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**Cogent Economics & Finance** 

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*Suggested Citation:* Liu, Jing (2022) : Alumni network, CEO turnover, and stock price crash risk: evidence from China, Cogent Economics & Finance, ISSN 2332-2039, Taylor & Francis, Abingdon, Vol. 10, Iss. 1, pp. 1-25, https://doi.org/10.1080/23322039.2022.2111813

This Version is available at: https://hdl.handle.net/10419/303761

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**Cogent Economics & Finance** 

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/oaef20

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To cite this article: Jing Liu (2022) Alumni network, CEO turnover, and stock price crash risk: evidence from China, Cogent Economics & Finance, 10:1, 2111813, DOI: 10.1080/23322039.2022.2111813

To link to this article: https://doi.org/10.1080/23322039.2022.2111813

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Received: 15 June 2022 Accepted: 05 August 2022

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Reviewing editor: Vassilios Papavassiliou, University College Dublin, Dublin, Ireland

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# GENERAL & APPLIED ECONOMICS | RESEARCH ARTICLE Alumni network, CEO turnover, and stock price crash risk: evidence from China

Jing Liu<sup>1</sup>\*

**Abstract:** This paper empirically tests the impact of CEO's alumni relationships on the stock price crash risk during CEO turnover. Empirical tests find that CEOs' advantage among alumni networks will increase stock price crash risk during CEO turnover to some degree. However, this effect is built on the CEO's power inside the firm that was established during the long tenure on the position. Further research finds that analysts' following can exacerbate the release of bad news, however, it seems that the either internal corporate governance or external cannot effectively monitor the opportunistic behavior of CEOs on the whole. In addition, the positive effect of alumni network on stock price crash risk mainly exists in the regions where the legal environment is weak, that is, a sound legal environment can effectively prevent the opportunistic behavior of managers. Besides, the experience of the M.B. A program may strengthen the CEO's tendency to take advantage of alumni connections to withhold bad news. This paper sheds light on the risk that social connection may bring and conducts to a more comprehensive understanding of the role that social network plays in business activities.

Subjects: Corporate Finance; Investment & Securities; Accounting

Keywords: Social networks; CEO tenure; stock price crash risk; Tenure; CEO successor

JEL: G14; G34

## 1. Introduction

Stock price crash risk is an extreme downward risk of stock price (Shihua et al., 2022). Based on the agency theory of crash risk, managers have incentives to suppress bad news from investors. When the amount of bad news reaches a threshold level, managers have to release it all to the market, causing a stock price crash (Jin & Myers, 2006; Khalil, Shihua, David et al., 2019; Kim & Zhang, 2016). Due to the negative influence that stock price crash brings on the stability of the capital market, researchers have paid much attention to its influencing factors (Chen et al., 2001; Khalil et al., 2019). Prior literature has proved the significant effect of governance of formal institutions such as margin-trading volatility, tax enforcement, board reforms, and so on (Hu et al., 2020; Lv & Wu, 2019; Shihua et al., 2022). In recent years, researchers also have paid attention to the important role that informal institutions play in stock price crashes (Fangzhou & Jiang, 2022; Ji et al., 2021; Khalil, Shihua, David et al., 2019). In emerging markets such as China, which is regarded as a "guanxi" (relation-based) society, social connections also have a significant effect on firms' stock price crash risk, such as the CEO's political connections and the geographical relationships within the firm (Hu et al., 2018; Xin et al., 2021). However, there is still little research on the relationship between CEO's alumni network and stock price crash risk, especially during CEO turnover, when the firm faces a big bath.





As an important social capital, the alumni network can increase managers' ability to conduct opportunistic behavior (Bebchuk et al., 2002; El-Khatib et al., 2015). Similarly, withholding bad news and whitewashing performance can be helpful for the CEO to increase the individual reputation and maintain career safety. Thus, CEOs are motivated to take advantage of the alumni network to withhold bad news as well.

On the one hand, social connection plays an important role in private information communication. The private information can be not only used for better decision-making to improve firm value, but also in pursuing the individual interests of managers. Especially for the skills on conducting opportunistic behavior, such information is reckoned to be unethical, even illegal, and cannot discuss in public. Thus, the private social connection will be an appropriate channel to communicate such information among firm leaders (Gu et al., 2019; Li et al., 2016). Then the CEOs with more friends in the social network can gain an information advantage on how to withhold bad news more subtle and more imperceptible.

On the other hand, even though the advantage among alumni networks can increase the ability of the CEO to withhold bad news and make it harder for investors to detect it, the bad news still accumulated in the firm. During CEO turnover, the successor takes over the firm's business. As a professional manager, it can be easier for the successor to detect the bad news hidden by the predecessor. At the same time, faced with huge performance pressure in the early stage of tenure (Chen & Zheng, 2014), the successor is motivated to conduct a big bath of bad news and thoroughly disclose the bad news the predecessor has hidden. This will spur the outburst of bad news and trigger a stock price crash.

This paper empirically tests the impact of the CEO's alumni network on the stock price crash risk during CEO turnover. The findings suggest that CEO's advantage in the alumni network will increase firm's stock price crash risk to some degree. This effect can be more significant when he (or she) steps down. However, this effect is built on the CEO's stable power inside the firm that was established during a long enough tenure. Further research finds that analysts' following can exacerbate the release of bad news, but it seems that either internal corporate governance or external cannot effectively restrain the opportunistic behavior of CEOs on the whole. The phenomenon mentioned above mainly exists in the regions where the legal environment is relatively weak, while not significant any longer in provinces with a sound legal environment. Besides, an experience of the M.B.A program may strengthen the tendency that a CEO takes advantage of external resources to conceal bad news.

This study makes several contributions. First, prior studies find that social network plays an important role in the capital market as a positive complement to formal institutions in emerging markets such as China, especially in information communication (Gu et al., 2019; Li et al., 2016). However, from the perspective of the CEO's alumni network on stock price crash risk, the research findings in this paper point out that without a sound legal environment, individual social connections will harm capital market and investors. These findings suggest that the positive impact of social networks relies on the development of formal institutions. Second, from the perspective of CEO turnover, this paper studies the influence of the social networks on stock price crash risk. This paper also enriches the literature on the research on the relationship between informal institutions, such as social network, and stock price crash risk (Hu et al., 2018; Khalil et al., 2022). Finally, from a practical perspective, this paper proves a sound legal environment can efficiently monitor managers' opportunistic behavior and guarantee the smooth operation of the capital market in emerging markets. This is of reference value for regulators and investors.

The rest of the paper is organized as follows. Section 2 develops the hypothesis. Section 3 describes the research design. Section 4 discusses the empirical results. Section 5 conducts further tests. Section 6 conducts robustness checks, and finally Section 7 concludes.

#### 2. Hypothesis development

Prior studies point out that managers' opportunity behavior is one of the most important factors that lead to the stock price crash (Kim et al., 2011a, Kim et al., 2011b; Jiahua & Zou, 2019). As the core figure among the senior executives, the CEO is one of the dominant factors that influence the opportunity behavior of the management. In a society build on the differential mode, *Guanxi* is a social capital of significant importance (Chang et al., 2016; Fei, 1992). Then, as social capital outside of the firm, the alumni networks can profoundly influence CEO's behavior, including withholding bad news.

On the one hand, from the perspective of motivation, CEOs with rich connections can have a stronger incentive to conceal bad news or whitewash performance. A core location in the alumni network not only brings about reputation for the CEO, but also brings about more attention at the same time (Shihua et al., 2022). Under the close attention of peers, CEOs have to deal with additional performance pressure, which will spur the CEO to withhold bad news. Besides, success in social life may also make CEO more confidential, and prior literature proves that an overconfident CEO will increase the possibility of a stock price crash (Kim et al., 2016).

On the other hand, from the perspective of ability, CEOs with rich connections can gain a stronger ability to withhold bad news more imperceptibly as well. How to withhold bad news more cleverly belongs to valuable information for the CEO. However, as the opportunistic behavior is unethical, even illegal, the skills cannot spread publicly. This determines that the relevant information can only spread through private channels, such as social connections (Gu et al., 2019; Li et al., 2016). Thus, the CEOs with a core location in the alumni network will gain more information about how to withhold bad information more subtle and imperceptible. That is, an advantage in the social network can provide not only stronger motivation but also valuable information for the CEO to conceal bad news. These will make bad news accumulate within the firm and form stock price crash risk.

However, during CEO turnover, the successor CEO takes over the operational activities and starts to master the firm thoroughly. In this process, as a professional manager, the successor will be sharper in detecting the bad news that the predecessor had hidden compared to outside shareholders. At the same time, at the early stage of the tenure, the market and investors know little about the new CEO, that is, there is serious information asymmetry between the shareholders and the CEO (Hambrick & Fukutomi, 1991). The CEOs stepping onto the position face great performance pressure to prove themselves and gain acceptance from the market (Ali & Zhang, 2015). Thus, the successor CEOs are motivated to disclose the bad news that their predecessor CEOs had hidden and should be responsible for. Through the big bath of bad news, the successors can protect their performance from paying for the mistakes of their predecessors (Hope & Wang, 2018). This effect will spur the burst of the accumulated bad news in the short time during the CEO turnover, and even lead to a stock price crash. These lead to the first hypothesis:

Hypothesis 1: The CEO's advantage in the alumni network will bring stock price crash risk, and the effect will be more significant during CEO turnover.

Prior studies point out that it takes some time for the CEO to build personal power inside the firm and control the firm (Chen & Zheng, 2014). At the early stage of the tenure, the CEO has not mastered the specific knowledge of the corporate culture and personnel relations within the firm (Herrmann & Nadkarni, 2013). That is to say, without a long enough tenure, a CEO cannot get control of the firm. His (or her) opportunistic behavior will be under close monitoring at the early stage of the tenure. Besides, prior literature has proved the important role of the board and the relationship among the board plays in controlling stock price crash risk (Hu et al., 2020; Khalil et al., 2020). That is, without the support from the board or stable power within the firm, even if the CEO

has information advantages in the alumni network outside the firm, he (or she) will also behave more cautiously and dare not delay or withhold the bad news. These lead to the second hypothesis:

Hypothesis 2: The impact of a CEO's advantage in alumni network on stock price crash risk during CEO turnover mainly exists among CEOs with longer tenure.

During the CEO turnover, the social connection between the predecessor CEO and his (or her) successor will have an impact on the stock price crash risk as well. Different from the outside successor, the inside successor is more likely to share a long-term colleague relationship with the CEO stepping down from the position, and even maybe supported by the predecessor CEO during career growth. The personal connection may encourage the successor to cover up the opportunistic behavior of the predecessor CEO. In addition, if the inside successor had been involved in withholding the bad news as a senior executive, that is, if the successor colluded with the predecessor CEO to withhold bad news, the successor has to continue covering up the bad news for his (or her) own sake. While for the successors from outside, the successor is less likely to share a close relationship with the CEO stepping down and cannot be involved in the predecessor's opportunistic behavior. Besides, as the firm knows less about the outside successors, they will face greater performance pressure and be more incentive to conduct a big bath of bad news. These lead to the third hypothesis:

Hypothesis 3: The impact of the CEO's advantage in alumni network on stock price crash risk during CEO turnover mainly exists among firms whose successors of CEO are from outside.

#### 3. Data and method

#### 3.1. Sample and data source

The research period of this paper begins in 2010, the reasons are as follows: First, the access to the personal information of CEOs before 2010 is poor; Second, the influence of the 2008 economic crisis can be avoided from 2010. Taking initial samples of A-share listed firms in China during the period from 2010 to 2020, this paper employs the following sampling procedures. First, I delete financial company observations. Second, we delete observations with missing data used in the empirical tests. Ultimately, 9696 firm-year observations are left in regression analysis, among them, there are 1592 samples of CEO turnover. Table 1 shows the distribution of CEO turnover, it can be seen that more than half of the CEOs have a tenure no longer than for years when they leave the position. At the same time, more than 60% of the CEO successors are from inside, and the trend has shown a downward trend in recent years.

The data of participants' education information used in this paper is manually collected from financial reports of listed firms, and all the other variables used in this paper are from the CSMAR database. Besides, to alleviate the undue influence of outliers, we winsorize all the continuous variables at their bottom and top 1% percentiles.

#### 3.2. Construction of key research variables

#### 3.2.1. Measures of crash risk

Following previous studies, I employ two measures of stock price crash risk: the negative skewness (*Ncskew*) and the down-to-up volatility (*Duvol*; Kim et al., 2011a,b; Leilei et al., 2022).

Specifically, I first calculate firm-specific weekly returns from the following expanded market index model regression at the firm-year level:

Table 1.	Distributi	on of CEC	) turnover						
year	turnover	tenu	ire≥4	tenu	ıre<4	inside su	iccessors	outside s	uccessors
	obs.	obs.	rate	obs.	rate	obs.	rate	obs.	rate
2009	79	28	35.44%	51	64.56%	53	67.95%	25	32.05%
2010	64	21	32.81%	43	67.19%	39	62.90%	23	37.10%
2011	94	40	42.55%	54	57.45%	66	71.74%	26	28.26%
2012	86	32	37.21%	54	62.79%	60	70.59%	25	29.41%
2013	106	30	28.30%	76	71.70%	79	78.22%	22	21.78%
2014	123	51	41.46%	72	58.54%	74	62.18%	45	37.82%
2015	127	61	48.03%	66	51.97%	86	69.92%	37	30.08%
2016	146	46	31.51%	100	68.49%	86	60.99%	55	39.01%
2017	152	48	31.58%	104	68.42%	88	61.11%	56	38.89%
2018	171	54	31.58%	117	68.42%	89	55.63%	71	44.38%
2019	204	75	36.76%	129	63.24%	126	63.64%	72	36.36%
2020	240	97	40.42%	143	59.58%	135	61.09%	86	38.91%
Total	1592	583	36.62%	1009	63.38%	981	64.37%	543	35.63%

Notes: As the information of some CEO successors are missing, the total number of inside successors and outside successors is less than the whole sample.

$$r_{i,t} = \alpha + \beta_{1,i} r_{m,j-2} + \beta_{2,i} r_{m,j-1} + \beta_{3,i} r_{m,j} + \beta_{4,i} r_{m,j+1} + \beta_{5,i} r_{m,j+2} + \varepsilon_{i,t}$$
(1)

where  $r_{i,t}$  is the return on stock *i* in week *j*,  $r_{m,j}$  is the value-weighted market return of all the A-share listed firms in China, and the other terms are the lagged terms and leading terms of  $r_{m,j}$ , respectively. And the firm-specific weekly return,  $W_{i,t}$ , can be calculated through Equation 2.

$$W_{i,t} = \ln(1 + \varepsilon_{i,t}) \tag{2}$$

where  $\varepsilon_{i,t}$  is the regression residual of Equation 1.

Then, the key dependent variables, *NCSKEW* and *DUVOL* can be calculated as Equation 3 and Equation 4, respectively.

$$NCSKEW_{i,t} = -\left[n(n-1)^{3/2} \sum W_{i,t}^{3}\right] / [(n-1)(n-2) \left(W_{i,t}^{2}\right)^{3/2}]$$
(3)

$$DUVOL_{i,t} = \ln\left\{ \left[ (n_u - 1) \sum_{down} {R_d}^2 \right] / \left[ (n_d - 1) \sum_{up} {R_u}^2 \right] \right\}$$
(4)

where  $n_u$  ( $n_d$ ) are the number of up (or down) weeks over the firm-specific weekly return,  $W_{i,t}$ .

A large value of either Ncskew or Duvol suggests a higher stock price crash risk for the firm.

#### 3.2.2. Measures of the centrality of CEO in alumni network

Following prior studies, this paper uses alumni connections to identify the social ties among the core economic participants, including the CEOs and chairpersons of all A-share listed firms in China, and calculate the network centrality based on this (Engelberg et al., 2013; Fang & Huang, 2017). Specifically, first I code a pare as connected if they have attended they have attended the same university, then calculate the degree centrality (*Degree*) and eigenvector centrality

(*Eigenvector*) to measure the network centrality of the nodes in the network and gain the network locations of the CEOs who stepped down.

Degree centrality is the number of ties a node has in network, and is reckoned to be the most direct measurement of the node's importance in the network (Tsvetovat & Kouznetsov, 2011). Specifically, degree centrality (*Degree*) is calculated by the following formula:

$$Degree_i = \sum_{i=1}^{N} Y_{ij} , (i \neq j)$$
(5)

where N is the size of the network and  $Y_{ij}$  equals 1 if there is a social tie between i and j.

Eigenvector centrality is a recursive version of degree centrality and can be used to detect the grey cardinals in the network (Tsvetovat & Kouznetsov, 2011), that is, to measure the quality of connections. Specifically, eigenvector centrality (*Eigenvector*) is calculated by the following formula:

$$Eigenvector_{i} = \frac{1}{\lambda} \sum t \in M(i)C_{E}(t)$$
(6)

where M(i) means the adjacency matrix of *i*,  $C_E(t)$  means the eigenvector centrality of the adjacency matrix of *i*.

#### 3.3. Model specification

To empirically test the impact of the alumni connections on stock price crash risk during CEO turnover, this paper employs Equation 7 as following:

$$\begin{aligned} \mathsf{Crash}_{i,t} &= \beta_0 + \beta_1 \mathsf{Centrality}_{i,t-1} + \beta_2 \mathsf{Centrality}_{i,t-1} \times \mathsf{Turnover}_{i,t} + \beta_3 \mathsf{Turnover}_{i,t} \\ &+ \sum \beta_m \mathsf{Controls} + \mathsf{Year} \ \mathsf{FE} + \mathsf{Industry} \ \mathsf{FE} + \varepsilon \end{aligned}$$
(7)

where the dependent variable is the stock price crash risk measured by the negative skewness (NCSKEW) and the down-to-up volatility (DUVOL). The independent variable Centrality is the network centrality of the CEO, and is measured by degree centrality (Degree) and eigenvector centrality (Eigenvector). The independent variable Turnover is dummy variable equals to 1 if the listed firm has CEO turnover in the year. And the key variable is the interaction of Centrality and Turnover (Centrality×Turnover). Following prior literature (Kim et al., 2011a,b, 2020), control variables include total asset of the firm (Size), leverage (Lev), return on assets (ROA), book to market ratio (BM), operating cash flow (CFO), ratio of independent directors (Indep), whether the firm suffered from negative net profit in the last year (Loss), the average monthly share turnover over the current fiscal year minus the average monthly share turnover over the previous fiscal year (DTurn), and average stock returns (Return). Besides, considering the differences among different industries and years, we also adopt the industry fixed effect and year fixed effect.

To examine the moderating effect of tenure on the relationship between alumni networks and the stock price crash risk during CEO turnover, this paper employs subsample tests based on the tenure of CEOs who step down the position. Specifically, according to the findings of prior studies (Brochet et al., 2021) and the statistics of the sample used in the paper,<sup>1</sup> the average tenure of CEOs is about 4 years. Therefore, this paper tests the impact of CEOs' alumni network on the price crash risk during CEO turnover in subsamples of CEOs whose tenure is longer than 4 years, and those whose tenure is less than 4 years respectively.

To examine the different impacts of alumni networks on the stock price crash risk for firms with inside successors and outside successors, this paper employs subsample tests based on the origin of successors. Specifically, this paper tests the impact of CEOs' alumni network on the price crash

Table 2. Sun	nmary statisti	cs				
Variable	Mean	SD	Min	Median	Max	Obs.
NCSKEW	-0.3193	0.7168	-3.3082	-0.2838	1.8128	9696
DUVOL	-0.2174	0.4758	-1.5749	-0.2192	1.1197	9696
Degree	43.1359	54.0993	0.0000	22.0000	282.0000	9696
Eigenvector	0.0078	0.0231	0.0000	0.0004	0.1683	9696
Turnover	0.1994	0.3995	0.0000	0.0000	1.0000	9696
Size	22.1375	1.3608	17.4950	21.9053	28.0962	9696
Lev	0.4343	0.2215	0.0473	0.4229	1.0451	9696
ROA	0.0275	0.0888	-0.6556	0.0344	0.2708	9696
BM	0.5909	0.2522	0.0222	0.5846	1.1578	9696
CFO	0.0455	0.0726	-0.1919	0.0452	0.2563	9696
Indep	0.3782	0.0565	0.3333	0.3636	0.6667	9696
Loss	0.1269	0.3328	0.0000	0.0000	1.0000	9696
DTurn	-0.1025	0.4903	-2.0086	-0.0273	1.0574	9696
Return	0.1744	0.5952	-0.8215	0.0222	4.8288	9696

risk during CEO turnover in subsamples of firms with inside successors during CEO turnover, and those with outside successors during CEO turnover respectively.

### 4. Empirical analysis

#### 4.1. Descriptive statistics

Table 2 shows the descriptive statistics for the variables used in this paper. The standard deviations of variables *NCSKEW* and *DUVOL* are 0.7168 and 0.4758 respectively, indicating that the stock price crash risk varies a lot among different firms. The mean value of variable *Degree* is 43.1359 and the median value is 22, that is, in the sample, on average, a CEO has 43 friends in the alumni network among core figures of listed firms, and more than half of the CEOs have at least 22 alumni in the network. From the standard deviation (=54.0993) and the range (=282) of variable *Degree*, it can be seen that the location of different CEOs varies a lot among the alumni network.

Besides, for the control variables, the mean value of variable Lev is 0.4343, indicating that the average leverage of the sample is 43.43%. The mean value of variable *Loss* is 0.1269, that is, there are 12.69% of firms suffer negative net profit, which is lower than the rate of firms with CEO turnover during the same period (2009–2020), i.e. 17.08%. This is consistent with the theory of bigbath (Hope & Wang, 2018).

#### 4.2. Main results

#### 4.2.1. The impact of alumni network on stock price crash risk during CEO turnover

Table 3 reports the regression results of model 7. In Column (3) and Column (4), the coefficients of variable *Eigenvector* are both positively significant at 1% level. And in Column (5)—Column (7), the coefficients of interaction term are all significantly positive. That is, CEO's advantage in alumni network will increase the stock price crash risk, especially when the friends of CEO are more influential. And this effect can be more significant during CEO turnover. The empirical results are consistent with H1.

Besides, for the control variables reported in Table 3, the coefficients of variables *Size*, *DTurn* and *Return* are significantly negative on the whole, indicating that bigger firms, firms with higher liquidity, and firms with higher return are blessed with lower stock price crash risk.

lable 3. The impact of	alumni network a	on stock price cra	sn risk auring Ce	U turnover				
Variables	(1)	(2)	(3)	(†)	(5)	(9)	(2)	(8)
	NCSKEW	DUVOL	NCSKEW	ΠΟΛΟΓ	NCSKEW	ΠΟΛΟΓ	NCSKEW	DUVOL
Degree	0.0002	0.0001			0.00002	0.00004		
	(1.1016)	(1.2764)			(0.1618)	(0.3833)		
Eigenvector			0.9482***	0.6875***			0.6330*	0.5272**
			(2.8293)	(3.3401)			(1.6645)	(2.3092)
Degree×Turnover					0.0007**	0.0004*		
					(2.0905)	(1.8117)		
Eigenvector×Turnover							1.4926**	0.7502
							(1.9812)	(1.5847)
Turnover					0.0147	0.0108	0.0343	0.0232
					(0.6517)	(0.6463)	(1.5182)	(1.5642)
Size	-0.0041	-0.0184***	-0.0042	-0.0185***	-0.0051	-0.0190***	-0.0049	-0.0189***
	(-0.4423)	(-2.8265)	(-0.4507)	(-2.8429)	(-0.6411)	(-2.9094)	(-0.5219)	(-2.8974)
Lev	-0.0158	-0.0031	-0.0169	-0.0039	-0.0177	-0.0044	-0.0195	-0.0057
	(-0.3151)	(-0.0937)	(-0.3373)	(-0.1175)	(-0.4245)	(-0.1351)	(-0.3902)	(-0.1739)
Roa	0.0348	0.0702	0.0386	0.0730	0.0590	0.0853	0.0591	0.0858
	(0.2170)	(0.6939)	(0.2407)	(0.7198)	(0.4171)	(0.8434)	(0.3693)	(0.8465)
BM	-0.2050***	-0.0650*	-0.2060***	-0.0658*	-0.2010***	-0.0627*	-0.2029***	-0.0640*
	(-3.7051)	(-1.7490)	(-3.7282)	(-1.7701)	(-4.4516)	(-1.6860)	(-3.6717)	(-1.7218)
CFO	0.1561	0.1003	0.1597	0.1029	0.1686	0.1080	0.1700	0.1092
	(1.2558)	(1.2062)	(1.2858)	(1.2377)	(1.5414)	(1.3019)	(1.3697)	(1.3166)
Indep	0.4659***	0.2889***	0.4708***	0.2924***	0.4676***	0.2896***	0.4658***	0.2893***
	(3.1255)	(2.9050)	(3.1682)	(2.9517)	(3.5868)	(2.9151)	(3.1415)	(2.9242)
Foss	0.0316	0.0291	0.0309	0.0286	0.0329	0.0299	0.0310	0.0287
	(0.8699)	(1.2746)	(0.8519)	(1.2535)	(1.0064)	(1.3156)	(0.8572)	(1.2617)
								(Continued)

I ADIE J. (CONTINUED)								
Variables	(1)	(2)	(3)	(†)	(2)	(9)	(2)	(8)
	NCSKEW	DUVOL	NCSKEW	ΠΟΛΟΓ	NCSKEW	ΠΟΛΟΓ	NCSKEW	DUVOL
DTurn	-0.1179***	-0.0767***	$-0.1168^{***}$	-0.0759***	-0.1208***	-0.0785***	-0.1194***	-0.0776***
	(-6.5903)	(-6.5507)	(-6.5167)	(-6.4720)	(-7.4718)	(-6.7115)	(-6.6727)	(-6.6232)
Return	-0.1769***	$-0.1431^{***}$	-0.1774***	-0.1435***	-0.1756***	-0.1423***	-0.1766***	-0.1430***
	(-9.4226)	(-11.0803)	(-9.4680)	(-11.1235)	(-10.4829)	(-11.0201)	(-9.4270)	(-11.0779)
Constant	-0.1473	0.1970	-0.1597	0.1880	-0.0654	0.2478*	-0.0826	0.2358*
	(-0.7390)	(1.4532)	(-0.8058)	(1.3936)	(-0.3943)	(1.8426)	(-0.4216)	(1.7607)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster by firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	9,696	9,696	9,696	9,696	9,696	9,696	9,696	9,696
$R^2$	0.0609	0.0711	0.0617	0.0720	0.0615	0.0716	0.0622	0.0723
Notes: This table estimates t	the relationship betwee	en the centrality of CEC	) in alumni network a	and stock price crash d	luring CEO turnover. Tr	ted in advantable	ss are the stock price c	rash proxies, i.e. the

the Eigenvector, and ana negree the بە network, Ē In alun CE CE centrality of IS The est Inter Б negative coefficient of skewness (Ncskew) and the down-to-up volatility (Duvol). The independent variable the independent variables are lagged by one period. The sample period covers 2009 through 2020. \*p < 0.10, \*\*p < 0.05, \*\*\*p < 0.01

#### 4.2.2. The influence of CEO's tenure on the main effect

Table 4 reports the subsample regression results based on CEO tenure. In Column (1), Column (3) and Column (4), the coefficients of *Degree* and *Eigenvector* are all significantly positive, that is, in the subsample of CEOs whose tenure are longer than 4 year, CEOs with a dominant location in the alumni network will bring additional stock price risk to the firm during turnover. While in the subsample of CEOs whose tenure less than 4 years, all the coefficients of network centrality are not significant any longer. That is, the effect of CEO's alumni network on the stock price crash risk mainly exists in the subsample of CEO who has ran the firm for some time and got the firm in control to some degree. The empirical results are consistent with H2.

#### 4.2.3. The influence of CEO successor on the main effect

Table 5 reports the subsample regression results based on the CEO successor. In Column (1), Column (3), Column (4), and Column (7), the coefficients of network centrality are all significantly positive. That is, whether the CEO successor is from inside or outside, the stock price crash risk that the alumni network brings during turnover cannot be released either. The empirical results are not consistent with H3. The reasons for the above phenomenon may be as follows: First, compared to the expressive relationship of family or alumni, colleague relationships are more instrumental. The instrumental relationship will make them pay more attention to the interests rather than the colleague's reputation. At the same time, prior studies find that CEOs experience greater performance pressure in the early stages of their tenure (Ali & Zhang, 2015; Fama, 1980), and this conflict of interest will overwhelm the fellowship. Second, compared to outside successors, inside successors are better informed about the bad news their predecessors had hidden. Blessed with the advantage of private information, the inside successors are more capable of taking a big bath of bad news hidden by the predecessors, to improve their performance and job security.

#### 5. Cross-sectional analysis

#### 5.1. The moderating effect of internal corporate governance

As managerial bad-news hoarding is proved to be an important cause of crash risk (Jin & Myers, 2006; Kim et al., 2016), sound corporate governance may be able to monitor opportunistic behavior more effectively and timely, and reduce the stock price crash risk (Sun et al., 2022). Under close supervision, even though the alumni network can provide valuable information on how to conceal bad news, the CEO will be more careful to take advantage of it. Therefore, this paper also conducts tests to study the moderating effect of internal corporate governance and external corporate governance.

Specifically, this paper measures the internal corporate governance by the ratio of independent directors on the board (*Indep*) and the establishment of audit committee in the firm (*AuditCom*), respectively. Then, this paper adds the interaction of the network centrality of CEO and the measurement of internal corporate governance to the main model and re-regress. Table 6 shows the regression results, in Column (1)-Column (4), the interaction terms are positive but not statistically significant, in Column (5)-Column (8), the coefficients are negative, that the audit committee may reduce the impact of CEO's influence, but the coefficients do not reach statistically significant, either. On the whole, internal corporate governance has little influence on the opportunistic behavior that CEO conducts by taking advantage of their alumni network.

#### 5.2. The moderating effect of external corporate governance

Similar to the tests of moderating effect of internal corporate governance, external corporate governance also has been proven to have a significant effect on stock price crashes (Fangzhou & Jiang, 2022; Sun et al., 2022). The supervision from outside will also make CEOs more careful to take advantage of their alumni connections to conduct opportunistic behavior such as withholding bad news. Therefore, this paper also tests the moderating effect of external corporate governance on the impact of CEOs' alumni networks. Specifically, this paper measures the external corporate governance by the natural log of the number of analysts following the firm and (*Following*), and

Table 4. Subsam	ple tests based or	n the tenure of CE	0					
Variables		CEOs with ter	ure≥ 4 yeαrs			CEOs with ten	ure < 4 years	
	(1)	(2)	(3)	(†)	(5)	(9)	(2)	(8)
	NCSKEW	ΠΟΛΟΓ	NCSKEW	DUVOL	NCSKEW	DUVOL	NCSKEW	DUVOL
Degree	0.0016**	0.0007			0.0002	0.0002		
	(2.1802)	(1.6252)			(0.5697)	(0.8062)		
Eigenvector			3.0722**	1.5193*			1.3009	0.7667
			(2.2909)	(1.8927)			(1.3667)	(1.4739)
Size	0.0054	0.0011	0.0113	0.0035	-0.0485**	-0.0446**	-0.0496**	-0.0448**
	(0.1774)	(0.0525)	(0.3753)	(0.1699)	(-2.0270)	(-2.5580)	(-2.0455)	(-2.5630)
Lev	-0.0962	-0.1107	-0.1241	-0.1247	-0.0023	0.0005	-0.0025	0.0004
	(-0.5600)	(-1.0004)	(-0.7237)	(-1.1192)	(-1.0472)	(0.3904)	(-0.3833)	(0.3282)
ROA	-0.4718*	-0.1897*	-0.4900**	-0.1999*	-0.0049	-0.0006	-0.0055	-0.0010
	(-1.8949)	(-1.6554)	(-2.0041)	(-1.7713)	(-0.4357)	(-0.0956)	(-0.1936)	(-0.1450)
BM	0.0841	0.0015	0.0765	0.0003	-0.0904	-0.0089	-0.0861	-0.0078
	(0.4321)	(0.0125)	(0.3891)	(0.0026)	(-0.6815)	(-0.0933)	(-0.6206)	(-0.0826)
CFO	0.4989	0.3490	0.4735	0.3395	0.0027	0.0532	0.0100	0.0560
	(1.3174)	(1.4512)	(1.2384)	(1.4051)	(0.0088)	(0.2799)	(0.0378)	(0.2952)
Indep	0.3823	0.2502	0.2986	0.2147	0.6298	0.5336**	0.6254*	0.5291**
	(0.7782)	(0.8153)	(0.6070)	(0.7018)	(1.5782)	(2.2760)	(1.7517)	(2.2610)
Loss	0.2162*	0.1316*	0.2070*	0.1258*	0.0946	0.0555	0.0919	0.0537
	(1.8329)	(1.8643)	(1.7781)	(1.8053)	(1.3421)	(1.2103)	(1.4545)	(1.1748)
DTurn	-0.4185***	-0.2841***	-0.4094	-0.2796***	-0.1399**	-0.0680*	-0.1350**	-0.0656*
	(-4.4980)	(-4.7532)	(-4.4202)	(-4.6636)	(-2.5599)	(-1.9111)	(-2.3384)	(-1.8550)
Return	-0.0402	-0.0414	-0.0386	-0.04.08	-0.2225***	-0.1803***	-0.2199***	-0.1793***
	(-0.7263)	(-1.0762)	(-0.7051)	(-1.0728)	(-4.4639)	(-4.8296)	(-4.3177)	(-4.7928)
Constant	-0.8728	-0.4132	-0.9794	-0.4613	0.7124	0.6869**	0.7180	0.6860**
								(Continued)

Table 4. (Continu	ued)							
Variables		CEOs with te	nure≥ 4 years			CEOs with te	nure < 4 years	
	(1)	(2)	(3)	(†)	(2)	(9)	(2)	(8)
	NCSKEW	ΤΟΛΛΟΓ	NCSKEW	ΠΟΛΟΓ	NCSKEW	ΤΟΛΠΟ	NCSKEW	ΠΟΛΟΓ
	(-1.4087)	(-0.9806)	(-1.5743)	(-1.0934)	(1.4206)	(1.9746)	(1.4677)	(1.9720)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster by firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	583	583	583	583	1,009	1,009	1,009	1,009
$R^2$	0.1526	0.1484	0.1493	0.1486	0.1069	0.1185	0.1083	0.1192
Notes: This table esti-	mates the relationship	between the centrality	y of CEO in alumni netw	ork and stock price cro	ash during CEO turnove	er. The dependent varia	ables are the stock price	crash proxies, i.e. the

negative coefficient of skewness (Ncskew) and the down-to-up volatility (Duvol). The independent variable of interest is the centrality of CEO in alumni network, i.e. the Degree and the Eigenvector, and the independent variables are lagged by one period. The sample period covers 2009 through 2020.

\*p < 0.10, \*\*p < 0.05, \*\*\*p < 0.01

Table 5. Subsam	ple tests base on	<b>CEO</b> successor						
Variables		Firms with insid	e CEO successor			Firms with outsic	de CEO successor	
	(1)	(2)	(3)	(†)	(5)	(9)	(2)	(8)
	NCSKEW	ΠΟΛΟΓ	NCSKEW	DUVOL	NCSKEW	DUVOL	NCSKEW	DUVOL
Degree	*6000.0	0.0005			0.0006	0.0001		
	(1.8215)	(1.6119)			(0.7766)	(0.1924)		
Eigenvector			1.7658**	1.0722*			2.5332*	0.9542
			(2.0389)	(1.8758)			(1.8563)	(1.1217)
Size	-0.0283	-0.0298*	-0.0289	-0.0302*	-0.0532	-0.0438	-0.0510	-0.0441*
	(-1.2697)	(-1.8992)	(-1.2977)	(-1.9267)	(-1.3563)	(-1.6306)	(-1.3249)	(-1.6529)
Lev	-0.0368**	-0.0113	-0.0375**	-0.0118	0.0484	0.0976	0.0525	0.0982
	(-2.0934)	(-0.7604)	(-2.1603)	(-0.7930)	(0.4113)	(1.3038)	(0.4434)	(1.3128)
ROA	-0.2328**	-0.0797	-0.2360**	-0.0817	0.0584	0.0947	0.0619	0.0951
	(-1.9857)	(-0.8023)	(-2.0377)	(-0.8273)	(0.4959)	(1.2647)	(0.5225)	(1.2706)
BM	-0.1641	-0.1154	-0.1612	-0.1132	0.1681	0.1122	0.1511	0.1097
	(-1.1474)	(-1.2174)	(-1.1233)	(-1.1927)	(0.7513)	(0.7490)	(0.6878)	(0.7402)
CFO	0.5358*	0.1800	0.5258*	0.1749	-0.4231	0.1282	-0.4144	0.1314
	(1.8325)	(0.9465)	(1.7965)	(0.9213)	(-0.9928)	(0.4646)	(-0.9679)	(0.4745)
Indep	0.5406	0.2917	0.5157	0.2771	0.5727	0.6607*	0.5640	0.6632*
	(1.2681)	(1.0490)	(1.2121)	(1.0009)	(1.0241)	(1.9494)	(1.0065)	(1.9579)
Loss	0.1071	0.0551	0.1012	0.0515	0.1453	0.0924	0.1351	0.0881
	(1.4232)	(1.1320)	(1.3625)	(1.0677)	(1.3593)	(1.3626)	(1.2703)	(1.3051)
DTurn	-0.1988***	-0.1151***	-0.1991***	-0.1152***	-0.1838*	-0.1026*	-0.1683*	-0.0965
	(-3.5748)	(-3.1870)	(-3.5945)	(-3.1970)	(-1.8770)	(-1.6669)	(-1.7072)	(-1.5560)
Return	-0.1564***	-0.1319***	-0.1517***	-0.1290***	-0.1950**	-0.1675***	-0.2020**	-0.1699***
	(-3.3901)	(-4.0674)	(-3.2884)	(-3.9715)	(-2.4336)	(-3.2519)	(-2.5212)	(-3.2983)
Constant	0.3779	0.4862	0.3811	0.4879	0.6687	0.4123	0.6213	0.4115
								(Continued)

Table 5. (Continue	d)							
Variables		Firms with insid	e CEO successor			Firms with outsid	de CEO successor	
	(1)	(2)	(3)	(†)	(2)	(9)	(2)	(8)
	NCSKEW	DUVOL	NCSKEW	ΠΟΛΟΓ	NCSKEW	ΠΟΛΟΓ	NCSKEW	ΠΟΛΟΓ
	(0.8491)	(1.5343)	(0.8571)	(1.5397)	(0.8628)	(0.7713)	(0.8114)	(0.7729)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster by firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	984	984	984	984	540	540	540	540
R <sup>2</sup>	0.1050	0.1079	0.1046	0.1080	0.1396	0.1529	0.1435	0.1545
Notes: This table estime	ates the relationship	between the centrality	y of CEO in alumni netv	work trust and stock pr	ice crash during CEO tu	urnover. The dependen	t variables are the stoc	k price crash proxies,

i.e. the negative coefficient of skewness (Ncskew) and the down-to-up volatility (Duvol). The independent variable of interest is the centrality of CEO in alumni network, i.e. the Degree and the Eigenvector, and the independent variables are lagged by one period. The sample period covers 2009 through 2020.

\*p < 0.10, \*\*p < 0.05, \*\*\*p < 0.01

Table 6. The moderatin	g effect of intern	al corporate gove	irnance					
Variables	The gov	ernance effect of	<sup>:</sup> independent dir	ectors	The	governance effec	ct of audit commi	ttee
	(1)	(2)	(3)	(†)	(5)	(9)	(2)	(8)
	NCSKEW	DUVOL	NCSKEW	ΠΟΛΟΓ	NCSKEW	DUVOL	NCSKEW	DUVOL
Degree×Indep	0.0055	0.0027						
	(1.2501)	(0.9461)						
Eigenvector×Indep			10.4671	2.1685				
			(0.9897)	(0.2989)				
Degree×AuditCom					-0.0002	-0.0002		
					(-0.3216)	(-0.3896)		
Eigenvector×AuditCom							-0.0666	-0.1008
							(-0.0486)	(-0.1141)
AuditCom					-0.0378	-0.0052	-0.0466	-0.0116
					(-0.8302)	(-0.1702)	(-1.2094)	(-0.4464)
Degree	-0.0014	-0.0007			0.0008	0.0005		
	(-0.8264)	(-0.5774)			(1.5729)	(1.3383)		
Eigenvector			-2.1602	0.1614			1.8639**	1.0350*
			(-0.5337)	(0.0575)			(2.0779)	(1.7521)
Size	-0.0408**	-0.0356***	-0.0397**	-0.0348***	-0.0374**	-0.0343**	-0.0369**	-0.0341**
	(-2.1519)	(-2.6427)	(-2.0996)	(-2.5874)	(-1.9977)	(-2.5647)	(-1.9710)	(-2.5429)
Lev	-0.0050*	-0.0006	-0.0053**	-0.0008	-0.0050*	-0.0006	-0.0053**	-0.0008
	(-1.9615)	(-0.5016)	(-2.0412)	(-0.5948)	(-1.9268)	(-0.4782)	(-2.0352)	(-0.6050)
ROA	-0.0220	-0.0087	-0.0231	-0.0093	-0.0220	-0.0086	-0.0231	-0.0093
	(-1.4710)	(-1.2063)	(-1.5292)	(-1.2765)	(-1.4404)	(-1.1898)	(-1.5026)	(-1.2699)
BM	-0.0160	0.0032	-0.0188	0.0010	-0.0255	-0.0006	-0.0264	-0.0009
	(-0.1421)	(0.0422)	(-0.1672)	(0.0133)	(-0.2274)	(-0.0076)	(-0.2360)	(-0.0112)
CFO	0.2243	0.1647	0.2262	0.1649	0.2313	0.1668	0.2301	0.1662
								(Continued)

Table 6. (Continued)								
Variables	The go	vernance effect o	of independent di	rectors	The	governance effec	t of audit commit	tee
	(1)	(2)	(3)	(†)	(5)	(9)	(2)	(8)
	NCSKEW	DUVOL	NCSKEW	DUVOL	NCSKEW	DUVOL	NCSKEW	DUVOL
	(0.9602)	(1.1053)	(0.9673)	(1.1069)	(0066:0)	(1.1180)	(0.9840)	(1.1146)
Indep	0.3850	0.3792	0.5308	0.4726**	0.6319**	0.5005***	0.6115*	0.4893**
	(0.9992)	(1.6456)	(1.5607)	(2.3261)	(1.9989)	(2.6169)	(1.9333)	(2.5631)
Loss	0.1593***	0.0838**	0.1510***	0.0792**	0.1540***	0.0822**	0.1468**	0.0781**
	(2.7289)	(2.3110)	(2.6105)	(2.1928)	(2.6498)	(2.2586)	(2.5495)	(2.1616)
DTurn	-0.1978***	-0.1145***	-0.1923***	-0.1113***	-0.1966***	-0.1140***	-0.1913***	$-0.1110^{***}$
	(-4.2115)	(-3.7859)	(-4.0980)	(-3.6926)	(-4.1902)	(-3.7667)	(-4.0755)	(-3.6799)
Return	-0.1592***	-0.1346***	-0.1597***	-0.1350***	-0.1628***	-0.1359***	-0.1625***	-0.1358***
	(-4.4580)	(-5.2109)	(-4.4872)	(-5.2383)	(-4.5666)	(-5.2672)	(-4.5453)	(-5.2576)
Constant	0.5687	0.4737*	0.4786	0.4144	0.4219	0.4040	0.4094	0.3985
	(1.4002)	(1.6924)	(1.2382)	(1.5313)	(1.1199)	(1.5149)	(1.0927)	(1.4963)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster by firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	1,592	1,592	1,592	1,592	1,592	1,592	1,592	1,592
R <sup>2</sup>	0.1013	0.1071	0.1020	0.1075	0.1016	0.1069	0.1026	0.1076
Notes: This table estimates t The dependent variables are	he moderating effect of the stock price crash p	of internal corporate g proxies, i.e. the negativ	jovernance on the relover the relover	ationship between the ness (Ncskew) and the	ecentrality of CEO in a down-to-up volatility	lumni network trust a (Duvol). The independ	ind stock price crash d lent variable of interes	uring CEO turnover. t is the centrality of

CEO in alumni network, i.e. the *Degree* and the *Eigenvector*, and the independent variables are lagged by one period. The moderating variables are the internal corporate governance, i. e. the rate of independent directors (*Indep*) and the establishment of audit committee (*AuditCom*). *AuditCom* is a dummy variable that set to 1 if a firm has established an audit committee, and 0 otherwise. The sample period covers 2009 through 2020.

whether the firm is audited by one of the international big 4 accounting firms (*Big*4), respectively. And add the interaction of the network centrality of the CEO and the measurement of external corporate governance to the main model and re-regress. Table 7 shows the regression results, in Column (1)-Column (8), all the coefficients of the interaction *Degree×Following* do not reach statistically significant. On the whole, external corporate governance still cannot effectively monitor the opportunistic behavior that CEO conducts by taking advantage of their alumni network as well.

### 5.3. The moderating effect of legal environment

In a sound legal environment, investor interests can be better protected. It will be more costly for CEOs to commit opportunistic behavior such as withholding bad news. This can act as a deterrent to the CEO, inhibiting their tendency to take advantage of the alumni network to commit opportunistic behavior. Therefore, this paper further tests the moderating effect of the legal environment empirically. Following Hao et al. (2020), this paper uses the Fan Gang marketization index to measure the legal environment of different provinces in China, and specifically takes the score of the legal environment in *Marketization Index of China's Provinces: NERI Report 2021* (Wang et al., 2021) as the measurement. As the scores are not comparable before and after 2016, the moderating effect of the legal environment is tested by subsample grouping. Specifically, the subsample grouping is based on the legal environment of the firms' location, if the province that a firm is located in gains a higher score than the median of the year, then it will be classified to the group of firms located in provinces with sound legal environment, and vice versa.

Table 8 shows the regression results of subsample tests. It can be seen that the negative influence of the CEO's alumni network mainly exists in the subsample of firms located in the provinces with a weak legal environment. While in the subsample of firms located in the provinces with a sound legal environment, the coefficients of network centrality are positive but not statistically significant. The regression results suggest that a sound legal environment can effectively prevent CEOs from taking advantage of the alumni network to conceal bad news and reduce the stock price crash risk.

## 5.4. The moderating effect of M.B.A. degree

Accounting to upper echelons theory (Hambrick, 2007), different types of education experience can have different influences on economic participants during their careers. Prior researches also prove that M.B.A. programs overemphasize the pursuit of self-interest (Bamber et al., 2010; Gintis & Khurana, 2008), and the reported cheating levels are also higher in M.B.A. than in other graduate programs (McCabe et al., 2006). The influence of the M.B.A program may increase the possibility of CEOs who have entered M.B.A programs taking advantage of the alumni network to hide or delay the bad news.

Therefore, this paper further conducts tests to study the moderating effect of an M.B.A degree. Specifically, this paper employs a dummy variable that is set to one if a CEO has an M.B.A degree (*MBA*), and adds the interaction of the network centrality of CEO and variable *MBA* to the main model and re-regress. Table 9 shows the regression results, in Column (3) and Column (4), the coefficients of the interaction *Eigenvector×MBA* are both positively significant at the 5% level, that is, M.B.A education will strengthen the effect of the CEO's alumni network on the stock price crash risk during CEO turnover.

#### 6. Robustness checks

To make sure that the findings are robust in this paper, I also conduct a series of robustness checks as follows:

#### 6.1. Subsample tests of the CEOs with master's degree

As an educational degree is an important factor affecting the centrality in the alumni network, at the same time, it is also highly related to the individual ability of the CEO. This may be one of the

Table 7. The mod	lerating effect of e	external corporate	: governance					
Variables	The <u>c</u>	governance effect	of analysts follow	ing	£	e governance effe	ct of external aud	lit
	(1)	(2)	(3)	(†)	(5)	(9)	(2)	(8)
	NCSKEW	DUVOL	NCSKEW	ΠΟΛΟΓ	NCSKEW	DUVOL	NCSKEW	DUVOL
Degree×Following	-0.0001	0.00003						
	(-0.2565)	(0.2064)						
Eigenvector× Following			-0.5190	-0.1743				
			(-0.8786)	(-0.4589)				
Degree×Big4					0.0012	0.0007		
					(1.4032)	(1.1010)		
Eigenvector×Big4							0.9100	0.1283
							(0.6113)	(0.1255)
Following	0.0454**	0.0385**	0.0448**	0.0406***				
	(1.9784)	(2.4659)	(2.1886)	(2.8668)				
Big4					-0.1155	-0.0747	-0.0765	-0.0491
					(-1.5327)	(-1.4787)	(-1.0657)	(-1.0386)
Degree	0.0008	0.0003			0.0006	0.0003		
	(1.1409)	(0.7760)			(1.3251)	(1.1691)		
Eigenvector			2.5077*	1.1592			1.7387**	0.9897**
			(1.9406)	(1.4055)			(2.2925)	(1.9923)
Size	-0.0645***	-0.0592***	-0.0629***	-0.0580***	-0.0352*	-0.0317**	-0.0333*	-0.0305**
	(-2.8184)	(-3.7326)	(-2.7529)	(-3.6649)	(-1.8153)	(-2.2851)	(-1.7061)	(-2.1907)
Lev	-0.0051*	-0.0008	-0.0054**	-0.0009	-0.0051**	-0.0007	-0.0053**	-0.0008
	(-1.9413)	(-0.6154)	(-2.0407)	(-0.6880)	(-1.9758)	(-0.5119)	(-2.0335)	(-0.5874)
ROA	-0.0209	-0.0077	-0.0222	-0.0082	-0.0227	-0.0092	-0.0237	-0.0097
	(-1.3384)	(-1.0217)	(-1.4094)	(-1.0783)	(-1.5209)	(-1.2691)	(-1.5661)	(-1.3323)
								(Continued)

		3				2		-
Variables	Ine	governance errec	t or analysts rollo	wing		ne governance err	ect of external au	
	(1)	(2)	(3)	(†)	(2)	(9)	(2)	(8)
	NCSKEW	ΠΟΛΟΓ	NCSKEW	ΠΟΛΟΓ	NCSKEW	DUVOL	NCSKEW	ΠΟΛΟΓ
BM	0.0592	0.0802	0.0523	0.0744	-0.0264	-0.0038	-0.0312	-0.0061
	(0.4749)	(0.9737)	(0.4234)	(0.9084)	(-0.2349)	(-0.0501)	(-0.2761)	(-0.0806)
CFO	0.1931	0.1376	0.1938	0.1362	0.2384	0.1740	0.2340	0.1711
	(0.8238)	(0.9197)	(0.8259)	(0.9094)	(1.0167)	(1.1638)	(0.9962)	(1.1438)
Indep	0.6399**	0.5073***	0.6182*	0.4967***	0.6053*	0.4867**	0.6144*	0.4944***
	(2.0248)	(2.6580)	(1.9547)	(2.6019)	(1.8766)	(2.5147)	(1.9267)	(2.5819)
Loss	0.1774***	0.1023***	0.1687***	0.0980***	0.1574***	0.0828**	0.1504***	0.0787**
	(3.0113)	(2.7678)	(2.8930)	(2.6560)	(2.6911)	(2.2735)	(2.5931)	(2.1709)
DTurn	-0.1886***	-0.1063***	-0.1844***	-0.1042***	-0.1978***	-0.1149***	-0.1936***	-0.1123***
	(-3.9989)	(-3.5036)	(-3.9209)	(-3.4465)	(-4.2180)	(-3.8000)	(-4.1285)	(-3.7239)
Return	-0.1662***	-0.1403***	-0.1670***	-0.1405***	-0.1615***	-0.1360***	$-0.1614^{***}$	-0.1361***
	(-4.6496)	(-5.4508)	(-4.6751)	(-5.4555)	(-4.5303)	(-5.2815)	(-4.5382)	(-5.2943)
Constant	0.9058**	0.8607***	0.8753**	0.8362***	0.3773	0.3568	0.3162	0.3208
	(2.0323)	(2.8271)	(1.9746)	(2.7519)	(0.9676)	(1.2938)	(0.8104)	(1.1575)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster by firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	1,592	1,592	1,592	1,592	1,592	1,592	1,592	1,592
$R^2$	0.1031	0.1119	0.1044	0.1125	0.1015	0.1076	0.1022	0.1079
Notes: This table esti The dependent varia CEO in alumni netwo following analysts ( <i>F</i> thor est to 1 if the fi	imates the moderating bles are the stock price irk, i.e. the <i>Degree</i> and i <i>ollowing</i> ) and the qual	effect of internal corp : crash proxies, i.e. the the <i>Eigenvector</i> , and th ity of external audit ( <i>B</i> ity of the international Bu	orate governance on th negative coefficient of ie independent variable ig4). Following is meas	ne relationship betweel skewness (Ncskew) and es are lagged by one pe sured by the natural loo the comple period court	n the centrality of CEC 1 the down-to-up vola riod. The moderating garithm of number of so 2009 thrunds and	in alumni network trus (ility (Duvol). The indepervariables are the exterr the analysts that follov	st and stock price crash andent variable of inter nal corporate governan wing the firm, and <i>Big</i>	during CEO turnover. est is the centrality of ce, i. e. the number of is a dummy variable
			d 1) dive < <	the second strate of the				

\*p < 0.10, \*\*p < 0.05, \*\*\*p < 0.01

Table 7 (Co

Table 8. The mo	derating effect of	legal environment						
Variables	Firms loca	ited in provinces w	vith weak legal en	vironment	Firms locat	ted in provinces w	ith sound legal en	wironment
	(1)	(2)	(3)	(†)	(5)	(9)	(2)	(8)
	NCSKEW	DUVOL	NCSKEW	ΠΟΛΟΓ	NCSKEW	DUVOL	NCSKEW	DUVOL
Degree	0.0011	0.0005			0.0004	0.0003		
	(1.4594)	(1.1883)			(0.8861)	(1.1418)		
Eigenvector			2.5618**	1.5341**			1.3065	0.6288
			(2.0563)	(1.9640)			(1.3618)	(1.0344)
Size	-0.0984***	-0.0771***	-0.0968***	-0.0765***	0.0110	-0.0018	0.0108	-0.0010
	(-3.4513)	(-3.9177)	(-3.4003)	(-3.6690)	(0.4395)	(-0.1046)	(0.4248)	(-0.0605)
Lev	-0.0341	-0.0222	-0.0312	-0.0197	-0.0323*	-0.0066	-0.0330*	-0.0069
	(-0.3442)	(-0.3097)	(-0.3160)	(-0.2691)	(-1.8394)	(-0.5209)	(-1.8749)	(-0.5451)
ROA	-0.0465	-0.0334	-0.0444	-0.0315	-0.2127*	-0.0543	-0.2166*	-0.0560
	(-0.4669)	(-0.4656)	(-0.4484)	(-0.4206)	(-1.8180)	(-0.6454)	(-1.8505)	(-0.6657)
BM	0.1915	0.1511	0.1896	0.1513	-0.0596	-0.0434	-0.0624	-0.0483
	(1.1863)	(1.3496)	(1.1716)	(1.3513)	(-0.3734)	(-0.4430)	(-0.3873)	(-0.4909)
CFO	0.4125	0.3758	0.4146	0.3811*	-0.0433	-0.0378	-0.0517	-0.0463
	(1.0488)	(1.5498)	(1.0544)	(1.7059)	(-0.1480)	(-0.1889)	(-0.1762)	(-0.2318)
Indep	0.7342	0.6645**	0.6795	0.6389**	0.6853*	0.5115*	0.6767*	0.5059*
	(1.3307)	(2.1390)	(1.2252)	(2.1868)	(1.6743)	(1.8420)	(1.6585)	(1.8257)
Loss	0.0539	0.0221	0.0433	0.0147	0.2843***	0.1531***	0.2794***	0.1499**
	(0.6304)	(0.4182)	(0.5078)	(0.2964)	(3.2552)	(2.6087)	(3.2331)	(2.5747)
DTurn	-0.2771***	-0.1521***	-0.2662***	-0.1460***	-0.1402**	-0.0936**	-0.1368**	-0.0931**
	(-3.4568)	(-2.9635)	(-3.2966)	(-2.7462)	(-2.2409)	(-2.3543)	(-2.1800)	(-2.3451)
Return	-0.1225*	-0.0982*	-0.1300*	-0.1023**	-0.1465***	-0.1438***	-0.1439***	-0.1426***
	(-1.7407)	(-1.9349)	(-1.8505)	(-2.2440)	(-3.5123)	(-4.5685)	(-3.4695)	(-4.5370)
Constant	1.5627**	1.2464***	1.5329**	1.2309***	-0.6294	-0.1837	-0.6322	-0.1953
								(Continued)

	nea)							
Variables	Firms loco	ated in provinces	with weak legal en	ivironment	Firms loca	ted in provinces <b>w</b>	ith sound legal e	nvironment
	(1)	(2)	(3)	(†)	(2)	(9)	(2)	(8)
	NCSKEW	ΠΟΛΟΓ	NCSKEW	ΠΟΛΟΓ	NCSKEW	ΠΟΛΟΓ	NCSKEW	ΠΟΛΟΓ
	(2.4494)	(2.9747)	(2.4174)	(2.9246)	(-1.3136)	(-0.5541)	(-1.3028)	(-0.5830)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster by firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	723	723	723	723	719	719	719	719
$R^2$	0.1022	0.1138	0.1036	0.1164	0.1429	0.1398	0.1439	0.1393
Notes: This table est The dependent varic	timates the moderating ibles are the stock price	g effect of internal corp e crash proxies, i.e. the	borate governance on th negative coefficient of s the independent variab	he relationship betwee skewness (Ncskew) and	n the centrality of CEO 1 the down-to-up volat	in alumni network trus ility (Duvol). The indepe	t and stock price crash endent variable of inter	i during CEO turnover. est is the centrality of

Ľ	0.1022	00110	0001.0	0.1104	0.1423	0601.0	0.1409	CECT.U
Notes: This table esti	mates the moderating	effect of internal corpc	orate governance on the	e relationship between	the centrality of CEO i	n alumni network trust	and stock price crash	during CEO turnover.
The dependent varial CEO in alumni netwo	bles are the stock price rk. i.e. the <i>Dearee</i> and t	crash proxies, i.e. the r the <i>Eigenvector</i> , and t	negative coefficient of sl the independent variable	kewness (Ncskew) and t es are lagged by one p	the down-to-up volatil eriod. Followina Hao e	ity ( <i>Duvol</i> ). The indeper et al. (2020), this paper	ident variable of intere uses the Fan Gana mi	st is the centrality of arketization index to
measure the market	environment of differen	nt provinces in China, a	and specifically takes the	e score of legal environ	ment in Marketization	Index of China's Provinc	es: NERI Report 2021 (V	Nang et al., 2021) as
the measurement. A:	s the scores are not cor	mparable before and o	after 2016, the moderat	ing effect of legal envir	onment is tested by s	ubsample grouping. Sp	ecifically, the subsamp	ole grouping is based
on the legal environr	nent of the firms' locat	tion, if the province the	at a firm located in gain	s higher score than the	e median of the year,	then it will be classified	to the group of firms	located in provinces
with sound legal env	ironment, and vice ver:	'sa. The sample period	l covers 2009 through 2	020.				
*p < 0.10, **p < 0.05,	***p < 0.01							

Table 9. The mod	erating effect of M	.B.A. degree		
Variables	(1)	(2)	(3)	(4)
	NCSKEW	DUVOL	NCSKEW	DUVOL
Degree×MBA	0.0002	0.0003		
	(0.2760)	(0.5498)		
Degree	0.0006	0.0003		
	(1.2529)	(1.2074)		
Eigenvector×MBA			3.6409**	2.8034**
			(2.0992)	(2.5256)
Eigenvector			1.0359	0.3041
			(1.1060)	(0.4802)
MBA	0.0549	0.0025	0.0577	0.0067
	(1.2282)	(0.0865)	(1.3151)	(0.2352)
Size	-0.0309	-0.0238*	-0.0293	-0.0225
	(-1.4839)	(-1.6621)	(-1.4137)	(-1.5770)
Lev	-0.0045*	0.0002	-0.0046**	0.0002
	(-1.9291)	(0.1592)	(-1.9715)	(0.1567)
ROA	-0.0196	-0.0052	-0.0198	-0.0051
	(-1.4749)	(-0.7859)	(-1.4937)	(-0.7711)
BM	-0.0363	-0.0295	-0.0436	-0.0353
	(-0.2928)	(-0.3628)	(-0.3509)	(-0.4334)
CFO	0.2684	0.1171	0.2576	0.1087
	(1.0358)	(0.7134)	(0.9941)	(0.6647)
Indep	0.5856*	0.4833**	0.5827*	0.4843**
	(1.6753)	(2.3667)	(1.6687)	(2.3733)
Loss	0.1891***	0.0923**	0.1836***	0.0888**
	(2.9017)	(2.2390)	(2.8487)	(2.1733)
Turnover	-0.1933***	-0.1074***	-0.1834***	-0.1007***
	(-3.7389)	(-3.2599)	(-3.5517)	(-3.0542)
Return	-0.1908***	-0.1590***	-0.1881***	-0.1576***
	(-4.7200)	(-5.5485)	(-4.6468)	(-5.4947)
Constant	0.4203	0.2952	0.3362	0.2386
	(1.0034)	(1.0242)	(0.8168)	(0.8360)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Cluster by firm	Yes	Yes	Yes	Yes
Obs.	1,329	1,329	1,329	1,329
R <sup>2</sup>	0.1046	0.1054	0.1086	0.1093

Notes: This table estimates the moderating effect of internal corporate governance on the relationship between the centrality of CEO in alumni network trust and stock price crash during CEO turnover. The dependent variables are the stock price crash proxies, i.e. the negative coefficient of skewness (*Ncskew*) and the down-to-up volatility (*Duvol*). The independent variable of interest is the centrality of CEO in alumni network, i.e. the *Degree* and the *Eigenvector*, and the independent variables are lagged by one period. The moderating variable is whether a CEO holds an M.B.A. (*MBA*). *MBA* is a dummy variable that set to 1 if a CEO holds an M.B.A. degree, and 0 otherwise. The sample period covers 2009 through 2020.

\*p < 0.10, \*\*p < 0.05, \*\*\*p < 0.01

confounding factors for the findings of this paper. To control the influence of individual ability on endogeneity problems, in the robustness checks, this paper only keeps the CEOs whose highest degree is Master as the subsample, and re-regress the main models. The research conclusions stand robust through the subsample tests.

#### 6.2. Subsample tests of the CEOs graduating from universities of Project 985

The university that a CEO graduated from can be an important factor that influences the quality of his (or her) alumni network. And the university that the CEO entered is also highly related to the ability of the CEO. This may be one of the confounding factors for the findings of this paper. Thus, in the robustness checks, this paper takes the CEOs who are graduated from the universities of *Project 985*, which means that the university is a key university in China as a subsample to make sure that there is no significant heterogeneity in individual abilities and the quality of connection among the subsample, and re-regress the main models. The research conclusions stand robust through the subsample tests.

#### 6.3. Drop the turnover that happened during the COVID-19 pandemic

The outbreak of COVID-19 has comprehensively impacted the macro economy in China, and the impact varies a lot among different industries. The Changes in the economic environment will inevitably impact firms' decisions. Thus, in the robustness checks, this paper drops the CEO turnover that happened during 2020 and re-regress the main models. The research conclusions stand robust through the tests.

#### 7. Conclusion

This paper empirically tests the impact of a CEO's alumni relationships on the stock price crash risk when he (or she) steps down. The main findings are as follows: (1) CEO's advantage among the alumni network will increase the firm's stock price crash risk when he (or she) steps down from the position to some degree. (2) The effect of a CEO's alumni network is built on the CEO's power inside the firm that was established during a long enough tenure. (3) Further research finds that corporate governance either internal or external can not effectively restrain the opportunistic behavior of CEOs on the whole, but a sound legal system can effectively deter the CEO's opportunistic behavior in advance. (4) Besides, an experience of M.B.A may strengthen the tendency of CEOs' opportunistic behavior, such as making use of their external resources to conceal bad news. The empirical results shed light on the potential negative effects of individual social networks on economic activities. What is worse, the existing corporate governance is not powerful enough to efficiently constrain it. And a sound legal environment is proved to be more efficient in monitoring the opportunistic behavior of CEOs.

This research has important implications for corporate governance practices. Although prior researches prove the great value of personal social relationships on firm value (Engelberg et al., 2013), this paper points out that CEO's social capital can be risky for the firm as well. CEOs who are blessed with an advantage in the social network can also be more powerful when conducting opportunistic behavior, such as withholding bad news. What is worse, this power is difficult to be effectively restrained by internal and external supervision. Besides, during CEO turnover, the firm has to face additional risks, which can be a challenge to the stable development of the firm. Then, firms should conduct a more comprehensive assessment of the value of the CEO's social capital, and design more effective supervision and incentive mechanisms accordingly. Thus, how effectively supervising and motivating CEOs with rich personal social connections seems to be a promising direction for future research.

#### Funding

The author received no direct funding for this research.

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#### **Disclosure statement**

No potential conflict of interest was reported by the author(s).

#### **Citation information**

Cite this article as: Alumni network, CEO turnover, and stock price crash risk: evidence from China, Jing Liu, *Cogent Economics & Finance* (2022), 10: 2111813.

#### Note

1. The average tenure of the CEOs covered in this paper is 3.84 year, and the median is 3 years.

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