lower probability of fraud.

Table. 4 Pearson correlations and Spearman correlations

	Fraud	*Fre*	*Multi*	*Size*	*Lev*	*Roa*	Ln*board*	*Big10*	*Ana*	*Dual*	*Turnover*	*Scfc*
Fraud	1	0.996***	−0.023***	−0.047***	0.076***	−0.129***	−0.004	−0.042***	−0.087***	0.010	0.090***	0.018**
Fre	0.807***	1	−0.023***	−0.048***	0.079***	−0.133***	− 0.004	−0.042***	− 0.091***	0.011*	0.090***	0.019***
Multi	−0.023***	−0.022***	1	−0.049***	− 0.100***	0.086***	0.037***	0.018***	0.080***	0.033***	−0.114***	−0.036***
Size	−0.058***	−0.058***	− 0.004	1	0.505***	−0.111***	0.269***	0.111***	0.349***	−0.196***	−0.315***	0.024***
Lev	0.078***	0.085***	−0.095***	0.495***	1	−0.452***	0.176***	0.022***	−0.050***	−0.168***	− 0.066***	0.085***
Roa	−0.123***	−0.131***	0.065***	−0.019***	− 0.387***	1	− 0.030***	0.023***	0.404***	0.086***	−0.112***	−0.032
Ln*board*	−0.010	−0.015**	0.039***	0.319***	0.192***	0.005	1	0.031***	0.136***	−0.188***	−0.127***	0.045**
Big10	−0.042***	−0.041***	0.018***	0.145***	0.024***	0.033***	0.042***	1	0.076***	0.013**	−0.059***	−0.017***
Ana	−0.087***	−0.099***	0.080***	0.377***	−0.056***	0.363***	0.150***	0.077***	1	0.018***	−0.161***	−0.012***
Dual	0.010	0.012*	0.033***	−0.184***	−0.167***	0.055***	−0.179***	0.013**	0.017***	1	0.056***	−0.046***
Turnover	0.080***	0.083***	−0.106***	−0.282***	− 0.056***	−0.133***	− 0.128***	−0.045***	− 0.169***	0.052***	1	0.006
Scfc	0.017**	0.019***	−0.048***	0.024***	0.090***	−0.040***	0.055***	−0.018***	−0.023***	− 0.064***	0.003	1

Notes. *, **, **, denotes significance at the 10%, 5%, and 1% levels, respectively. The lower-left corner of this table shows the Pearson correlation coefficients, and its upper-right corner shows the Spearman correlation coefficients

Table. 5 The regression results of hypotheses

Variable	*Fraud* Xtlogit (1)	*Fre* Xtpoisson (2)	*Fraud* Xtlogit (3)	*Fre* Xtpoisson (4)
Multi	−0.1180* (− 1.70)	−0.0864* (−1.92)	−0.1661** (−2.21)	−0.1336*** (− 2.76)
Multi×Scfc			−0.2795* (−1.96)	− 0.3359* (− 1.81)
Size	0.1819*** (3.43)	0.1649*** (4.91)	0.1631*** (3.31)	0.1688*** (5.42)
Lev	−0.2137 (−1.06)	− 0.0622 (− 0.49)	0.0198 (0.10)	0.0594 (0.50)
Roa	−1.9968*** (−4.49)	− 1.4080*** (− 5.41)	−1.9804*** (− 4.70)	−1.4762*** (− 6.04)
Ln*board*	0.3136 (1.44)	0.3691*** (2.66)	0.2943 (1.44)	0.4056*** (3.10)
Big10	−0.1672** (−2.45)	− 0.1503*** (−3.45)	−0.1384** (− 2.15)	−0.1305*** (− 3.17)
Ana	− 0.1089*** (− 3.31)	−0.1079*** (− 4.99)	−0.0917*** (− 2.93)	−0.0942*** (− 4.57)
Dual	0.1024 (1.34)	0.0845* (1.76)	0.0678 (0.95)	0.0829* (1.86)
Turnover	0.0617** (2.52)	0.0622*** (4.05)	0.0662*** (2.85)	0.0619*** (4.27)
Scfc	0.2781 (1.25)	0.3114** (2.26)	0.6544*** (2.96)	0.6268*** (4.73)
Individual fixed effect	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Observations	13,806	13,843	13,806	13,843
L-likelihood	− 4590.32	− 7226.44	− 5130.83	− 8090.22
Chi^2	378.10	457.62	417.24	521.48

Notes. The model represents by column (1) removed 1923 groups because they contain the same dependent variables (i.e., all 1 or 0), and 10,898 observations are dropped. The model represented by column (2) deletes 1808 groups because the dependent variables of these groups are all 0, and 10,754 observations are dropped; this model additionally drops 107 groups (107 observations) because these groups only have one observation per group (similar to the process in the section below). Xtlogit represents a fixed-effect Logit model. Xtpoisson represents a fixed-effect Poisson model (similar to the process in the section below). The *z*-statistics of the estimated parameters are shown in brackets. *, **, **, denote significance at the 10%, 5%, and 1% levels, respectively (the same is true for subsequent tables)

Robustness tests

Difference in differences model

We refer to previous studies (Chen et al. 2001; Lel and Miller 2015) and use the DID model to estimate the difference in corporate fraud levels before and after the change in ownership structure. The specific model is as follows:

$$\begin{aligned} Fraud_{i,t} = {} & \alpha_0 + \alpha_1 After_{i,t} \times Treat1_{i,t}(orTreat2_{i,t}) \\ & + \alpha_2 Treat1_{i,t}(orTreat2_{i,t}) + \alpha_i Controls_{i,t} + Fixed\ Effect \\ & + e_{i,t,}. \end{aligned} \tag{3 − a}$$

$$\begin{aligned} Fre_{i,t} = {} & \beta_0 + \beta_1 After_{i,t} \times Treat1_{i,t}(orTreat2_{i,t}) + \beta_2 Treat1_{i,t}(orTreat2_{i,t}) \\ & + \beta_i Controls_{i,t} + Fixed\ Effect + e_{i,t}. \end{aligned} \tag{3 − b}$$

In these two models, *Treat1* (*Treat2*) is a dummy variable denoting whether the company's ownership structure has changed. We code *Treat1* as equal to 1 if firms change from having a structure containing a "single large shareholder" to one composed of "multiple large shareholders," and 0 otherwise. We code *Treat2* as equal to 1 if a firm's structure changes from being composed of "multiple large shareholders" to containing a "single large shareholder" and 0 otherwise. We delete the observations that *Multi* changes two or more times. *After* is a dummy variable indicating whether the year in which the observation occurs is after the ownership structure changes. Therefore, the interaction term composed of *After* and *Treat1* (*or Treat2*) exhibits the net effect of

multiple large shareholders (a single large shareholder) relative to that of a single large shareholder (multiple large shareholders) on the level of corporate fraud.

The empirical results show that when the company's equity structure is transformed from containing a single large shareholder to multiple large shareholders, its tendency and frequency of corporate fraud are significantly reduced, and companies' fraudulent behavior considerably increases after changing from having multiple to a single large shareholder.[4]

Alternative measures

As *Multi* is the key variable, this study uses another definition to ensure the robustness of the measurement criteria of the presence of multiple large shareholders. Following Laeven and Levine (2008) and Zhu et al. (2018), we redefine large shareholders to have over 20% ownership. Therefore, *Multi20* (a large shareholder holding more than 20% of a company's shares) is used to replace *Multi* in models (1-a) and (1-b). The empirical results show that the coefficients of *Multi20* are remained essentially unchanged.

Propensity score matching

As listed companies have certain endogenous problems due to their choice of shareholding structure, we match companies with a single large shareholder to similar companies with multiple large shareholders. We use all the control variables of model (1) for the matching process and match samples using the nearest matching method at a ratio of 1:1. Then, we regress these matched samples according to model (1-a) and model (1-b). The results show that the coefficients of *Multi* are still significantly negative.

Considering cross-listed companies

Jiang and Kim (2015) show that cross-listing (i.e., listing a firm on several exchanges such as the Hong Kong, London, or New York stock exchanges) may mitigate against the prevalence of corporate fraud in China. First, we control the dummy variable *Crosslist* (denoting whether the company is cross-listed or not) in the model; second, we delete the observations of cross-listed companies. The results show that the above two methods have not changed the signs or significance of the coefficients of the main variables. The coefficient of the variable *Crosslist* is insignificant, meaning whether or not the company is cross-listed, there is no substantial effect on fraud. A possible reason for this phenomenon is that the number of cross-listed companies is relatively small.

Considering bank relationships and prior fraud

Jiang and Kim (2015) argue that punishment is an element of the legal environment that may affect the level of corporate fraud. They also propose that banks may play a monitoring role. However, Chinese studites pay little attention to these concepts.

We take the variable *Bankloan* to control for the banking relationships. To measure bank financing, following Qian and Yeung (2015), we use the total outstanding loans (adjusted by their total assets) based on their balance sheets. The results show that there is a positive correlation between *Bankloan* and *Fraud*, consistent with the

[4]Result tables are not reported for brevity, but are available upon request.

findings of Qian and Yeung (2015); that is, the lenders themselves (i.e., banks) do not play a monitoring role in China, and banks lend to firms even when these firms' controlling shareholders tunnel at the expense of the firm's minority shareholders.

To control for prior fraud and fines, we take the variable *Prepunish* denoting whether the company has been punished for fraud by a regulator in the past year or not. The results show that if companies have been punished by a regulator, their probability and frequency of fraud are significantly increased. A possible reason for this phenomenon is that the punishments inflicted on listed companies by regulators are relatively light, but prior instances of punishment increase the public's attention on a company. Therefore subsequent fraud is more likely to be discovered.

Further analyses

Number of large shareholders and corporate fraud

Gomes and Novaes (2006) consider that multiple large shareholders have different interests. Even if other large shareholders do not subjectively protect the interests of minority shareholders, the competition between large shareholders for control right will also objectively prevent behaviors that harm the interests of the minority. Boubaker and Sami (2011) find that the fiercer the competition for control right between multiple large shareholders, the more significant the supervisory effect among large shareholders will be. We use the number of shareholders with over 10% ownership, excluding the controlling shareholder, to measure the number of non-controlling large shareholders (*Largenum*). Models (1-a) and (1-b) are used for regression, and the results show that the number of large shareholders is negatively related with corporate fraud.

Multiple large shareholders and different types of fraud

Referring to the classification of company fraud types by the China Securities Regulatory Commission, this article classifies corporate fraud into the following groups: information disclosure fraud, operating fraud, and leader fraud. This article examines the effect of multiple large shareholders on different types of fraud to comprehensively analyze the effects of the presence of multiple large shareholders. Among these types, information disclosure fraud accounts for 72.07% of the total fraud in China. Operating fraud accounts for 62.14%; leader fraud accounts for 22.69%; the sum of these percentages exceeds 100% because one fraud event may belong to more than one of these groups. The impact of the presence of multiple large shareholders on the different types of fraud is shown in Table 6.

Table 6 shows that the governance effect of multiple large shareholders on operating and leader frauds is not significant; however, it is significant in the case of information disclosure fraud. The possible reasons are as follows. There are differences in the punishments inflicted by the regulatory authorities in cases involving these three types of fraud, considering the securities market system. Chinese regulatory authorities punish operating and leader frauds more seriously than they do information disclosure fraud. Serious operating and leader frauds may even violate criminal law. However, Chinese regulators impose relatively light penalties for information disclosure fraud. In most cases, companies engaging in this type of fraud are punished only by warnings, reprimands, and rectification orders. This punishment is very disproportionate to the

Table 6 Multiple large shareholders and different types of fraud

	Information disclosure fraud		Operating fraud		Leader fraud	
Variable	***Fraud*(1)**	***Fre*(2)**	***Fraud*(3)**	***Fre*(4)**	***Fraud*(5)**	***Fre*(6)**
Multi	−0.1520* (−1.88)	− 0.1184** (− 2.32)	0.0115 (0.13)	−0.0242 (− 0.44)	−0.2600 (− 1.08)	−0.1000 (− 1.07)
Controls	YES	YES	YES	YES	YES	YES
Individual fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,265	10,302	9222	9259	5574	5574
L-likelihood	− 3339.49	− 5627.14	− 2967.60	− 5001.61	− 1420.27	− 2206.27
Chi^2	339.71	443.08	341.74	393.39	169.82	246.88

Notes: *, **, **, respectively, denote significance at the 10%, 5%, and 1% levels

considerable gains that can be obtained from such fraud. This low cost makes information disclosure fraud the most common among listed companies. Therefore, the supervisory role of multiple large shareholders is more obvious in information disclosure fraud since its penalty is relatively light. The impact of multiple large shareholders on the fraud of listed companies is complementary to legal punishments.

Mechanism test 1: information asymmetry

The previous analysis regarding the impact of multiple large shareholders on the level of corporate fraud reveals that this equity structure is a good corporate governance mechanism and that it plays a supervisory role. A controlling shareholder can obtain internal information regarding the enterprise that is unknown to external investors, and therefore, information asymmetry between the controlling shareholder and the external investors exist. When there are multiple large shareholders in a company, Anderson et al. (2003) note that the degree of information asymmetry within the company is increased by the restrictions imposed by the controlling shareholders on information disclosure, and multiple large shareholders can alleviate this problem by directly monitoring the controlling shareholders. However, the change in the shareholding percentages of large shareholders can increase the amount of information given to external investors. Chen et al. (2020) find that transmitting firm-specific information can decrease information asymmetry and stock price synchronicity. Therefore, the presence of multiple large shareholders may inhibit corporate fraud by reducing a company's degree of information asymmetry.

According to Kovacs (2010), this article selects analyst forecasting dispersion to measure information asymmetry (*Info*). Following Li and Hu (2016), we use the following formula to calculate analyst forecast dispersion:

$$Info_{i,t} = \ln\left(1 + STD\left(FEPS_{i,t}\right)/Abs\left(AEPS_{i,t}\right)\right). \quad (4)$$

In model (4), $AEPS_{i,t}$ denotes the actual earnings per share of the companies observed; $STD\ (FEPS)_{i,t}$ is the standard deviation of analysts' forecasts of earnings per share.

Referring to the methods of Wen and Ye (2014), the following mediation effect regression model is established:

$$Info_{i,t} = \alpha_0 + \alpha_1 Multi_{i,t} + \alpha_i Controls_{i,t} + Fixed\ Effect + e_{i,t}. \quad (5-a)$$

$$Fraud/Fre_{i,t} = \alpha_0 + \alpha_1 Multi_{i,t} + \alpha_2 Info_{i,t} + \alpha_i Controls_{i,t} + Fixed\ Effect + e_{i,t}. \quad (5-b)$$

In the context of a mediation regression test, if α_1 in the model (5-a) is significantly nonzero, this indicates that the presence of multiple large shareholders has a significant impact on information asymmetry; otherwise, the regression will be stopped. In the model (5-b), if α_1 and α_2 are not 0, this can preliminarily verify information asymmetrys' mediation effect. Table 7 reports the mechanism test results, which show that *Multi* is significantly negatively correlated with *Info*. After controlling the *Info* variable in the main regression, we find that *Info* significantly increases the corporate fraud probability and frequency. The coefficient of *Multi* is still significant in columns (2) and (3). Therefore, information asymmetry partially mediates the relationship between multiple large shareholders and the level of corporate fraud.

Mechanism test 2: capital occupation

The mutual supervision among several large shareholders makes it impossible for any shareholder to control the operational decisions of the enterprise alone. Additionally, these large shareholders can supervise the controlling shareholder to reduce self-interest behavior (Bennedsen and Wolfenzon 2000; Bloch and Hege 2003; Pagano and Röell 1998), protect the interests of small and medium investors. A controlling shareholder's entrenchment behavior is mainly manifested through capital occupation. Therefore, we propose that the presence of multiple large shareholders reduces corporate fraud by reducing the level of controlling shareholders' capital occupation. This

Table. 7 Mechanism test: Information asymmetry and capital occupation

Variable	*Info*	*Fraud*	*Fre*	*Occ*	*Fraud*	*Fre*
Model	**Xtreg (1)**	**Xtlogit (2)**	**Xtpoisson (3)**	**Xtreg (4)**	**Xtlogit (5)**	**Xtpoisson (6)**
Multi	−0.0619*** (− 5.75)	−0.2137** (− 2.47)	−0.1620*** (− 2.75)	−0.0011* (− 1.69)	−0.1221* (− 1.76)	−0.0845* (− 1.86)
Info		0.1578** (2.40)	0.1826*** (4.12)		2.5479*** (3.91)	1.0430*** (4.20)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Individual fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,065	9379	9514	24,453	13,646	13,695
L-likelihood		− 3010.61	− 4477.43		− 4552.45	− 7154.79
Chi^2		274.33	323.40		380.13	454.43
R^2	0.319			0.026		
F value	374.73			28.68		

Notes. The model represented by column (2) delete 1897 groups due to these groups having the same dependent variables (i.e., all 1 or 0), and 9686 observations were dropped. The model represented by column (3) deleted 1689 groups because the dependent variables of these groups are all 0, and 9382 observations were dropped; additionally, this model deleted 169 groups (169 observations) because these groups only had one observation per group. Similarly, the model represented by column (5) deleted 1912 groups because these groups have the same dependent variables (i.e., all 1 or 0), and 10,807 observations were dropped; the model represented by column (6) deleted 1797 groups because the dependent variables of these groups were all 0, and 10,656 observations were dropped; additionally, this model deleted 102 groups (102 observations) because these groups only had one observation per group

study measures capital occupation as the agency cost incurred when controlling shareholders infringe on the interests of minority shareholders.

Similar to the previous procedures, the following mediation effect regression model is established:

$$Occ_{i,t} = \alpha_0 + \alpha_1 Multi_{i,t} + \alpha_i Controls_{i,t} + Fixed\ Effect + e_{i,t}. \quad (6-a)$$

$$Fraud/Fre_{i,t} = \alpha_0 + \alpha_1 Multi_{i,t} + \alpha_2 Occupation_{i,t} + \alpha_i Controls_{i,t} + Fixed\ Effect + e_{i,t}. \quad (6-b)$$

In model (6-a), if α_1 is significantly nonzero, this indicates that multiple large shareholders have a significant impact on embezzlement by controlling a company's shareholders; otherwise, the regression will be stopped. In model (6-b), if α_1 and α_2 are not 0, this can preliminarily verify the mediation effect of capital occupation. Columns (4) and (5) of Table 7 report the results of mechanism test 2, showing that the presence of multiple large shareholders is significantly negative regarding capital occupation. After controlling for occupation in models (1-a) and (1-b), we find that *Multi* is still significantly negative and *Occ* is positive as shown in columns (5) and (6) of Table 7, consistent with the assumption that the capital occupation of controlling shareholders may be positively related to the level of corporate fraud. Therefore, the presence of multiple large shareholders reduces corporate fraud by reducing the capital occupation of controlling shareholders.

Conclusion

In recent years, corporate fraud has become a hot topic among scholars, and the prior literature has studied various determinants. However, there is little evidence on how multiple large shareholders influence corporate fraud.

This study examines the impact of multiple large shareholders on corporate fraud. We show that the presence of multiple large shareholders results in improved corporate governance using a sample of Chinese listed companies during 2010–2018. There are lower probabilities and frequencies of corporate fraud when companies have multiple large shareholders. Furthermore, the negative effects of multiple large shareholders on corporate fraud are pronounced with the separation of ownership and control. Additionally, information asymmetry and capital occupation play mediating roles in this relationship. Based on additional tests, the more multiple large shareholders, the less the tendency and frequency of corporate fraud. The governance effect of multiple large shareholders on operating and leader frauds is not significant. However, in the case of information disclosure fraud, it is significant. Our results remain after several robustness tests.

Our study enriches the literature on corporate fraud and multiple large shareholders. Moreover, our results reveal two specific mechanisms by which multiple large shareholders influence corporate fraud, that is, increasing information transparency and reducing tunneling of controlling shareholders.

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Authors' contributions
All authors contribute to the research, and do much effort in the process of revision on every version of the paper. XZ raised the research questions, pointed out the specific directions for analyzing the problem and made efforts in the

revision of the article. DY participated in the research design and drafted the work. ZL and Lynda provided constructive and valuable suggestions during the revision of the paper. The author(s) read and approved the final manuscript.

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Availability of data and materials

The datasets generated and analyzed during the current study are available in the CSMAR (http://www.gtarsc.com/) repository, which is one of the most publicly used and widely accepted database in financial and economic research. Data are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This manuscript does not involve human participants, human data or human tissue.

Consent for publication

The authors declare that consent has been obtained for any form of data (including personal details, images or videos) from anyone included in the manuscript. The authors agree to publish all case report statements.

Competing interests

The authors declare that they have no competing interests.

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