TUDelft

Delft University of Technology

Investigating the Role of Executive Intrafirm Alumni Networks in Top Management Fraud
Multilevel Study in China's Construction Industry

Wang, Ran ; Wang, Tongbing; Lee, Chia-Jung; Liu, Zhengxuan; Zhang, Guoqiang

Important note
To cite this publication, please use the final published version (if applicable).
Please check the document version above.

Investigating the Role of Executive Intrafirm Alumni Networks in Top Management Fraud: Multilevel Study in China's Construction Industry

Ran Wang[1]; Tongbing Wang[2]; Chia-Jung Lee[3]; Zhengxuan Liu[4]; and Guoqiang Zhang[5]

Abstract: To explore factors that influence the likelihood of committing fraud in the construction industry, this study concentrated on senior executives and tested whether some characteristics at the individual and firm levels have impacts on the likelihood of fraud committed by top management. Based on social network theory, this study first proposes that intrafirm alumni networks may increase the probability of senior executives engaging in corrupt behavior. Then the study explored whether the effect of executives' alumni networks on their wrongdoings is influenced by external and internal corporate governance measures. To verify the hypotheses, this study collected data on 2,017 senior executives from 118 construction companies in China from 2013 to 2021. Because of the multilevel structure of the data, hierarchical linear modeling was used. The results show that alumni networks have a significant positive effect on top management fraud. The effect is weakened by external auditing, altered by board independence, and strengthened by the size of the board of directors and the size of the supervisory board. This multilevel research contributes to advancing the understanding of managers' fraudulent behavior within an organization and extends the literature on social networks and corporate governance in the construction industry. **DOI: [10.1061/JMENEA.MEENG-5648](https://doi.org/10.1061/JMENEA.MEENG-5648).** © 2023 American Society of Civil Engineers.

Practical Applications: This study addressed fraud in the construction industry by examining the role of top managers and their social networks. Corporate governance was considered to investigate variations in the impact of social networks on top management fraud across firms. The findings demonstrate that top managers with extensive alumni networks are more susceptible to engaging in fraud, particularly in firms with an overabundance of independent directors, large boards, or non-Big 4 auditing firms. To mitigate this issue in the short term, companies are advised to redesign their corporate hiring policies and governance systems to ensure that preferential treatment based on alumni networks is avoided. Promoting diversity among executives can help maintain a well-balanced top management team. To ensure the appropriate utilization of alumni networks, implementing stringent monitoring by two boards is suggested, through adjustments in board structure, such as enhancing board diversity. In the long term, policymakers should refine company laws and promote the engagement of Big 4 auditing firms. These measures are intended to combat fraud and enhance corporate governance, fostering a more transparent business environment. By implementing these strategies, the construction industry can make significant progress in combating fraud and cultivating a trustworthy business environment.

Author keywords: Alumni networks; Top management fraud; Hierarchical linear modeling; Corporate governance; Social networks.

[1]Assistant Professor, College of Civil Engineering, Hunan Univ., Lushan Rd. (S), Yuelu District, Changsha, Hunan Province 410082, China. ORCID: https://orcid.org/0000-0002-0964-9063. Email: wangran@hnu.edu.cn

[2]Graduate Student, College of Civil Engineering, Hunan Univ., Lushan Rd. (S), Yuelu District, Changsha, Hunan Province 410082, China. Email: wtonbin@163.com

[3]Associate Professor, Dept. of International Business, Tunghai Univ., No. 1727, Sec.4, Taiwan Boulevard, Xitun District, Taichung 40704, Taiwan. Email: chiajlee@thu.edu.tw

[4]Marie Skłodowska-Curie European Fellow, National Center for International Research Collaboration in Building Safety and Environment, Hunan Univ., Changsha, Hunan Province 410082, China; Faculty of Architecture and the Built Environment, Delft Univ. of Technology, Julianalaan 134, Delft 2628 BL, Netherlands (corresponding author). Email: zhengxuanliu@hnu.edu.cn

[5]Professor, College of Civil Engineering, Hunan Univ., Lushan Rd. (S), Yuelu District, Changsha, Hunan Province 410082, China. Email: gqzhang@hnu.edu.cn

Introduction

Sustainability issues have gained significant global attention ([Liu et al. 2022](#)), and corruption has been identified as one of the contributing factors. Within the construction industry, corruption has become a pervasive concern ([Alkhatib and Abdou 2018](#)), and its occurrence is possible at any phase of a construction project ([Owusu et al. 2019](#)). Operational-level managers often find themselves directly involved in corrupt practices due to their day-to-day responsibilities ([Ameyaw et al. 2017](#)). However, these managers are bound by their reporting hierarchy, and their unethical choices may be influenced by factors such as negative leadership behavior ([Kish-Gephart et al. 2010](#)). Senior executives in construction companies also can engage in corrupt behavior, which can have serious consequences, including compromising the quality of construction projects and harming stakeholders ([Wang et al. 2020](#)). Previous studies have drawn upon upper echelon theory to investigate the potential impact of demographic characteristics, such as career horizon ([Wang et al. 2020](#)), on top management fraud in the construction industry. Despite these efforts, there remains a notable gap in comprehensively understanding the underlying mechanisms of top management fraud. In addition to the individual characteristics

of top managers, it is crucial to consider how their decision-making and behaviors may be significantly influenced by the characteristic patterns of ties between individuals (Hall and Wellman 1985; Sparrowe et al. 2001; Tian et al. 2023). This perspective acknowledges the fact that each top manager is embedded within a broader social network (Granovetter 1985). Further exploration of these social network dynamics may lead to a deeper understanding of the mechanisms driving top management fraud in the construction industry.

A substantial body of behavioral and management literature has emphasized the various advantages of social networks, which include providing resources (Oh et al. 2006), power and influence (Chiu et al. 2017), cooperation (Huang et al. 2023), and competitive advantage (Collins and Clark 2003). Social networks have been associated with numerous positive outcomes, such as increased bidding competitiveness (Lu et al. 2021) and improved organizational performance (Boso et al. 2013). Notably, some studies (Ferris et al. 2003) argued that an individual's social networks could serve as an indicator of their social influences and capabilities. However, social networks also may have a dark side and act as a sugarcoated pill. In the context of the construction industry, certain studies (e.g., Zhang et al. 2017) have reported that business-to-government corruption in construction projects may stem from *guanxi* (i.e., social networks) with government officials. Despite these findings, it remains unclear whether social networks promote or hinder top management fraud in construction firms. This study addressed this research gap by investigating the factors that may influence top management fraud in the construction industry, taking into consideration the highly networked and social nature of top managers (Shue 2013).

The influence of executives' alumni networks on top management fraud is specifically investigated. Previous studies have shown that alumni networks significantly influence managerial decision-making (Cohen et al. 2008). However, few studies have specifically explored the relationship between alumni networks and top management fraud. When top managers have alumni connections with other top managers or board members in the same firm, they may be able to access internal information (Guan et al. 2016) that could be exploited to further their own interests (Granovetter 1985). Coordination among top managers or acquiescence by board members may be necessary for some fraudulent activities, which may be deemed direct participation in illegal practices or a failure to report them. Thus, alumni networks may contribute to the planning, decision-making, and implementation of top management fraud through social connections.

In addition to examining the impact of individual executives' alumni networks, this study investigated the moderating effect of corporate governance on top management fraud, recognizing the multidetermined nature of unethical activities (Kish-Gephart et al. 2010). Previous research often focused primarily on either the individual level (Troy et al. 2011) or the firm level (Lee et al. 2018), overlooking the possibility that executives with similar features may make different choices when situated in different organizations. To address this research gap, this study considered both external and internal aspects of corporate governance. External governance is represented by the utilization of Big 4 auditing firms, whereas internal governance mainly revolves around the monitoring roles of the board of directors and supervisory board. Conducted in the context of China, an emerging economy known for its distinct culture of *guanxi*, or social networks (Zhou et al. 2021), this research benefitted from exploring the influence of relationships on corruption within the construction industry. These networks and their associated tacit beliefs and behaviors potentially can distort norms, leading to the normalization of certain illegal

acts (Zhang et al. 2017). By examining the interplay between executives' alumni networks and corporate governance, this study provides valuable insights into the complexities of top management fraud in the construction sector.

The primary goal of this study was to clarify the antecedents of top management fraud in the construction industry from the perspective of social networks. Such clarification may facilitate decision makers in implementing measures that effectively mitigate top management fraud and corporate scandals. To accomplish this overarching goal, three specific objectives were set.

- Objective 1: Explore the potential association between top management fraud and executives' alumni networks. The intent of this objective was to investigate whether top executives' alumni networks have a significant impact on the occurrence of fraudulent activities within construction companies.
- Objective 2: Investigate the moderating effect of external governance mechanisms, specifically the role of rigorous auditing conducted by Big 4 auditing firms. The intent of this objective was to assess whether the relationship between executives' alumni networks and top management fraud is contingent on the level of external scrutiny and oversight provided by reputable auditing firms.
- Objective 3: Examine the potential moderating role of internal governance mechanisms, particularly the monitoring carried out by the board of directors and supervisory board. The intent of this objective was to understand how the presence and effectiveness of board monitoring may influence the strength of the association between executives' alumni networks and top management fraud.

By addressing these specific objectives, this study advances the understanding of the complex interplay between social networks, corporate governance, and top management fraud in the construction industry. The findings from this research are expected to offer valuable insights for an informed decision and to contribute to the development of more-effective strategies to prevent and address fraudulent behaviors within construction companies.

Literature Review and Hypotheses Development

Top management fraud, as defined by Zahra et al. (2005), refers to "deliberate actions taken by top managers to swindle, cheat, con, or deceive stakeholders or other investors, intended for the benefit of individuals or the company." Although prior studies have identified various factors that may affect executives' involvement in fraudulent behaviors, such as compensation incentives (Wang et al. 2021) and individual characteristics (Troy et al. 2011), little attention has been given to the role of social networks. Cooper et al. (2013) called for further investigation into the relationship between networks and fraud prevention. Therefore the present study examined the impact of alumni networks, one of the most significant social networks to which an individual may belong, on top management fraud, with a focus on corporate governance as moderator.

Alumni Network

Alumni networks are formed naturally due to shared educational and cultural backgrounds, leading to a sense of homogeneity and emotional bonds among members (McPherson et al. 2001). Such networks can facilitate communication and trust-building among senior managers, but also can increase the opportunities for unethical behavior (Guan et al. 2016). Furthermore, alumni networks can serve as a valuable resource for individuals, beyond simply providing emotional connections. They also can be a means to

facilitate economic interests and expand one's networking resources, because schools often provide an ideal platform for forming these connections (Cohen et al. 2008; Fracassi and Tate 2012). However, such personal connections also can lead to increased opportunities for fraudulent activities, especially for economic actors such as top managers (Granovetter 1985). Although a larger alumni network can improve intrafirm information communication and offer various other benefits (Guan et al. 2016), it also raises the risk of misconduct and deception. For example, Li (2023) provided evidence that the interconnectedness among a company's top management team can increase the likelihood of financial reporting fraud.

In line with Dbouk et al. (2020) and Griffin et al. (2021), our study examined not only the connections among executives but also those between executives and board members. This choice was motivated by findings suggesting that an alumni network between executives and board members within a company can foster in-group favoritism, potentially compromising the independence of effective supervision and leading to a decrease in a firm's valuation (Bruynseels and Cardinaels 2014). When top managers interact with board members who share an alumni network, these board members may tend to perceive the executives' behavior more favorably and exercise less oversight (Chidambaran et al. 2011). Consequently, executives might be more inclined to engage in fraudulent activities with the tacit approval of board members. Building on these considerations, this paper proposes the following hypothesis:

H1: Executives' intrafirm alumni networks increase the likelihood of top management fraud.

Big 4 Auditing Firms

Independent auditors, such as the Big 4 auditing firms, are crucial in mitigating information asymmetry and restraining managers' opportunistic behaviors. They provide high-quality accounting information and reduce bias and errors in firms' reports (Bushman and Smith 2001). The Big 4 auditing firms are considered to be capable of conducting rigorous audits, which in turn diminishes the likelihood of executives manipulating accounting information and extracting shareholder wealth (DeFond and Zhang 2014). This can be explained from the following two perspectives.

First, in the event of quality problems or scandals, Big 4 auditing firms may suffer greater damage to their reputation and future revenue streams than small firms. As a result, they have a stronger inherent economic incentive to provide high-quality audits (DeAngelo 1981). This drives them to identify misstatements and fraudulent activities by senior executives in a timely and effective manner. Second, compared with small firms that may sacrifice independence to cater to clients and ingratiate themselves to management (Wang et al. 2008), Big 4 firms have a larger client base, which reduces their pressure to retain clients. This makes them more likely to maintain their independence (Guan et al. 2016) and actively disclose fraudulent activities by managers. The high risk of disclosure may reduce executives' motivation to engage in fraudulent behaviors, even though some managers may have large alumni networks, internal information, and opportunities to commit fraud. Under rigorous auditing, the impact of managers' internal resources on fraud is likely to be limited. Therefore, this study assumed that the relationship between executives' alumni networks and fraud becomes less positive when Big 4 auditing firms are employed.

H2: Big 4 auditing firms weaken the positive effect of intrafirm alumni networks on top management fraud.

Board Monitoring

Board monitoring widely is considered to be a crucial internal corporate governance mechanism (Walsh and Seward 1990). In contrast to the US system of a single board, China's listed companies have a board of directors and a supervisory board. A board of directors in China is structured similarly to those in developed countries (Firth et al. 2007), and is responsible for making major decisions and for appointing and evaluating senior executives (Jiang and Kim 2015).

The board of directors plays a critical role in determining decisions regarding fraudulent activities at the apex of corporate decision-making. The board typically is composed of inside or outside directors, and the level of board independence is determined by the number of independent directors on the board. Independent directors, who have no material relationship with the company, are better positioned to monitor and safeguard their reputations. A board comprised primarily of independent directors is likely to be more vigilant and thorough in evaluating strategic decisions and management behavior. The literature on corporate governance suggests that a higher degree of board independence generally is beneficial in solving principal–agent conflicts by counteracting the power and self-serving inclinations of top managers (Fama and Jensen 1983). Thus, boards with more independent directors are expected to be more effective in monitoring and evaluating executives, limiting the opportunities for fraudulent activity. Even managers with extensive alumni networks may be deterred from making unethical decisions when there is an independent board of directors overseeing their actions.

H3: Board independence weakens the positive effect of intrafirm alumni networks on top management fraud.

Although a board of directors is appointed by shareholders, they may not always be able to influence the potentially bad decision-making carried out by top managers, because the control of information is often in the hands of the top management. To mitigate this information asymmetry, a large board is needed. Although the debate on whether a larger board size is beneficial or detrimental to corporate governance is ongoing, some scholars posit that larger boards may contain more professional expertise and experience to obtain and process a great deal of information about their firms (de Villiers et al. 2011). When the information advantage of executives with large alumni networks is weakened, their motivation for committing fraud also could be greatly reduced. In addition, a large board may have the potential for heterogeneity (Wiersema and Bantel 1992). The presence of heterogeneous members may result in competitive interactions (Hogg 2006), and thus decision-making is less likely to be characterized by acquiescence (Hogg and Terry 2000), even if an executive has links with some directors. Without the acquiescence of directors, top management fraud may be prevented and/or detected in a timely manner. Therefore, when a large board is employed, the effect of alumni networks on top management fraud would be less positive.

H4: Board size weakens the positive effect of intrafirm alumni networks on top management fraud.

Chinese listed construction companies also adopt a supervisory board to monitor the performance of directors and senior executives. However, the effectiveness of this monitoring may be impacted by the information available to the board (Xi 2006). A larger supervisory board with diverse expertise could access various information and resources, thereby increasing the likelihood of limiting fraud by top managers, even if they have access to large alumni networks and internal information.

Furthermore, supervisory boards are associated with executive compensation, because the board can submit proposals to

© ASCE

04023067-3

J. Manage. Eng.

shareholders and influence compensation (Ding et al. 2010). A large board with diverse expertise may easily find executives' faults and justify decreasing their compensation. Additionally, such a board can act as a deterrent and can oppose senior executives who adopt opportunistic behaviors, including top management fraud (Firth et al. 2007). In fear of compensation reduction and deterrence, some executives may be hesitant to commit fraud, even with ample opportunities and large alumni networks. Thus, a large supervisory board is likely to decrease the chances of executives conducting fraud in Chinese construction companies. Taken together, this study assumes that even top managers with large alumni networks would be less likely to conduct fraud if a firm has a large supervisory board.

H5: Supervisory board size weakens the positive effect of intra-firm alumni networks on top management fraud.

Method

Sample and Data

To test the preceding hypotheses, this study collected data on top management in construction companies listed on the Shanghai and Shenzhen stock exchanges between 2013 and 2021. The sample included chief executive officers (CEOs) and non-CEO executives, as identified in the annual reports of listed construction companies (Zhang et al. 2011). The present research obtained the data from the China Stock Market and Accounting Research (CSMAR) and China Center for Economic Research (CCER) databases. The data on top management fraud were collected manually from enforcement records released by the China Securities Regulatory Commission (CSRC) and from information published online by Sina Finance. In each record, the CSRC provided information on the guilty party's name, position, description of illegal facts, violation year, violation type (e.g., false disclosure of financial information, illegal stock trading, and occupancy of company's assets), punishment type (e.g., warning, confiscation of illegal gains, and market entry ban), and total penalty amount. This study relied on the year in which the violating activities were conducted, rather than the announcement date following Wang et al. (2020). For example, on July 5, 2019, the CSRC issued a report stating that several executives in a construction company were fined because they falsely claimed that a tourist resort project was progressing well in 2015, despite the fact that the project was suspended at that time (China Securities Regulatory Commission 2019). In this case, these executives were considered to be violators in 2015 rather than 2019. Information on top managers' educational backgrounds was gathered from various sources, including CSMAR, Sinofin, Sina Finance, and China Finance Information (2023), and used to match executives' alumni networks. The final data set consisted of 7,577 individual-year observations, derived from 2,017 executives in 118 construction companies, and included a varied number of executives per year in a panel data set.

Measures

Dependent Variable

The dependent variable, top management fraud, was measured as a binary variable reflecting whether a top manager committed fraudulent behaviors in the focal year. This variable had a value of 1 if the focal top manager conducted illegal activities; otherwise, it had a value of 0 (Wang et al. 2020).

Independent Variable

The alumni network of executives was the independent variable in our analysis. This study operationalized an alumni connection between two individuals if they attended the same educational institution for either undergraduate or graduate degrees, regardless of whether they attended the school in the same period, for the same major, or in the same class. This approach followed the methodology used by Guan et al. (2016), and Gu et al. (2019). In evaluating an executive's alumni networks, our study adopted a methodology reminiscent of Fracassi and Tate's (2012) by quantifying the cumulative count of their alumni connections within the focal firm. We specifically considered the collective number of connections with executives, directors, and supervisory board members, and refrained from delineating the networks based on varying hierarchical levels and organizational entities. This decision was rooted in the inherent intricacies of professional networks, in which myriad diverse connections coexist within an individual's network sphere. Moreover, we posited that the propensity for engaging in fraudulent activities could be influenced significantly by the amalgamated impact of these multifaceted connections. For example, an individual might exhibit a diminished inclination toward fraudulent behavior due to their associations with fellow executives, or, conversely, an augmented commitment to legal compliance stemming from their connections with directors or supervisory board members. Consequently, we opted to employ the total count of connections with executives, directors, and supervisory board members to align our measurement with the complex dynamics observed in real-world scenarios. This metric, often referred to as degree centrality, reflects the extent to which an individual actively engages and interacts with other members within the network (Freeman 1978). This research also updated the names of all universities in China to their current names, because some universities may merge or change their names over time. For example, this study considered executives who graduated from Hangzhou University to be alumni of Zhejiang University, because Hangzhou University merged with Zhejiang University. In this study, a total of 566 educational institutions (including educational institutions in China and overseas) were involved. The detailed distribution of educational institutions and alumni networks is presented in Table 1.

Moderating Variables

This study examined four moderating variables related to external and internal corporate governance. For external governance, this study used the presence of Big 4 auditors, which was operationalized as a binary variable indicating whether the external auditors hired by the focal firm were from a Big 4 accounting firm (DeAngelo 1981). This variable equaled 1 if the external auditors were from a Big 4 auditing firm, and 2 otherwise. Regarding internal corporate governance, board independence, board size,

Table 1. Statistics of relevant universities and alumni networks

Year	Total number of universities	Number of alumni in each university			
		Min	Max	Mean	Standard deviation
2013	206	1	29	2.709	3.438
2014	200	1	28	2.995	3.889
2015	225	1	32	2.902	4.242
2016	256	1	38	2.801	4.513
2017	276	1	40	2.844	4.675
2018	328	1	44	2.860	4.829
2019	323	1	41	2.913	4.689
2020	337	1	41	2.893	4.822
2021	340	1	48	2.847	5.019

and supervisory board size were considered. Board independence was measured as the percentage of independent directors on the board of directors, following Lee et al. (2018). Board size, which may affect monitoring effectiveness, was calculated as the sum of directors, similar to the approach used by Wang et al. (2018). Finally, supervisory board size was represented by the total number of supervisory board members, as suggested by Firth et al. (2007).

Control Variables

The control variables were categorized according to two levels: individual, and firm. As posited by upper echelon theory, at the individual level an executive's observable demographic characteristics could significantly affect their behavior (Hambrick and Mason 1984). Therefore, this study first considered education level, which was coded as the highest level of education gained by a manager, ranging from 1 (below junior college) to 5 (doctoral degree). Second, tenure was calculated as the number of years a manager held a top management position (Bruynseels and Cardinaels 2014). Third, political background was operationalized as a binary variable, with 1 assigned to executives who served or currently serve as officers in central or local governments or military (Fan et al. 2007). Fourth, previous studies have shown that women tend to have a lower risk appetite and lower overconfidence (Charness and Gneezy 2012), so this study assigned a value of 1 to the gender variable for female top managers, and 0 otherwise. Fifth, according to prospect theory, compensation incentives affect executives' risky decision-making, including fraudulent activities (Wang et al. 2021). Thus, executive compensation was measured by total pay and ownership. The log of total pay was used to capture salary, stipends, and bonuses (Lu and Shi 2018), whereas ownership was calculated as the ratio of the total number of shares held by an executive to the number of shares in the focal company (Troy et al. 2011). Finally, career horizon was defined as the number of years remaining before an executive's retirement age (Krause and Semadeni 2014).

For the firm level, this study first aggregated some individual-level variables to the top management team (TMT) level to represent the firm level. Thus, the percentage of female executives in the top management team was first controlled. Second, firm size was controlled for. Compared with small firms, large firms may be more complex and difficult to manage effectively (Aharony et al. 2015), providing more opportunities for executives' opportunistic behavior. Firm size was measured as the logarithm of the total number of employees within a firm (Krause and Semadeni 2014). Third, as suggested by Wiersema and Bantel (1992), TMT size has been reported to affect team cohesion, the level of member communication, the degree of information asymmetry, and, in turn, members' behavioral decisions. The present study used the total number of top managers to measure TMT size. Fourth, board meeting frequency is a direct reflection of a board's diligence and motivation to perform its duties (Lipton and Lorsch 1992). In this study, board meeting frequency was operationalized by the number of board meetings in the focal year (Firth et al. 2007). Fifth, according to agency theory, it is necessary for shareholders to monitor managers to prevent opportunistic behaviors that are detrimental to firm value (Jensen and Meckling 1976). To indicate shareholders' exercise of monitoring rights, shareholder meeting frequency was controlled and measured as the total number of shareholder meetings in a focal year (Guo 2009). Sixth, supervisory board meeting frequency was defined as the total number of supervisory board meetings held annually (Firth et al. 2007). Seventh, this study controlled for CEO duality because of the inescapable influence of a CEO (Shi et al. 2016). This variable equaled to 1 if a CEO also served as the chairman of the board of directors, and 0 otherwise. Eighth, large shareholders are likely to have sufficient incentives to monitor

management effectively, thereby discouraging opportunistic behaviors (Shleifer and Vishny 1997). Ownership concentration was considered and represented by the Herfindahl index, which was calculated as the sum of the squared percentage of total shares held by each of the top ten shareholders (Wang et al. 2019). Ninth, in China, the state still exerts influence on construction companies. State ownership was measured by the percentage of shares held by government entities (Shen and Lin 2009). Tenth, poor financial performance may produce strong incentives for executives to engage in illegal activities (Wang et al. 2021). Here, firm performance was controlled for, which was indicated by the prior year's return on assets (ROA) (Wang et al. 2019). Last, eight year dummies were created to consider unobserved heterogeneity arising from the external environment (Troy et al. 2011).

The variables are summarized in Table 2.

Hierarchical Linear Modeling

The data used in this study corresponded to three dimensions: year, individual, and firm. These dimensions were nested, meaning that multiple individual-year observations were nested within an individual manager, and multiple managers were nested within a firm. This violated the assumption of independent and identically distributed random variables necessary for traditional regression, making hierarchical linear modeling (HLM) a more appropriate approach. HLM allows for modeling of underlying relationships across variables and testing cross-level moderating effects, which cannot be achieved by traditional regression. Cross-level effects are important in the field of organizational behavior and corporate management because an individual or firm's behavior is associated with group-level, industry-level, region-level, and even country-level factors. HLM can test these top-down influences on the relationship between low-level factors and dependent variables. Therefore, this study used HLM to analyze the data.

To perform HLM analysis, it is crucial to determine the appropriate level for each variable (year, individual, or firm). This prevents issues such as data aggregation bias, reduced variance in predictor variables, and misjudging units of analysis. To address this, intraclass correlation (ICC) testing was conducted, which assesses aggregation accuracy. Variables with high ICC(1) and ICC(2) values, indicating similarity within groups and difference across groups, are reliable for aggregation (Ozkaya et al. 2013). Reliable aggregation is achieved and justified when (1) the ICC(1) value of a variable is greater than 0.25, (2) ICC(2) is greater than 0.7, and (3) the F ratio for ICC(1) is significant (Klein and Kozlowski 2000; LeBreton and Senter 2008). The ICC(1) and ICC(2) values for all variables are presented in Table 3. All variables, except ROA and total pay, met the necessary requirements for reliable aggregation. Therefore, this study input the mean value of each variable across focal years at the second or third level. ROA and total pay, which exhibited large variance across years, were assigned to the year level.

Next, appropriate centering should be given due attention because it influences the estimation and the interpretation of the model (Raudenbush and Bryk 2002). In this study, the second level (individual level) focused on the differences among individuals in a focal firm and were of primary interest, whereas the lowest level (year level) and the third level (firm level) concentrated on differences among organizations. Therefore this study performed group mean centering for all continuous and ordinal variables in the second level (individual level), and grand mean centering for all the continuous variables in the lowest level (year level) and the third level (firm level) (Ou et al. 2017). For dichotomous variables including year dummies, this research did not implement centering,

Table 2. Variables: description and type

Variable	Description	Type
	Individual level	
Alumni network	Total number of alumni owned by an executive within the firm	Numerical
Education	1 = below junior college, 2 = college, 3 = bachelor's degree, 4 = master's degree, 5 = doctoral degree	Ordinal categorical
Gender	1 = female, 0 = male	Binary categorical
Career horizon	Number of years remaining before an executive's retirement age	Numerical
Total pay	Sum of salary, stipends, and bonuses	Numerical
Ownership	Ratio of the total number of shares held by an executive to the number of shares in the focal company	Numerical
Political background	Whether executives served or currently serve as officers in central or local governments or military (1 = yes, 0 = no)	Binary categorical
Tenure	Number of years a manager held a top management position.	Numerical
	Firm level	
ROA	Prior year's return on assets	Numerical
Board size	Total number of directors	Numerical
Board independence	Percentage of independent directors on the board of directors	Numerical
Supervisory board size	Total number of supervisory board members	Numerical
TMT size	Total number of top managers	Numerical
Percentage of female executives	Proportion of female directors to the total number of board members	Numerical
Firm size	Logarithm of the total number of employees within a firm	Numerical
CEO duality	Whether a CEO also serves as the chairman of the board of directors or not (1 = yes, 0 = no)	Binary categorical
Board meeting frequency	Number of board meetings in the focal year	Numerical
Shareholder meeting frequency	Number of shareholder meetings in the focal year	Numerical
Supervisory board meeting frequency	Number of supervisory board meetings in the focal year	Numerical
Ownership concentration	Herfindahl index: the sum of the squared percentage of total shares of a firm held by each of the top ten shareholders	Numerical
State ownership	Percentage of shares held by government entities	Numerical
Big 4	Whether the external auditors hired by the focal firm were from a Big 4 accounting firm (1 = yes, 2 = no)	Binary categorical

Table 3. Intraclass correlations of relevant variables

Variable	ICC(1)	F ratio for ICC(1)	ICC(2)
	Individual level		
Alumni network	0.6099	15.07[****]	0.9336
Career horizon	0.8199	41.98[****]	0.9767
Total pay	0.1140	2.16[****]	0.5432
Ownership	0.9184	102.33[****]	0.9902
Political background	0.4043	7.11[****]	0.8600
Tenure	0.4057	7.37[****]	0.9099
	Firm level		
ROA	0.0268	1.22	0.1817
Board size	0.7277	25.06[****]	0.9601
Board independence	0.7189	24.02[****]	0.9584
Supervisory board size	0.8084	38.97[****]	0.9743
TMT size	0.6556	18.13[****]	0.9449
Percentage of female executives	0.6227	15.75[****]	0.9369
Firm size	0.9808	460.14[****]	0.9978
CEO duality	0.3540	5.93[****]	0.8314
Board meeting frequency	0.4232	7.61[****]	0.8696
Shareholder meeting frequency	0.4206	7.53[****]	0.8681
Supervisory board meeting frequency	0.5430	11.69[****]	0.9151
Ownership concentration	0.8142	40.44[****]	0.9753
State ownership	0.4889	9.61[****]	0.8959
Big 4	0.8531	53.27[****]	0.9812

Note: [****]$p < 0.001$.

in order to ensure the interpretability of our estimates (Lander et al. 2019).

Because a binary outcome was used as the dependent variable, this study adopted a multilevel logit model. To make the models succinct, a random intercept model was employed

$$\text{Level 1 (year level)}: Y_{ijk} = \log\left[\frac{p_{ijk}}{1 - p_{ijk}}\right] = \beta_{ijk} + \sum_p \beta_{pjk} \cdot X_{pijk} \tag{1}$$

$$\text{Level 2 (individual level)}: \beta_{ijk} = \gamma_{00k} + \sum_q \gamma_{0qk} \cdot Z_{qjk} + e_{0jk} \tag{2}$$

$$\text{Level 3 (firm level)}: \gamma_{00k} = W_{000} + \sum_m r_{00m} \cdot H_{mk} + u_{00k} \tag{3}$$

where p_{ijk} = probability that executive j of firm k is involved in top management fraud in year i; X_{pijk} represents the variables in the year level and the eight year dummies; β_{pjk} is the coefficient corresponding to each variable in the year level; Z_{qjk} denotes the different variables in the individual level; γ_{0qk} denotes the coefficient of each variable in the individual level; H_{mk} are the variables in the firm level; r_{00m} represents the coefficient of each variable in the firm level; e_{0jk} and u_{00k} = error terms denoting the unique effects associated with individual j and firm k; and β_{ijk}, γ_{00k}, and W_{000} = intercepts of Level 1, Level 2, and Level 3, respectively. The intercept of Level 1 would in turn become the dependent variable of Level 2, and the intercept of Level 2 would be the dependent variable of Level 3. In addition, there is no random error term in Level 1 because the total variance at that level is assumed to be included in the estimates Y_{ijk} (Hox et al. 2017).

This multilevel logit model was generated using HLM version 6 software. First, top management fraud (dependent variable), ROA, total pay, and the eight year dummies were added to Level 1 (year level). Next, alumni network (independent variable) and control variables about individual executives (e.g., tenure) were entered in Level 2 (individual level). Finally, the moderators and the control variables about firms (e.g., state ownership) were included in Level 3 (firm level).

Table 4. Descriptive statistics and collinearity diagnostics

Variable	N	Mean	Standard deviation	VIF
1. Fraud	7,577	0.02	0.15	—
2. Education	2,017	3.29	0.87	1.109
3. Alumni network	2,017	0.29	0.90	1.077
4. Gender	2,017	0.13	0.34	1.177
5. Career horizon	2,017	21.95	7.10	1.279
6. Total pay	7,577	12.42	2.91	1.055
7. Ownership	2,017	0.01	0.01	1.045
8. Political background	2,017	0.06	0.22	1.028
9. Tenure	2,017	3.75	2.93	1.176
10. Board size	118	8.34	1.30	1.58
11. Board independence	118	0.39	0.06	1.723
12. Supervisory board size	118	3.52	0.95	1.345
13. TMT size	118	7.46	2.76	1.404
14. Percentage of female executives	118	0.13	0.15	1.371
15. Firm size	118	7.42	1.22	2.687
16. CEO duality	118	1.77	0.31	1.1
17. Board meeting frequency	118	10.81	3.04	1.493
18. Supervisory board meeting frequency	118	1.67	2.66	1.136
19. Shareholder meeting frequency	118	3.60	1.27	1.387
20. Ownership concentration	118	0.17	0.11	1.904
21. State ownership	118	0.06	0.13	1.595
22. Big 4	118	1.94	0.22	1.987
23. ROA	7,577	−0.01	0.97	1.022

Note: VIF = variance inflation factor.

Results

Table 4 provides the descriptive statistics for the variables for the year, individual, and firm levels, as well as the results of collinearity diagnostics. Tables 5 and 6 present the results of correlation analysis. According to the correlation coefficients in Table 5, fraud is significantly correlated with gender, career horizon, board size, supervisory board size, TMT size, percentage of female executives, firm size, board meeting frequency, supervisory board meeting frequency, shareholder meeting frequency, ownership concentration, state ownership, and Big 4. Although some correlation coefficients were significant, they were lower than 0.7, indicating that none of these variables was highly correlated. To test potential multicollinearity, this study calculated the variance inflation factor (VIF). All VIF values were below 10, indicating that collinearity was not a notable problem (Hair et al. 2014). The hypotheses regarding top management fraud were verified using HLM, and the results are presented in Table 7.

Model 1 tested the effects of control variables on top management fraud. Firm size (-0.194; $p < 0.05$), supervisory board meeting frequency (-0.125; $p < 0.01$), and state ownership (-9.314; $p < 0.001$) have significant negative impacts on top management fraud, whereas board meeting frequency (0.113; $p < 0.05$), ownership concentration (2.849; $p < 0.1$), gender (0.378; $p < 0.05$), and ROA (0.437; $p < 0.05$) have significant positive impacts on top management fraud. Model 2 introduced the independent variable, alumni network, to test whether alumni networks have an impact on executives' fraudulent behavior. The results show that alumni network does have a significant positive effect on executive fraud (0.090; $p < 0.01$). Hypothesis 1 is supported. Models 3–6 examined the role of moderators in the relationship between alumni network and top management fraud. The coefficient of the interaction term of alumni network and Big 4 in Model 3 was significantly negative (-0.172; $p < 0.01$). This indicates that the Big 4 weakens the positive effect of alumni network, consistent with Hypothesis 2. As indicated in Model 4, the interaction term of alumni network and board independence was significantly negative (-0.946; $p < 0.01$), providing support for Hypothesis 3. An interaction term between alumni network and board size was added to Model 5, and

Table 5. Correlation analysis (Part 1)

Variable	1	2	3	4	5	6	7	8	9	10
1	—	—	—	—	—	—	—	—	—	—
2	−0.01	1	—	—	—	—	—	—	—	—
3	−0.02	0.17***	1	—	—	—	—	—	—	—
4	0.05***	−0.01	0.03***	1	—	—	—	—	—	—
5	0.06***	−0.02	−0.00	0.17***	1	—	—	—	—	—
6	0.00	0.01	0.01	−0.00	−0.07***	1	—	—	—	—
7	0.00	0.00	0.04***	−0.03**	−0.04***	0.03**	1	—	—	—
8	0.01	0.07***	0.02**	−0.02*	−0.08***	−0.00	0.01	1	—	—
9	−0.01	−0.04***	−0.01	−0.01	−0.33***	0.16***	0.01	0.00	1	—
10	−0.02**	−0.04***	−0.05***	−0.02*	0.00	0.01	−0.05***	0.01	0.04***	1
11	−0.00	0.12***	0.10***	−0.04***	−0.15**	−0.02	−0.02**	0.01	−0.00	−0.49***
12	−0.06***	0.15***	−0.04***	−0.11***	−0.19***	0.02	−0.07***	0.01***	0.01***	0.13***
13	−0.03***	0.02*	−0.00	−0.09***	−0.10***	0.02	−0.07***	0.00	0.05***	0.00
14	0.08***	−0.03***	0.01	0.36***	0.14***	0.03***	0.04***	−0.05***	−0.04	−0.05
15	−0.04***	0.18***	0.13***	−0.10***	−0.25***	−0.03***	−0.05***	0.10***	0.04***	−0.18***
16	0.00	−0.01	0.04***	−0.05***	−0.06***	0.06***	−0.14***	−0.02*	0.06***	0.09***
17	0.07***	0.09***	0.12***	0.02**	−0.04***	−0.09***	−0.02*	0.02*	−0.09***	−0.08***
18	−0.04***	0.07***	0.05***	0.00	−0.06***	−0.04***	−0.03***	0.02**	−0.02**	−0.13***
19	0.05***	−0.02*	0.04***	0.07***	0.04***	−0.05***	−0.03***	−0.05***	−0.06***	0.16***
20	−0.03**	0.14***	0.02*	−0.09***	−0.18***	−0.00	−0.03**	0.02**	0.02*	−0.18***
21	−0.05***	0.08***	−0.03**	−0.09***	−0.12***	−0.06***	−0.05***	0.00	−0.03**	0.04***
22	0.03***	−0.15***	−0.16***	0.05***	0.16***	0.01	0.04***	−0.11***	−0.01	0.21***
23	0.01	0.00	0.01	−0.01	0.01	0.10***	0.01	−0.04***	0.04***	−0.00

Note: The coefficients refer to Pearson correlation coefficients if the two variables are numerical, to point-biserial correlation coefficients if one variable is numerical while the other is binary categorical variable, and to Spearman correlation coefficient if the two variables are both binary categorical variables. 1 = fraud; 2 = education; 3 = alumni network; 4 = gender; 5 = career horizon; 6 = total pay; 7 = ownership; 8 = political background; 9 = tenure; 10 = board size; 11= board independence; 12 = supervisory board size; 13 = TMT size; 14 = percentage of female executives; 15 = firm size; 16 = CEO duality; 17 = Board meeting frequency; 18 = supervisory board meeting frequency; 19 = shareholder meeting frequency; 20 = ownership concentration; 21 = state ownership; 22 = big 4; and 23 = ROA. *$p < 0.10$; **$p < 0.05$; and ***$p < 0.01$.

Table 6. Correlation analysis (Part 2)

Variable	11	12	13	14	15	16	17	18	19	20	21	22
11	1	—	—	—	—	—	—	—	—	—	—	—
12	0.17**	1	—	—	—	—	—	—	—	—	—	—
13	0.14**	0.25**	1	—	—	—	—	—	—	—	—	—
14	−0.10**	−0.26**	−0.24**	1	—	—	—	—	—	—	—	—
15	0.50**	0.24**	0.18**	−0.24**	1	—	—	—	—	—	—	—
16	−0.07**	0.08**	0.16**	−0.11**	0.05**	1	—	—	—	—	—	—
17	0.11***	0.02	0.14**	0.06**	0.19**	0.09**	1	—	—	—	—	—
18	0.12**	0.04**	−0.08**	0.01	0.19**	0.05**	0.24**	1	—	—	—	—
19	−0.08**	−0.04**	0.07**	0.13**	−0.17**	0.07**	0.43**	0.07**	1	—	—	—
20	0.30**	0.24**	0.22**	−0.23**	0.44**	0.04**	0.08**	0.01	−0.08**	1	—	—
21	0.06**	0.25**	0.13**	−0.22**	0.10**	0.05**	0.15**	−0.04**	0.01	0.49**	1	—
22	−0.41**	−0.04**	0.02	0.13**	−0.79**	−0.05**	−0.12**	−0.15**	0.10**	−0.36**	0.05**	1
23	0.01	0.02	0.06**	−0.05	0.01	−0.01	−0.06**	0.02	−0.03**	0.04**	0.01	−0.01

Note: The coefficients refer to the Pearson correlation coefficients if the two variables are numerical, to point-biserial correlation coefficients if one variable is numerical and the other is a binary categorical variable, and to the Spearman correlation coefficient if both variables are binary categorical variables. 11 = board independence; 12 = supervisory board size; 13 = TMT size; 14 = percentage of female executives; 15 = firm size; 16 = CEO duality; 17 = board meeting frequency; 18 = supervisory board meeting frequency; 19 = shareholder meeting frequency; 20 = ownership concentration; 21 = state ownership; 22 = Big 4; and 23 = ROA. **$p < 0.05$; and ***$p < 0.01$.

its coefficient was significantly positive (0.076; $p < 0.01$), rejecting Hypothesis 4. Hypothesis 5 assumed that the positive effect of alumni network on top management fraud would be weakened by supervisory board size. The coefficient of the interaction term between alumni network and supervisory board size in Model 6 was significantly positive (0.055; $p < 0.05$). Therefore Hypothesis 5 also was not supported. Model 7 was the full model with all interaction terms, and its results were roughly similar to those of Models 2–6.

To further explain the moderating role of corporate governance, this paper followed Aiken et al. (1991) and plotted the relationship between alumni network and top management fraud under different levels of moderating variables (mean ± 1 standard deviation). Except for Big 4, Big 4 equaled 1 for low level and 2 for high level. Fig. 1 shows the moderating effect of Big 4, board independence (BI), board size, and supervisory board size (SB size). When Big 4 is low, that is, when a Big 4 auditing firm was employed, the likelihood of fraud is lower than when Big 4 is high [Fig. 1(a)]. This confirms Hypothesis 2. When board independence is higher, the effect of alumni on fraud is less positive, and even becomes negative [Fig. 1(b)]. However, when executives have a certain number of alumni connections, their likelihood to commit fraud becomes higher when board independence is high than when board independence is low. This result is not fully in line with H3. When the board size is larger, the effect of alumni on fraud is more positive, and the likelihood of fraud appears to be higher [Fig. 1(c)], which is inconsistent with H4. When the supervisory board size is larger, the likelihood of fraud becomes higher than when the supervisory board size is smaller [Fig. 1(d)]. This result is contrary to H5.

Discussion

This study offers insights into top management fraud in China's construction industry. First, executives' intrafirm alumni network was found to significantly increase the likelihood of fraud. A larger alumni network provides more opportunities for executives to exchange sensitive information and use it for their own benefit at the expense of shareholders, even by illicit means. This is consistent with prior research highlighting the negative effects of social networks (Bruynseels and Cardinaels 2014; Gu et al. 2019; Guan et al. 2016). Although some studies have identified positive effects of networks (e.g., Baker and Faulkner 2004; Kong et al. 2019),

criminologists believe that the dark side of social networks outweighs their positive aspects, particularly in China's context. Chinese *guanxi* (i.e., social networks) culture has a profound impact on business and commercial activities in Chinese society (Lin 2011), and similar phenomena have been observed in the construction industry (e.g., Zhang et al. 2017), further amplifying the negative aspects of social networks in China's context.

Second, this study found that the relationship between alumni networks and top management fraud is moderated by the auditing firms employed. The results indicate that Big 4 auditing firms significantly weaken the positive effect of alumni networks on fraud. This demonstrates that Big 4 auditing firms provide more-rigorous audits, making it harder for executives with large alumni networks to commit or cooperate in fraud. This finding is in line with previous research suggesting that Big 4 auditing firms can play a key governance role in mitigating agency problems, including top management fraud, in emerging markets such as China (Fan and Wong 2005).

Third, board independence was found to alter the effect of alumni networks on fraud. When board independence is high, the positive effect of alumni networks on fraud is reduced, and may even become negative. This suggests that board independence can mitigate the dark side of alumni networks to a significant extent. However, board independence may not necessarily prevent top management fraud in China's listed construction companies. Independent directors in the construction industry, who often are accountants, lawyers, and bankers, have limited knowledge about the firm compared with professional executives (Rebeiz 2001), and may be dominated by executives with alumni networks and internal information (Stiles 2001). This information asymmetry may provide opportunities for executives to engage in fraud, even when board independence is high.

Fourth, the study found that board size significantly strengthened the positive effect of alumni networks on top management fraud, which is contrary to the initial hypothesis. This unexpected result may be explained by the ineffectiveness of large boards due to coordination problems (Lipton and Lorsch 1992) and reduced efficiency (Jensen 1993). Large boards also may be prone to free-riding problems and group fault lines (Eisenberg et al. 1998). In contrast, executives with intrafirm alumni networks can communicate more easily with each other, potentially facilitating fraudulent activities.

Table 7. Results of hierarchical linear modeling

Variable	Model 1 Coef.	Model 1 S.E.	Model 2 Coef.	Model 2 S.E.	Model 3 Coef.	Model 3 S.E.	Model 4 Coef.	Model 4 S.E.	Model 5 Coef.	Model 5 S.E.	Model 6 Coef.	Model 6 S.E.	Model 7 Coef.	Model 7 S.E.
Intercept	−6.607****	1.196	−6.587****	1.191	−6.687****	1.190	−6.591****	1.194	−6.604****	1.195	−6.619****	1.200	−6.757****	1.197
Firm level														
Board size	0.034	0.139	0.033	0.141	0.034	0.140	0.033	0.140	0.029	0.142	0.031	0.141	0.030	0.141
Board independence	2.198	2.895	2.161	2.909	2.190	2.906	2.213	2.894	2.196	2.914	2.170	2.917	2.193	2.901
Supervisory board size	−0.093	0.107	−0.091	0.108	−0.092	0.108	−0.093	0.107	−0.098	0.108	−0.097	0.109	−0.096	0.108
TMT size	−0.036	0.049	−0.036	0.049	−0.036	0.049	−0.037	0.049	−0.037	0.049	−0.036	0.049	−0.038	0.049
Percentage of female executives	0.472	0.768	0.463	0.767	0.453	0.768	0.468	0.763	0.484	0.767	0.460	0.768	0.483	0.765
Firm size	−0.194**	0.085	−0.193**	0.085	−0.192**	0.085	−0.193**	0.085	−0.195**	0.085	−0.195**	0.085	−0.194**	0.085
CEO duality	−0.636	0.535	−0.639	0.531	−0.640	0.532	−0.638	0.532	−0.634	0.532	−0.634	0.532	−0.635	0.534
Board meeting frequency	0.113**	0.050	0.111**	0.051	0.111**	0.051	0.112**	0.051	0.112**	0.050	0.111**	0.051	0.114**	0.050
Shareholder meeting frequency	0.082	0.102	0.084	0.103	0.084	0.102	0.083	0.102	0.084	0.102	0.084	0.103	0.082	0.102
Supervisory board meeting frequency	−0.125***	0.045	−0.125***	0.045	−0.125***	0.045	−0.125***	0.045	−0.124***	0.045	−0.124***	0.045	−0.125***	0.045
Ownership concentration	2.849*	1.581	2.852*	1.579	2.853*	1.580	2.860*	1.580	2.868*	1.579	2.852*	1.580	2.888*	1.583
State ownership	−9.314****	1.142	−9.323****	1.140	−9.308****	1.138	−9.271****	1.146	−9.288****	1.140	−9.310****	1.143	−9.359****	1.163
Big 4	1.713***	0.521	1.707***	0.523	1.758***	0.527	1.708***	0.521	1.710***	0.519	1.718***	0.521	1.785****	0.521
Individual level														
Alumni network	—	—	0.090***	0.033	0.425****	0.092	0.085**	0.033	0.074**	0.031	0.106***	0.033	0.880****	0.173
Education	0.049	0.066	0.038	0.066	0.038	0.066	0.040	0.066	0.042	0.067	0.038	0.066	0.045	0.067
Gender	0.378**	0.149	0.377**	0.148	0.377**	0.149	0.383**	0.150	0.390***	0.151	0.378***	0.148	0.393***	0.152
Career horizon	0.000	0.011	−0.001	0.011	−0.001	0.011	−0.001	0.011	−0.002	0.011	−0.001	0.011	−0.002	0.011
Ownership	1.267	1.131	0.776	0.996	0.819	0.999	0.578	0.962	0.631	0.973	0.858	1.008	0.574	0.972
Political background	−0.155	0.441	−0.155	0.452	−0.158	0.453	−0.159	0.450	−0.170	0.451	−0.156	0.451	−0.174	0.450
Tenure	−0.027	0.028	−0.027	0.028	−0.027	0.028	−0.027	0.028	−0.028	0.028	−0.027	0.028	−0.028	0.028
Year level														
Total pay	0.037	0.031	0.036	0.031	0.036	0.031	0.036	0.031	0.036	0.031	0.036	0.031	0.036	0.031
ROA	0.437**	0.189	0.436**	0.188	0.436**	0.188	0.436**	0.188	0.438**	0.189	0.437**	0.188	0.439**	0.189
Year dummies	Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Alumni network × Big 4	—	—	—	—	−0.172***	0.056	—	—	—	—	—	—	−0.407****	0.093
Alumni network × Board independence	—	—	—	—	—	—	−0.946***	0.357	—	—	—	—	−1.386***	0.474
Alumni network × Board size	—	—	—	—	—	—	—	—	0.076***	0.024	—	—	0.039	0.035
Alumni network × SB size	—	—	—	—	—	—	—	—	—	—	0.055**	0.022	0.041	0.034
−2 log likelihood	15,816.414		15,798.562		15,799.610		15,803.118		15,798.388		15,793.730		15,802.872	

Note: Coeff. = coefficient; and S.E. = standard error. *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$; and ****$p < 0.001$.
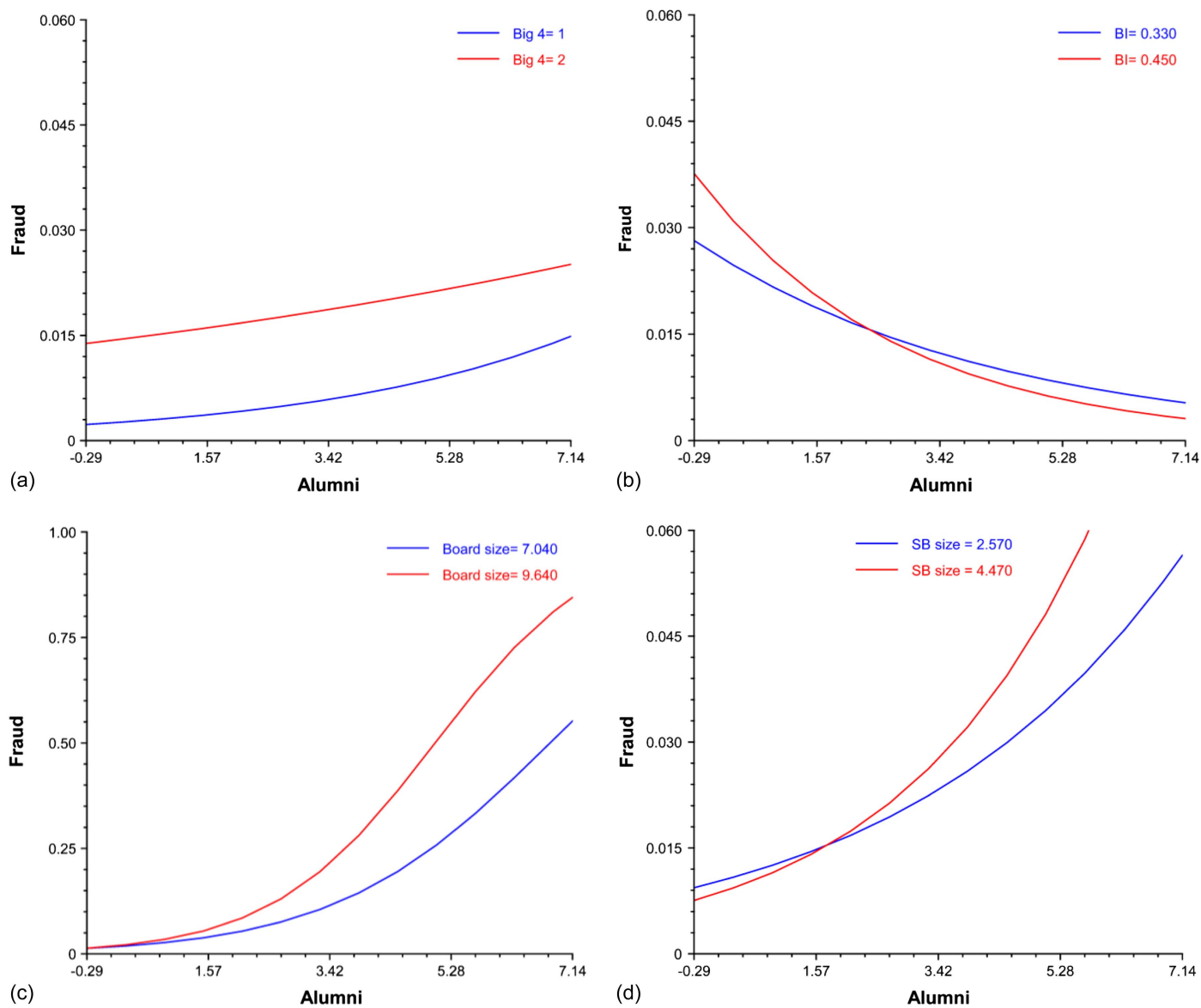
Fig. 1. Effect of moderators on alumni network–top management fraud relationship: (a) Big 4; (b) board independence (BI); (c) board size; and (d) supervisory board size (SB size).

Fifth, the study also found that the positive relationship between alumni network and top management fraud is strengthened by the size of the supervisory board. Although research on supervisory boards is limited, existing studies have reported that their monitoring role is minimal (Xi 2006), and viewed them more as friendly advisors (Xiao et al. 2004). Contrary to the expectations of this study, when the supervisory board has more members, the positive relationship between alumni network and top management fraud is even stronger. This may be attributed to coordination problems and ineffectiveness resulting from a large board, which is similar to the problems associated with a large board of directors. This is consistent with the findings of Ding et al. (2010) and Ran et al. (2015), who also reported a negative effect associated with larger supervisory board size.

Finally, this research confirmed the role of several control variables. Firm size was negatively associated with top management fraud, consistent with previous studies (Damanpour 2010; Li and Chen 2018). The frequency of board meetings had a positive correlation with top management fraud, indicating that higher activity

intensity in board meetings may be linked to potential problems within firms (Vafeas 1999). However, supervisory board meeting frequency had a negative relationship with top management fraud, suggesting that a more active supervisory board improves monitoring and enhances the value of information (Firth et al. 2007). Ownership concentration positively affected top management fraud, aligning with Filatotchev et al. (2013), who found that large shareholders may exploit inside information and power to the detriment of minority shareholders. Conversely, state ownership had a negative impact on top management fraud. In China, the government party still plays a strong role in the construction industry (Zhang and Xu 2022), reducing information asymmetry with managers (Yiu et al. 2019) and implementing more-effective monitoring in China's construction industry. At the individual level, gender had a positive association with top management fraud, possibly due to the information disadvantage of female executives and their perceived risk-loving tendencies (Adams and Funk 2011). Finally, at the year level, a positive relationship was observed between ROA and top management fraud, suggesting that managers

may engage in fraud to maintain the appearance of strong financial performance. This aligns with findings by Summers and Sweeney (1998), who found that fraudulent firms tend to have higher ROA than nonfraudulent firms before the occurrence of fraud.

Conclusion and Future Studies

To investigate whether social networks play a role in corruption in China's construction industry, this study analyzed the influence of alumni networks on top management fraud in construction firms. Data were collected on 7,577 individual-year observations from 2,017 executives in 118 construction firms in China and were analyzed using HLM due to the nested data structure. The results indicated that executives with larger alumni networks within their firms may have a higher likelihood of engaging in unacceptable activities. Moreover, this likelihood can be found to be further enhanced if the firm (1) did not employ an international Big 4 auditing firm, (2) had a larger board of directors, (3) had more independent directors on the board, or (4) had a larger supervisory board.

This research contributes significantly to the existing literature in multiple ways. First, it expands the research on corruption in the construction industry. Previous studies have identified flawed regulatory systems and negative incentives as causes of corruption (Owusu et al. 2019; Zhang et al. 2017). However, given China's unique *guanxi* culture, this paper investigated whether executives' alumni networks contribute to fraudulent behavior. This study confirms that top managers and their social networks also play a role in fraudulent behavior in the construction industry.

Second, the role of the social networks of non-CEO executives in fraud was examined, which contributes to existing social network theory. Specifically, this research focused on the social networks of executives in top management teams, because prior studies mainly emphasized directors' social networks, such as director interlocks (Wang et al. 2022) or CEO–director social ties (Zaman et al. 2021). Because each member of a firm's top management team shares the responsibility of its operations, any member has the potential to engage in fraudulent activities to benefit themselves. The findings suggest that individual executives' social networks play a crucial role in top management fraud, even after accounting for contextual factors reported by previous researchers.

Third, this study identified the boundary conditions under which social networks' impact top management fraud varies. Previous studies tended to focus on either individual-level or firm-level characteristics (Lombardi et al. 2020), and rarely considered the joint effects of these characteristics. Furthermore, it is important to acknowledge that individual behaviors depend not only on their characteristics but also on their environment. This study integrated year-level, individual-level, and firm-level factors into a multilevel model. This framework enhanced our hierarchical understanding of top management fraud. By applying a multilevel approach, this study examined the cross-level moderating effect of corporate governance, providing insights into the contingent impact of social networks on top management fraud.

Some practical implications are offered by this research, as well. When hiring top management, it is crucial not to ignore their social networks, particularly the intrafirm alumni network. Managers with extensive social networks may have an advantage in accessing internal information, potentially leading to opportunities for engaging in fraudulent behaviors. Therefore, companies should pay careful attention to the social networks of prospective executives to prevent their involvement in such activities. Furthermore, effective corporate governance requires thoughtful consideration. Engaging international Big 4 auditing firms is highly recommended, because they have a substantial mitigating effect on executives' misconduct, weakening the relationship between alumni networks and top management fraud. However, the impact of board independence on top management fraud is limited, necessitating a reevaluation of board member composition. Companies should thoroughly assess the size of both the board of directors and the supervisory board, recognizing that although a large board offers expertise, it may suffer from communication inefficiencies. Thus, appointing an appropriate number of directors and supervisory board members based on their status is advisable.

In summary, in the short term, companies are recommended to redesign their corporate hiring rules and governance systems. Giving priority to executives with extensive alumni networks may not be prudent; instead, promoting a diverse top management team could help maintain balance. To ensure appropriate use of alumni networks, adopting strict monitoring through the board of directors and supervisory board is suggested, which involves adjusting the board structure, such as enhancing board diversity. In the long term, policymakers are encouraged to refine relevant company laws, for example, encouraging listed companies above a certain size to employ internationally renowned Big 4 auditing firms. These measures collectively contribute to promoting ethical conduct and preventing top management fraud in the construction industry.

Although this study supports the argument that alumni networks increase the likelihood of top management fraud, there are some limitations to this study. First, the study assumed that an alumni connection exists as long as two people graduated from the same institution. It would be more accurate to take into account the grade, major, department, and other relevant information. However, obtaining such information is difficult, so the current method was adopted to identify alumni networks. Second, in addition to alumni networks and corporate governance, it is suggested that more factors of top management fraud should be explored, such as institutional environment, which has been reported to exert an influence to the effectiveness of governance strategies (Delhi and Mahalingam 2020). Third, according to Kuang and Lee (2017), the detection dates of corrupt activities are much later than their occurrence dates. This means that some fraudulent behaviors that have not been revealed were not included in the sample used. Some corruption cases (e.g., bribery) may never be uncovered, and thus were ignored in this study. Finally, the sample used in this study was limited to China. Generally, the wider the sample coverage, the more generalizable are the findings. Future studies are recommended to replicate this study in other countries. However, the findings of this research still provide a reference for some East Asian countries due to cultural similarities.

Data Availability Statement

Some or all data, models, or code that support the findings of this study are available from the corresponding author upon reasonable request.

Acknowledgments

References

Adams, R. B., and P. Funk. 2011. "Beyond the glass ceiling: Does gender matter?" *Manage. Sci.* 58 (2): 219–235. https://doi.org/10.1287/mnsc.1110.1452.

Aharony, J., C. Liu, and A. Yawson. 2015. "Corporate litigation and executive turnover." *J. Corporate Finance* 34 (Oct): 268–292. https://doi.org/10.1016/j.jcorpfin.2015.07.009.

Aiken, L. S., S. G. West, and R. R. Reno. 1991. *Multiple regression: Testing and interpreting interactions*. Thousand Oaks, CA: SAGE.

Alkhatib, O. J., and A. Abdou. 2018. "An ethical (descriptive) framework for judgment of actions and decisions in the construction industry and engineering–Part I." *Sci. Eng. Ethics* 24 (2): 585–606. https://doi.org/10.1007/s11948-017-9895-1.

Ameyaw, E. E., E. Pärn, A. P. C. Chan, D. G. Owusu-Manu, D. J. Edwards, and A. Darko. 2017. "Corrupt practices in the construction industry: Survey of Ghanaian experience." *J. Manage. Eng.* 33 (6): 05017006. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000555.

Baker, W. E., and R. R. Faulkner. 2004. "Social networks and loss of capital." *Social Networks* 26 (2): 91–111. https://doi.org/10.1016/j.socnet.2004.01.004.

Boso, N., V. M. Story, and J. W. Cadogan. 2013. "Entrepreneurial orientation, market orientation, network ties, and performance: Study of entrepreneurial firms in a developing economy." *J. Bus. Venturing* 28 (6): 708–727. https://doi.org/10.1016/j.jbusvent.2013.04.001.

Bruynseels, L., and E. Cardinaels. 2014. "The audit committee: Management watchdog or personal friend of the CEO?" *Accounting Rev.* 89 (1): 113–145. https://doi.org/10.2308/accr-50601.

Bushman, R. M., and A. J. Smith. 2001. "Financial accounting information and corporate governance." *J. Accounting Econ.* 32 (1): 237–333. https://doi.org/10.1016/S0165-4101(01)00027-1.

Charness, G., and U. Gneezy. 2012. "Strong evidence for gender differences in risk taking." *J. Econ. Behav. Organ.* 83 (1): 50–58. https://doi.org/10.1016/j.jebo.2011.06.007.

Chidambaran, N. K., S. Kedia, and N. Prabhala. 2011. *CEO director connections and corporate fraud*. New York: Fordham Univ. Schools of Business.

China Finance Information. 2023. "Stock market database." Accessed November 25, 2023. https://cfi.cn/.

China Securities Regulatory Commission. 2019. "China securities regulatory commission administrative punishment decision (18 responsible personnel including Eco Beauty Co., Ltd., Bada Garden Construction Co., Ltd., Wang Rennian)." [In Chinese.] Accessed July 21, 2023. http://www.csrc.gov.cn/csrc/c101928/c1042435/content.shtml.

Chiu, C.-Y., P. Balkundi, and F. J. Weinberg. 2017. "When managers become leaders: The role of manager network centralities, social power, and followers' perception of leadership." *Leadersh. Q.* 28 (2): 334–348. https://doi.org/10.1016/j.leaqua.2016.05.004.

Cohen, L., A. Frazzini, and C. Malloy. 2008. "The small world of investing: Board connections and mutual fund returns." *J. Polit. Econ.* 116 (5): 951–979. https://doi.org/10.1086/592415.

Collins, C. J., and K. D. Clark. 2003. "Strategic human resource practices, top management team social networks, and firm performance: The role of human resource practices in creating organizational competitive advantage." *Acad. Manage. J.* 46 (6): 740–751. https://doi.org/10.5465/30040665.

Cooper, D. J., T. Dacin, and D. Palmer. 2013. "Fraud in accounting, organizations and society: Extending the boundaries of research." *Accounting Organ. Soc.* 38 (6–7): 440–457. https://doi.org/10.1016/j.aos.2013.11.001.

Damanpour, F. 2010. "An integration of research findings of effects of firm size and market competition on product and process innovations: Product and process innovations." *Br. J. Manage.* 21 (4): 996–1010. https://doi.org/10.1111/j.1467-8551.2009.00628.x.

Dbouk, W., Y. Fang, L. Liu, and H. Wang. 2020. "Do social networks encourage risk-taking? Evidence from bank CEOs." *J. Finan. Stab.* 46: 100708. https://doi.org/10.1016/j.jfs.2019.100708.

DeAngelo, L. E. 1981. "Auditor size and audit quality." *J. Accounting Econ.* 3 (3): 183–199. https://doi.org/10.1016/0165-4101(81)90002-1.

DeFond, M., and J. Zhang. 2014. "A review of archival auditing research." *J. Accounting Econ.* 58 (2–3): 275–326. https://doi.org/10.1016/j.jacceco.2014.09.002.

Delhi, V. S. K., and A. Mahalingam. 2020. "Relating institutions and governance strategies to project outcomes: Study on public–private partnerships in infrastructure projects in India." *J. Manage. Eng.* 36 (6): 04020076. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000840.

de Villiers, C., V. Naiker, and C. J. van Staden. 2011. "The effect of board characteristics on firm environmental performance." *J. Manage.* 37 (6): 1636–1663. https://doi.org/10.1177/0149206311411506.

Ding, S., Z. Wu, Y. Li, and C. Jia. 2010. "Executive compensation, supervisory board, and China's governance reform: A legal approach perspective." *Rev. Quant. Finance Accounting* 35 (4): 445–471. https://doi.org/10.1007/s11156-010-0168-1.

Eisenberg, T., S. Sundgren, and M. T. Wells. 1998. "Larger board size and decreasing firm value in small firms." *J. Financ. Econ.* 48 (1): 35–54. https://doi.org/10.1016/S0304-405X(98)00003-8.

Fama, E. F., and M. C. Jensen. 1983. "Separation of ownership and control." *J. Law Econ.* 26 (2): 301–325. https://doi.org/10.1086/467037.

Fan, J. P. H., and T. J. Wong. 2005. "Do external auditors perform a corporate governance role in emerging markets? Evidence from East Asia." *J. Accounting Res.* 43 (1): 35–72. https://doi.org/10.1111/j.1475-679x.2004.00162.x.

Fan, J. P. H., T. J. Wong, and T. Zhang. 2007. "Politically connected CEOs, corporate governance, and post-IPO performance of China's newly partially privatized firms." *J. Financ. Econ.* 84 (2): 330–357. https://doi.org/10.1016/j.jfineco.2006.03.008.

Ferris, S. P., M. Jagannathan, and A. C. Pritchard. 2003. "Too busy to mind the business? Monitoring by directors with multiple board appointments." *J. Finance* 58 (3): 1087–1111. https://doi.org/10.1111/1540-6261.00559.

Filatotchev, I., G. Jackson, and C. Nakajima. 2013. "Corporate governance and national institutions: A review and emerging research agenda." *Asia Pac. J. Manage.* 30 (4): 965–986. https://doi.org/10.1007/s10490-012-9293-9.

Firth, M., P. M. Y. Fung, and O. M. Rui. 2007. "Ownership, two-tier board structure, and the informativeness of earnings—Evidence from China." *J. Accounting Public Policy* 26 (4): 463–496. https://doi.org/10.1016/j.jaccpubpol.2007.05.004.

Fracassi, C., and G. Tate. 2012. "External networking and internal firm governance." *J. Finance* 67 (1): 153–194. https://doi.org/10.1111/j.1540-6261.2011.01706.x.

Freeman, L. C. 1978. "Centrality in social networks conceptual clarification." *Social Networks* 1 (3): 215–239. https://doi.org/10.1016/0378-8733(78)90021-7.

Granovetter, M. 1985. "Economic action and social structure: The problem of embeddedness." *Am. J. Sociol.* 91 (3): 481–510. https://doi.org/10.1086/228311.

Griffin, P. A., H. A. Hong, Y. Liu, and J. W. Ryou. 2021. "The dark side of CEO social capital: Evidence from real earnings management and future operating performance." *J. Corporate Finance* 68: 101920. https://doi.org/10.1016/j.jcorpfin.2021.101920.

Gu, Z., Z. Li, Y. G. Yang, and G. Li. 2019. "Friends in need are friends indeed: An analysis of social ties between financial analysts and mutual fund managers." *Accounting Rev.* 94 (1): 153–181. https://doi.org/10.2308/accr-52160.

Guan, Y., L. N. Su, D. Wu, and Z. Yang. 2016. "Do school ties between auditors and client executives influence audit outcomes?" *J. Accounting Econ.* 61 (2–3): 506–525. https://doi.org/10.1016/j.jacceco.2015.09.003.

Guo, B. 2009. "The determinants of new venture sustainable development: A corporate governance model-evidence from small and medium listed companies in China." In *Strategic management engineering: Enterprise, environment and crisis*, edited by J. Xiaowen, X. Erming, and I. Schneider, 288–295. Chengdu, China: Sichuan University Press.

Hair, J. F., W. C. Black, B. J. Babin, and R. E. Anderson. 2014. *Multivariate data analysis*. London: Pearson Education.

Hall, A., and B. Wellman. 1985. "Social networks and social support." In *Social support and health*, edited by S. Cohen and S. L. Syme, 23–41. San Diego: Academic.

Hambrick, D. C., and P. A. Mason. 1984. "Upper echelons: The organization as a reflection of its top managers." *Acad. Manage. Rev.* 9 (2): 193–206. https://doi.org/10.2307/258434.

Hogg, M. A. 2006. "Social identity theory." In *Contemporary social psychological theories*, edited by P. J. Burke, 111–136. Stanford, CA: Stanford University Press.

Hogg, M. A., and D. J. Terry. 2000. "Social identity and self-categorization processes in organizational contexts." *Acad. Manage. Rev.* 25 (1): 121–140. https://doi.org/10.2307/259266.

Hox, J. J., M. Moerbeek, and R. van de Schoot. 2017. *Multilevel analysis: Techniques and applications*. New York: Routledge.

Huang, R., G. Liu, K. Li, Z. Liu, X. Fu, and J. Wen. 2023. "Evolution of residents' cooperative behavior in neighborhood renewal: An agent-based computational approach." *Comput. Environ. Urban Syst.* 105 (Oct): 102022. https://doi.org/10.1016/j.compenvurbsys.2023.102022.

Jensen, M. C. 1993. "The modern industrial revolution, exit, and the failure of internal control systems." *J. Finance* 48 (3): 831–880. https://doi.org/10.1111/j.1540-6261.1993.tb04022.x.

Jensen, M. C., and W. H. Meckling. 1976. "Theory of the firm: Managerial behavior, agency costs and ownership structure." *J. Financ. Econ.* 3 (4): 305–360. https://doi.org/10.1016/0304-405X(76)90026-X.

Jiang, F., and K. A. Kim. 2015. "Corporate governance in China: A modern perspective." *J. Corporate Finance* 32 (Jun): 190–216. https://doi.org/10.1016/j.jcorpfin.2014.10.010.

Kish-Gephart, J. J., D. A. Harrison, and L. K. Treviño. 2010. "Bad apples, bad cases, and bad barrels: Meta-analytic evidence about sources of unethical decisions at work." *J. Appl. Psychol.* 95 (1): 1–31. https://doi.org/10.1037/a0017103.

Klein, K. J., and S. W. J. Kozlowski. 2000. "From micro to meso: Critical steps in conceptualizing and conducting multilevel research." *Organ. Res. Methods* 3 (3): 211–236. https://doi.org/10.1177/109442810033001.

Kong, D., J. Xiang, J. Zhang, and Y. Lu. 2019. "Politically connected independent directors and corporate fraud in China." *Accounting Finance* 58 (5): 1347–1383. https://doi.org/10.1111/acfi.12449.

Krause, R., and M. Semadeni. 2014. "Last dance or second chance? Firm performance, CEO career horizon, and the separation of board leadership roles." *Strategic Manage. J.* 35 (6): 808–825. https://doi.org/10.1002/smj.2139.

Kuang, Y. F., and G. Lee. 2017. "Corporate fraud and external social connectedness of independent directors." *J. Corporate Finance* 45 (Aug): 401–427. https://doi.org/10.1016/j.jcorpfin.2017.05.014.

Lander, M. W., J. van Oosterhout, P. Heugens, and J. L. Pruijssers. 2019. "Career stage dependent effects of law firm governance: A multilevel study of professional-client misconduct." *Hum. Relations* 72 (9): 1497–1529. https://doi.org/10.1177/0018726718796157.

LeBreton, J. M., and J. L. Senter. 2008. "Answers to 20 questions about interrater reliability and interrater agreement." *Organ. Res. Methods* 11 (4): 815–852. https://doi.org/10.1177/1094428106296642.

Lee, C. J., R. Wang, C. Y. Lee, C. C. W. Hung, and S. C. Hsu. 2018. "Board structure and directors' role in preventing corporate misconduct in the construction industry." *J. Manage. Eng.* 34 (2): 04017067. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000593.

Li, H., and P. Chen. 2018. "Board gender diversity and firm performance: The moderating role of firm size." *Bus. Ethics Eur. Rev.* 27 (4): 294–308. https://doi.org/10.1111/beer.12188.

Li, V. 2023. "Groupthink tendencies in top management teams and financial reporting fraud." *Accounting Bus. Res.* 1–23. https://doi.org/10.1080/00014788.2022.2145555.

Lin, L.-H. 2011. "Cultural and organizational antecedents of *Guanxi*: The Chinese cases." *J. Bus. Ethics* 99 (3): 441–451. https://doi.org/10.1007/s10551-010-0662-3.

Lipton, M., and J. W. Lorsch. 1992. "A modest proposal for improved corporate governance." *Bus. Lawyer* 48 (1): 59–77.

Liu, B., Z. Yang, B. Xue, D. Zhao, X. Sun, and W. Wang. 2022. "Formalizing an integrated metric system measuring performance of urban sustainability: Evidence from China." *Sustainable Cities Soc.* 79 (Apr): 103702. https://doi.org/10.1016/j.scs.2022.103702.

Lombardi, R., M. Cano-Rubio, R. Trequattrini, and G. Fuentes-Lombardo. 2020. "Exploratory evidence on anticorruption activities in the Spanish context: A sustainable governance approach." *J. Cleaner Prod.* 249 (Mar): 119424. https://doi.org/10.1016/j.jclepro.2019.119424.

Lu, J., and Z. Shi. 2018. "Does improved disclosure lead to higher executive compensation? Evidence from the conversion to IFRS and the dual-class share system in China." *J. Corporate Finance* 48 (Feb): 244–260. https://doi.org/10.1016/j.jcorpfin.2017.11.004.

Lu, Y., B. Liu, and Y. Li. 2021. "Collaboration networks and bidding competitiveness in megaprojects." *J. Manage. Eng.* 37 (6): 04021064. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000961.

McPherson, M., L. Smith-Lovin, and J. M. Cook. 2001. "Birds of a feather: Homophily in social networks." *Annu. Rev. Sociol.* 27 (1): 415–444. https://doi.org/10.1146/annurev.soc.27.1.415.

Oh, H., G. Labianca, and M.-H. Chung. 2006. "A multilevel model of group social capital." *Acad. Manage. Rev.* 31 (3): 569–582. https://doi.org/10.5465/amr.2006.21318918.

Ou, A. Y., J. Seo, D. Choi, and P. W. Hom. 2017. "When can humble top executives retain middle managers? The moderating role of top management team faultlines." *Acad. Manage. J.* 60 (5): 1915–1931. https://doi.org/10.5465/amj.2015.1072.

Owusu, E. K., A. P. C. Chan, and M. Shan. 2019. "Causal factors of corruption in construction project management: An overview." *Sci. Eng. Ethics* 25 (1): 1–31. https://doi.org/10.1007/s11948-017-0002-4.

Ozkaya, H. E., C. Dabas, K. Kolev, G. T. M. Hult, S. H. Dahlquist, and S. A. Manjeshwar. 2013. "An assessment of hierarchical linear modeling in international business, management, and marketing." *Int. Bus. Rev.* 22 (4): 663–677. https://doi.org/10.1016/j.ibusrev.2012.10.002.

Ran, G., Q. Fang, S. Luo, and K. C. Chan. 2015. "Supervisory board characteristics and accounting information quality: Evidence from China." *Int. Rev. Econ. Finance* 37 (May): 18–32. https://doi.org/10.1016/j.iref.2014.10.011.

Raudenbush, S. W., and A. S. Bryk. 2002. *Hierarchical linear models: Applications and data analysis methods*. Thousand Oaks, CA: SAGE.

Rebeiz, K. S. 2001. "Corporate governance and role of CEO in engineering companies." *J. Manage. Eng.* 17 (1): 14–23. https://doi.org/10.1061/(ASCE)0742-597X(2001)17:1(14).

Shen, W., and C. Lin. 2009. "Firm profitability, state ownership, and top management turnover at the listed firms in China: A behavioral perspective." *Corporate Governance Int. Rev.* 17 (4): 443–456. https://doi.org/10.1111/j.1467-8683.2009.00725.x.

Shi, W., B. L. Connelly, and W. G. Sanders. 2016. "Buying bad behavior: Tournament incentives and securities class action lawsuits." *Strategic Manage. J.* 37 (7): 1354–1378. https://doi.org/10.1002/smj.2400.

Shleifer, A., and R. W. Vishny. 1997. "A survey of corporate governance." *J. Finance* 52 (2): 737–783. https://doi.org/10.1111/j.1540-6261.1997.tb04820.x.

Shue, K. 2013. "Executive networks and firm policies: Evidence from the random assignment of MBA peers." *Rev. Financ. Stud.* 26 (6): 1401–1442. https://doi.org/10.1093/rfs/hht019.

Sparrowe, R. T., R. C. Liden, S. J. Wayne, and M. L. Kraimer. 2001. "Social networks and the performance of individuals and groups." *Acad. Manage. J.* 44 (2): 316–325. https://doi.org/10.5465/3069458.

Stiles, P. 2001. "The impact of the board on strategy: An empirical examination." *J. Manage. Stud.* 38 (5): 627–650. https://doi.org/10.1111/1467-6486.00252.

Summers, S. L., and J. T. Sweeney. 1998. "Fraudulently misstated financial statements and insider trading: An empirical analysis." *Accounting Rev.* 73 (1): 131–146.

Tian, L., Y. Jiang, and Y. Yang. 2023. "CEO childhood trauma, social networks, and strategic risk taking." *Leadersh. Q.* 34 (2): 101618. https://doi.org/10.1016/j.leaqua.2022.101618.

Troy, C., K. G. Smith, and M. A. Domino. 2011. "CEO demographics and accounting fraud: Who is more likely to rationalize illegal acts?" *Strategic Organ.* 9 (4): 259–282. https://doi.org/10.1177/1476127011421534.

Vafeas, N. 1999. "The nature of board nominating committees and their role in corporate governance." *J. Bus. Finance Accounting* 26 (1–2): 199–225. https://doi.org/10.1111/1468-5957.00253.

Walsh, J. P., and J. K. Seward. 1990. "On the efficiency of internal and external corporate control mechanisms." *Acad. Manage. Rev.* 15 (3): 421–458. https://doi.org/10.2307/258017.

Wang, H., J. Wu, Y. Yang, R. Li, and Y. Liu. 2019. "Ownership concentration, identity and firm performance: Evidence from China's listed firms." *Emerging Mark. Finance Trade* 55 (15): 3653–3666. https://doi.org/10.1080/1540496X.2019.1672042.

Wang, Q., T. J. Wong, and L. Xia. 2008. "State ownership, the institutional environment, and auditor choice: Evidence from China." *J. Accounting Econ.* 46 (1): 112–134. https://doi.org/10.1016/j.jacceco.2008.04.001.

Wang, R., C. J. Lee, S. C. Hsu, and C. Y. Lee. 2018. "Corporate misconduct prediction with support vector machine in the construction industry." *J. Manage. Eng.* 34 (4): 04018021. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000630.

Wang, R., C.-J. Lee, S.-C. Hsu, and J.-H. Chen. 2021. "Preventing or encouraging illegal activities by construction firms: Effects of top management team compensation and aspiration-performance discrepancies." *Eng. Constr. Archit. Manage.* 28 (6): 1739–1760. https://doi.org/10.1108/ECAM-08-2019-0440.

Wang, R., C.-J. Lee, S.-C. Hsu, S. Zheng, and J.-H. Chen. 2020. "Effects of career horizon and corporate governance in China's construction industry: Multilevel study of top management fraud." *J. Manage. Eng.* 36 (5): 04020057. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000816.

Wang, Z., S. Yao, A. Sensoy, J. W. Goodell, and F. Cheng. 2022. "Learning from failures: Director interlocks and corporate misconduct." *Int. Rev. Financ. Anal.* 84 (Nov): 102406. https://doi.org/10.1016/j.irfa.2022.102406.

Wiersema, M. F., and K. A. Bantel. 1992. "Top management team demography and corporate strategic change." *Acad. Manage. J.* 35 (1): 91–121. https://doi.org/10.5465/256474.

Xi, C. 2006. "In search of an effective monitoring board model: Board reforms and the political economy of corporate law in China." *Connecticut J. Int. Law* 22 (1): 1–46.

Xiao, J. Z., J. Dahya, and Z. Lin. 2004. "A grounded theory exposition of the role of the supervisory board in China." *Br. J. Manage.* 15 (1): 39–55. https://doi.org/10.1111/j.1467-8551.2004.t01-1-00399.x.

Yiu, D. W., W. P. Wan, and Y. Xu. 2019. "Alternative governance and corporate financial fraud in transition economies: Evidence from China." *J. Manage.* 45 (7): 2685–2720. https://doi.org/10.1177/0149206318764296.

Zahra, S. A., R. L. Priem, and A. A. Rasheed. 2005. "The antecedents and consequences of top management fraud." *J. Manage.* 31 (6): 803–828. https://doi.org/10.1177/0149206305279598.

Zaman, R., N. Atawnah, G. A. Baghdadi, and J. Liu. 2021. "Fiduciary duty or loyalty? Evidence from co-opted boards and corporate misconduct." *J. Corporate Finance* 70 (Oct): 102066. https://doi.org/10.1016/j.jcorpfin.2021.102066.

Zhang, B., Y. Le, B. Xia, and M. Skitmore. 2017. "Causes of business-to-government corruption in the tendering process in China." *J. Manage. Eng.* 33 (2): 05016022. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000479.

Zhang, L., W. Ji, J. Tao, and Q. Wang. 2011. "Who shall leave? How CEO preference and power affect executive turnover in Chinese listed companies." *Corporate Governance Int. Rev.* 19 (6): 547–561. https://doi.org/10.1111/j.1467-8683.2011.00855.x.

Zhang, S., and Z. Xu. 2022. "Governance for principal–principal relationship in infrastructure public–private partnerships: A case study in China." *J. Manage. Eng.* 38 (3): 05022005. https://doi.org/10.1061/(ASCE)ME.1943-5479.0001025.

Zhou, L., Y. Niu, V. L. Wang, and K. Tang. 2021. "Hustle for survival or bustle for revival: Effects of Guanxi orientation and order of entry for China's electronic business ventures." *Ind. Mark. Manage.* 93 (Feb): 370–381. https://doi.org/10.1016/j.indmarman.2020.04.003.