**CEO power and stock price crash risk in China: Do female directors’ critical mass and ownership structure matter?**

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**Abstract**

This study investigates how CEO power is associated with stock price crash risk. We further examine the moderating roles of female directors’ critical mass and ownership structure on the relationship between CEO power and stock price crash risk. Employing one of the largest datasets to-date of Chinese listed firms over the 2005-2015 period (13,421 firm-year observations), we find that CEO’s power to increase the likelihood of stock price crash risk is significantly mitigated when the percentage of: (a) female directors; and (b) ownership by blockholders and institutions, is high within firms. We interpret our findings within a theoretical framework that draws insights from neo-institutional, managerial power and critical mass theories. The findings are robust to the use of alternative measures, estimation methods and endogeneity issues.

**Keywords:** CEO power; stock price crash risk; female director critical mass; ownership structure; managerial power theory; China.

1. **Introduction**

Governance embodies the ability of individuals (usually top managers) to positively influence others in order to accomplish organizational objectives via power dynamics that are inherent in decision-making. As research on governance, accounting and finance develops, scholars have increasingly directed their attention towards understanding the quixotic implications of top executives’ power on firms’ financial performance (Clark, Murphy, & Singer, 2014). However, the existing accounting and finance research has rarely examined the adverse effects of a leader’s power on organizational outcomes (Chen, Lee-Chai, & Bargh, 2001; Sturm & Antonakis, 2015).

Hence, in this paper, we examine the adverse effects of CEO power on stock price crash risk (hereafter crash risk). We argue that the power of such CEOs is driven primarily by their involvement in the compensation setting process, and as a result, dissimilarity in CEOs’ compensation structure occurs, and thereby often resulting in agency problems. We further investigate the extent to which such a relationship can be moderated by: (a) the presence of a critical mass of female directors within corporate boards; and (b) ownership structure of firms. Our underlying arguments are drawn from neo-institutional (Scott, 2001), managerial power (Bebchuk, Fried, & Walker, 2002; Agyei-Boapeah et al., 2019) and critical mass (Konrad, Kramer, & Erkut, 2008; Kramer, Konrad, Erkut, & Hooper, 2006) theoretical perspectives.

Theoretically, neo-institutional perspective (Scott, 2001; Haque & Ntim, 2020) elucidates that institutional forces (i.e., coercive, cognitive and normative pressures) influence firms to strive to gain legitimacy and efficiency by following standard governance practices and abstaining from engaging in corporate malpractices. In the context of organizations, the top leaders are mainly responsible to effectively implement the institutional policies, while adhering to institutional pressures and norms. In addition, managerial power theory (Bebchuk & Fried, 2004; Bebchuk et al., 2002) explains that CEOs have power over corporate boards in their compensation setting process, which can better explain the agency problems within firms. They further explained that this managerial power enables CEOs to have higher compensation packages, which are usually not associated with firm performance, and consequently extraction or misappropriation of corporate resources occur. On the other hand, following the deterioration of governance practices and corporate scandals in the 21st century, critical mass theory (Konrad et al., 2008; Kramer et al., 2006) has emerged in the management field. This theory emphasizes on the presence of female directors in firms. According to this theory, a critical mass of three or more female directors is critical to improving the internal corporate governance practices within firms (Konrad et al., 2008; Kramer et al., 2006; Zalata et al., 2019a, b). Such a critical mass of female directors can act as an efficient monitor or controlling lever over the activities and decisions of top management, and thus, can serve as a mitigating force on the power of CEOs.

Observably, the burgeoning research on CEO power and crash risk has been confined to distinct isolated paths. Studies from accounting (e.g., Friedman, 2014; Gul, Srinidhi, & Ng, 2011), finance (e.g., Adams, Almeida, & Ferreira, 2005; Andreou, Antoniou, Horton, & Louca, 2016a, Andreou, Louca, & Petrou, 2016b; Tan & Liu, 2016; Sarhan et al., 2019), economics (e.g., Feng, Ge, Luo, & Shevlin, 2011; Khanna, Kim, & Lu, 2015; Morse, Nanda, & Seru, 2011), law (e.g., Bebchuk et al., 2002) and leadership/management (e.g., Clark et al., 2014; Schyns & Schilling, 2013) disciplines have illuminated numerous circumstances under which powerful corporate executives can result in negative financial outcomes within firms. In this case, crash risk refers to a sharp drop in the stock price over a small period of time due to the abrupt release of adverse news about a firm. Prior literature (e.g., Hutton, Marcus, & Tehranian, 2009; Jin & Myers, 2006) has linked such sudden crash of stock prices with the information concealing nature of top managers. Although evidence on the antecedents of crash risk prevails from governance and related research (e.g., Andreou et al., 2016a; Ghadhab, 2019; Kim, Li, & Li, 2014; Kim & Zhang, 2016; Tan & Liu, 2016; Xu, Li, Yuan & Chan, 2014; Zhang, Xie, & Xu, 2016), studies examining different characteristics of CEOs, especially CEO power as determinants of crash risk are limited (e.g., Andreou et al., 2016b; Kim, Wang, & Zhang, 2016; Kim et al., 2011). The only exception is a study by Al Mamun, Balachandran, and Duong (2017). Specifically, they investigated the CEO power–crash risk nexus and found that powerful CEOs are associated with greater crash risk using a sample of US firms.

In this paper, we seek to depart from existing studies by providing new insights on the potential negative effects of powerful corporate executives, and thereby extending, as well as making a number of new contributions to the extant literature. First, existing studies (e.g., Al Mamun et al., 2017) have examined the extent to which external governance mechanisms (i.e., the market for corporate control mechanisms) can mitigate a CEO’s power on detrimental crash risk. However, given the context of governance and CEO power research, the substantial role of internal governance mechanism (e.g., gender diversity in corporate boards) can arguably shed new insights on the ongoing debate of the negative effects of the power of top corporate executives, such as CEOs. Specifically, we contribute to existing literature by bridging this potential gap along with employing critical mass theory (hereafter CMT) (Konrad et al., 2008; Kramer et al., 2006) to investigate the extent to which female directors’ critical mass involvement in corporate boards can moderate the detrimental effects of powerful CEOs on crash risk. In line with CMT and minority representation (Konrad et al., 2008; Kramer et al., 2006) within firms, we argue that female directors in comparison to their male counterparts are less inclined to engage in malpractices, including the strategic concealment of crucial price sensitive information, which can result in crash risk. Accordingly, we examine whether female directors can serve as a moderating force on the relationship between CEO power and crash risk.

Second, in contrast to agency theory perspective (Jensen & Meckling, 1976), we employ managerial power theory (hereafter MPT) (Bebchuk & Fried, 2004; Bebchuk et al., 2002) and argue that different investors (concentrated, institutional and foreign investors) are likely to: (a) be more inclined to safeguard their material interests due to high levels of ownership stakes; (b) be more actively involved in the monitoring of top managers; and (c) curtail the compensation or rent extraction powers of CEOs, that can result in crash risk, and thereby negatively affecting the wealth of investors. Thus, we posit that these varying ownership structures can modify the link between CEO power and crash risk by mitigating the former’s negative effect on the firm’s stock prices.

Third, Al-Mamun et al. (2017) focused on the US market, and arguably, their findings cannot be easily generalized to emerging markets, and especially the emerging Chinese markets due to varying financial, accounting and governance structures (Conyon & He, 2011, 2012; Conyon, He, & Zhou, 2015). In this case, we focus on China due to a number of reasons. Firstly, the institutional context can offer new insights in terms of corporate governance structures (Davis, 2005). Previous studies have mostly ignored the role of such institutional pressures (Judge, Douglas, & Kutan, 2008) in the examination of top executives’ commitment to corporate goals. Secondly, the often volatile, but large, rapidly growing and vibrant Chinese stock markets, which usually experiences bubbles and crashes (Piotroski, Wong, & Zhang, 2015; Xu, Jiang, Chan, & Yi, 2013) offer us an appropriate setting to investigate our proposed arguments on crash risk in the context of China. Thirdly, the promulgation of the first “Code of Corporate Governance” in China (by China’s Securities Regulation Committee – CSRC) in 2002 depicts the drive to incorporate sound governance practices (e.g., disclosure of top management’s compensation and boards’ characteristics, and promoting board diversity), especially gender diversity with research relating to accounting and governance structures steadily developing (Conyon & He, 2011, 2012; CSRC, 2005). Fourthly, the structure of executive compensation, which is the emerging debate in Chinese firms is mainly comprised of cash compensation (i.e., base salary, cash bonuses and compensation) in contrast to equity/stock options that are common in developed markets (Conyon & He, 2011; Xu et al., 2014). Finally, past evidence (Gul, Kim, & Qiu, 2010) shows that ownership structure in China is quite unique, such that ownership is highly concentrated, especially state ownership, with a record strongly protecting the benefits and interests of such concentrated owners, often to the detriment of minority shareholders. Moreover, since opening up its markets to international investors, foreign direct investments have increased among Chinese firms, who despite being in the minority, have been influential in altering those firms’ risky decisions.

Fourth, despite increasing demands to test and integrate new theories (Barkema & Gomez-Mejia, 1998; Chen, Ezzamel, & Cai, 2011; Zehnder, Herz, & Bonardi, 2017), the arguments of existing studies, such as those by Al Mamun et al. (2017) have been based mainly on the widely tested agency perspective, and thus limiting the scope for theoretical development and advancement. Therefore, we seek to contribute to the existing literature by departing from most prior studies in employing MPT (Bebchuk & Fried, 2004; Bebchuk et al., 2002) along with neo-institutional and critical mass theories to explain CEO power and the crash risk nexus in institutionally driven organizational settings. We found support for our arguments while examining a longitudinal dataset of A-shares in Chinese firms listed on the Shanghai and Shenzhen Stock Exchanges from 2005 to 2015. Our results are supported by a series of sensitivity, endogeneity, and reverse causality analyses.

The rest of the paper is organized as follows. The next section reviews the literature and develops hypotheses. The following sections outline the research design, present the empirical results, and discuss the findings. The final section concludes the paper.

1. **Literature review and hypotheses development**

Existing literature posits mixed arguments pertaining to the positive or negative repercussions of power use in organizations and society (Chen et al., 2001; Sturm & Antonakis, 2015). In particular, the dark or negative side of power, which is related to corruption has attracted the attention of researchers over the centuries. Noticeably, however, governance scholars only started examining power dynamics in recent decades (e.g., Bebchuk et al., 2002; Grabke-Rundell & Gomez-Mejia, 2002; Tan & Liu, 2016; Tosi, Werner, Katz, & Gomez-Mejia, 2000). Indeed, despite growing calls for new cross-disciplinary studies that may uncover new insights (Zehnder et al., 2017), existing research is largely silent on the examination of top corporate executives’ power by integrating different theoretical perspectives from different disciplines, such accounting, economics, finance, and management (Abdul Wahab et al., 2018). We, thus, attempt to bridge this gap by drawing inspiration from neo-institutional (Scott, 2001; Haque & Ntim, 2020), managerial power (Bebchuk et al., 2002; Elmagrhi et al., 2019) and critical mass (Konrad et al., 2008; Kramer et al., 2006) theoretical perspectives.

***2.1. CEO power as a determinant of stock price crash risk***

Theoretically, neo-institutional theoretical view (Scott, 2001; Haque & Ntim, 2020) emphasizes that institutional actors (e.g., political, social, and economic institutions) are essential in: (a) influencing firms to pursue good governance practices; and (b) refraining them from corporate malpractices and wrongdoings. Institutional forces (i.e., coercive, cognitive, and normative pressures) drive firms to achieve the strategic requirements of legitimacy and efficiency (Scott, 2001). Consequently, scholars have employed a neo-institutional perspective in examining the diffusion of institutional practices in terms of accounting and governance standards (Judge et al., 2008). In particular, top corporate executives, such as CEOs are responsible for the effective implementation of institutional guidelines and policies in order to ensure that good corporate governance practices will be followed (Abdul Wahab et al., 2018). Moreover, little evidence exists about the influence of such institutional pressures on the consequence of executives’ power, which may sometimes lead to negative financial outcomes for firms.

Significantly, MPT (Bebchuk & Fried, 2004; Bebchuk et al., 2002; Ntim et al., 2019) contends that a better explanation for the lack of association between CEO’s pay and firm outcomes or agency problems can be attributed to the former’s power over boards in their compensation setting process. These CEOs can manipulate the board members in increasing their compensation packages by exercising ‘structural power’ (i.e., compensation and number of titles) (as discussed by Grabke-Rundell & Gomez-Mejia (2002)). Hence, CEOs power over their compensation design process is a manifestation of the agency problem. Bebchuk and Fried (2004) further argued that CEOs’ power over the board could enable them to negotiate for compensation packages that are not linked to their performance and thus, facilitating the extraction of corporate resources. Choe, Tian, and Yin (2014) have also supported managerial power theory and found evidence of the power and pay relationship (using CEO pay slice as a proxy for CEO power), while using a dataset of S&P 500 firms from 1999-2008.

Previous research provides evidence on the consequences of CEO power on: (i) earnings management that is driven by compensation motives (Feng et al., 2011; Friedman, 2014); (ii) commitment of corporate fraud and its concealment due to their power in the appointments of top executives (Khanna et al., 2015); (iii) in ex-post rigging of incentive contracts by inducing board members (Morse et al., 2011); and (iv) the determination of bond ratings and yield spreads (Liu & Jiraporn, 2010), among others. By contrast, studies on the CEO’s characteristics as determinants of crash risk elucidate that: (i) CEO’s overconfidence increases future crash risks (Kim et al., 2016); (ii) incentives from CEO’s option holdings are weakly positively linked with crash risk (Kim et al., 2011); and (iii) younger CEOs are more inclined to cause crash risk (Andreou et al., 2016b).

We extend the arguments of MPT from a broader firm performance to a more specific adverse stock performance debate, namely crash risk. Drawing on MPT (Bebchuk & Fried, 2004; Bebchuk et al., 2002), this study theorizes that powerful CEOs with inclination to maintain their: (i) dominance in the compensation setting process, and (ii) personal benefits, can withhold negative news about their firms from the market to a tipping point. Afterward, the concealed negative price sensitive information is suddenly released into the market, and consequently, stock price abruptly crashes (e.g., Hutton et al., 2009; Jin & Myers, 2006). It is imperative to investigate such a unique relationship in the institutional environment of China, where the institutional pressures are increasingly transforming governance practices of listed firms. In addition, due to the high involvement of the state and appointment of politically linked executives in the past, CEOs are much more dominant in Chinese listed firms (Xu et al., 2014). In the context of Chinese firms, the involvement of CEOs in the compensation setting process can further exacerbate information asymmetry problems. Consequently, we conjecture that CEOs are more likely to: (a) focus more on short-term goals (Conyon & He, 2011; Xu et al., 2014); (b) exercise their power to extract rents or personal benefits by misusing firm’s resources (Grinstein & Hribar, 2004); and (c) ultimately lead the firm to deleterious financial situation (Feng et al., 2011; Khanna et al., 2015).

We argue that such a distinctive CEO power offered by the Chinese institutional context can provide valuable insights with respect to the extant literature. Thus, drawing on MPT (Bebchuk & Fried, 2004; Bebchuk et al., 2002), we hypothesize that CEOs in order to meet the institutional pressures (i.e., to accomplish the strategic needs of legitimacy and efficiency via good corporate governance practices) that are inherent in the compensation setting process are likely to conceal crucial information about stock prices up to a tipping point, where it will have to be released and, ultimately causing their firms’ stock price to crash. Accordingly, our first hypothesis is as follow:

**Hypothesis 1:** *CEO power has a positive relationship with stock price crash risk of firms.*

***2.2. Mitigating effect of female critical mass within corporate boards on crash risk***

Theoretically, CMT (Konrad et al., 2008; Kramer et al., 2006) elucidates whether or not female presence matters in organizations. Recently, the debate on the significance of female presence in top management has gained intense attention in both developed and developing economies (Adams & Ferreira, 2009; Bugeja, Matolcsy, & Spiropoulos, 2016; Cumming, Leung, & Rui, 2015; Gul et al., 2011; Gull, Nekhili, Nagati, & Chtioui, 2018; Gyapong, Monem, & Hu, 2015; McGuinness, Lam, & Vieito, 2015; Nekhili, Nagati, Chtioui, & Nekhili, 2017; Post & Byron, 2015; Zalata et al., 2019a, b). CMT theory was integrated into management field due to: (i) the deteriorating governance practices; (ii) corporate scandals (e.g., Enron and WorldCom); (iii) inattentive corporate boards with excessive focus on short-term profits driven by the need to meet the terms of a generous CEO compensation package (Konrad et al., 2008). Contrary to previous focus on hiring more competent directors or increasing percentage of outside directors, Konrad et al. (2008) employed CMT and discussed the impact of a minority on group policymaking, as well as tokenism. From a governance perspective, it is suggested that female directors are more inclined to ask tougher questions and put stronger arguments forward against excessive compensation structure of CEOs and other top executives than male directors. Specifically, female’s behavioural and interaction qualities differ from those of men and are beneficial to the organizations in numerous ways. According to CMT (Kramer et al., 2006), a critical mass of three or more females on boards or important committees can enhance the internal corporate governance practices, and act as a controlling lever on other members and top management team members.

Meanwhile, research on corporate boards provides mixed evidence (Arun, Almahrog, & Aribi, 2015; Gull et al., 2018; Gyapong et al., 2015, 2019; McGuinness et al., 2015; Nekhili et al., 2017; Post & Byron, 2015) on how gender diversity or female presence within boardrooms can affect the firm’s governance structures and financial/non-financial outcomes. For instance, Adams and Ferreira (2009) found that female-driven boards are more effective in monitoring managers, and on average, such intense managerial monitoring cannot only improve governance structures, but also equally negatively affect the firm’s financial performance. Further, a higher percentage of females on boards can result in enhanced strategic control (Nielsen and Huse, 2010); improve governance standards (Gul et al., 2011; Adams and Funk, 2012). Recently, Liu, Wei, and Xie (2014) highlighted that in the context of female directors, “one is a token, two is a presence, and three is a voice.” Cumming et al. (2015) articulated that female directors are more effective in reducing the occurrence and severity of fraud and are important levers in averting the negative financial consequence. Thus, these studies reveal that the presence of gender diversity at the management level may have a significant effect on corporate-level decisions.

In particular, these studies depict that evidence subsists on the significance of female director critical mass on board (Adams & Funk, 2012; Cumming et al., 2015; Gul et al., 2011; Gull et al., 2018; Liu et al., 2014) in the determination of CEO compensation and different financial outcomes for firms. However, the existing literature is silent on how female presence on corporate boards (who design optimal contracts for top management, while linking CEO’s compensation to financial outcomes) can curb the tendency of powerful CEOs to drive their firms’ stock prices to crash. Noticeably, the examination of how the dark or negative side of powerful CEOs can be curtailed may enhance current understanding of governance and power dynamics. Accordingly, this study integrates critical mass and managerial power perspectives and proposes a moderating effect of female directors’ critical mass on the power of CEOs to increase crash risk. MPT (Bebchuk & Fried, 2004; Bebchuk et al., 2002) explains the information asymmetry problem from the perspective of the CEO’s power in the compensation-setting process. These powerful CEOs regularly attempt to inflate their compensation packages, and as a result, wide dissimilarity exists in the compensation of the CEO and other top members. Scholars (Brick, Palmon, & Wald, 2006; Core, Holthausen, & Larcker 1999) have suggested that corporate boards can act as a controlling lever to modify the CEO power over the pay-setting process.

In the unique Chinese context, the drive to promote gender diversity on corporate boards has increased since the promulgation of new institutional reforms and governance instructions by CSRC (Conyon & He, 2011, 2012). Therefore, in institutionally driven Chinese context, we extend previous literature (Adams & Ferreira, 2009; Arun et al., 2015; Bugeja et al., 2016; Cumming et al., 2015; Gull et al., 2018; Gyapong et al., 2015, 2019; Liu et al., 2014), and conjecture that if a critical mass of three or more female directors is accomplished on corporate boards, it can: (i) act as a controlling agent to efficiently monitor CEOs; and (ii) modify the positive relationship between powerful CEOs and crash risk. In other words, it can diminish the power of the CEOs because such female directors’ critical mass within boards may raise legitimate questions about the compensation level of CEOs (beyond the optimal level). Consequently, this can inhibit the disparity in the compensation slice of CEOs in comparison to other executives. Accordingly, our next hypotheses is as follows:

**Hypothesis 2:***A female director critical mass of three or more on corporate boards mitigates the negative effect of CEO power on stock price crash risk*.

***2.3. Mitigating effect of ownership structure on crash risk***

According to agency perspective (Jensen & Meckling, 1976), agency conflict occurs between executives and shareholders, when the former exploits the agency relationship in their favour by extracting shareholder’s wealth for self-interests. Contrarily, MPT (Bebchuk & Fried, 2004) elucidates that CEOs involvement in the compensation setting process give them undue power over others. Such excessive power should be controlled in order to avoid negative consequences of leadership. In this context, MPT argues that the ownership structure of the organization can support or restrain the power of CEOs (Van Essen, Otten, & Carberry, 2015). In particular, ownership concentration and institutional investors are vital in curbing the dark side of CEO power (Bebchuk et al., 2002).

Prior studies (Bebchuk & Fried, 2004; Shleifer & Vishny, 1997) indicate that concentrated owners have the means and inducements to monitor the top management efficiently. Such owners have high stakes in public corporations and therefore, keen to improve their firms’ financial position. They exercise both formal (nomination and voting of executives) and informal (interactions with top management) influence to secure their financial interests. On the other hand, the dispersed owners (who possesses a small portion of ownership) find it difficult to check the executives due to huge monitoring costs involved. Such dispersed shareholders (a) have dissimilar strategies and desires for their firms’ future (Thomsen & Pedersen, 2000), and (b) dispose off their shares in case of disagreements with top management or financial losses (Heugens & Lander, 2009). Evidently (Core et al., 1999; Khan, Dharwadkar, & Brandes, 2005), ownership concentration of top five percentage negatively affects executive compensation.

MPT (Bebchuk & Fried, 2004; Bebchuk et al., 2002) further argues that the owner’s identity is also important in constraining or facilitating CEO power in the pay-setting process. Specifically, the role of institutional investors has radically increased over the past decades (Hartzell & Starks, 2003; Van Essen et al., 2015). Such institutional investors are in a position to monitor the management besides influencing other investors in order to enhance their financial positions. Previously, Hartzell and Starks (2003) similarly found that institutional ownership leads to a decline in the level of executive compensation and high level of institutional investors leads to a reduction in the power of managers to extract rent via compensation. The presence of institutional ownership can also result in decreased information asymmetry and increased disclosure of crucial information (Boone & White, 2015). Thus, the institutional ownership can also provide better monitoring mechanism on management and hence, can curtail the power of CEOs. Preceding empirical studies have mainly focused on institutional ownership or investment as the antecedent of crash risk (An & Zhang, 2013; Boone & White, 2015; Callen & Fang, 2013) and have paid lesser attention to ownership concentration and foreign ownership (Boubaker, Mansali, & Rjiba, 2014; Gul et al., 2010). On the contrary, some studies depict that ownership structure, and more specifically, CEO stock ownership and institutional ownership are linked mostly to CEO compensation (David, Kochhar, & Levitas, 1998; Hambrick & Finkelstein, 1995; Khan et al., 2005; Musteen, Datta, & Herrmann, 2009). However, the moderating role of varying ownership structure on the determination of CEO power and crash risk is still non-existent in the literature.

Filling this gap, we follow MPT and argue that different investors (concentrated, institutional and foreign) can: (a) strive to safeguard their material interests (due to high level of ownership stakes); (b) actively monitor top management; and (c) curtail the negative side of CEOs’ power, which can lead to crash risk and affect the wealth of investors. We further argue that such monitoring may not only reduce their inclination towards self-interests in compensation packages, but also may change their information hoarding behaviour, and consequently may help their firms’ stock prices from crashing. In addition, we conjecture that the presence of foreign owners can also mitigate CEO power and can avoid the risk of a stock price crash. We test our hypotheses in the unique Chinese context. Evidently (Gul et al., 2010), in China, the ownership structure is quite different from developed and other developing markets (i.e., highly concentrated ownership, a huge number of institutional investors and increasing foreign ownership) (since opening to the foreign markets). This peculiar ownership structure can be influential in mitigating the negative side of powerful CEOs, and thereby help in avoiding the negative financial outcomes. Consequently, we posit our last set of hypotheses are as follows.

**Hypothesis 3a:** *Ownership concentration mitigates the negative effect of CEO power on crash risk*.

**Hypothesis 3b:** *High percentage of institutional ownership mitigates the negative effect of CEO power on crash risk*.

**Hypothesis 3c:** *The presence of foreign ownership mitigates the negative effect of CEO power on crash risk*.

1. **Research design**

***3.1. Sample and data collection***

Our sample comprises A-Share Chinese firms listed in Shanghai and Shenzhen stock exchanges over the period 2005-2015. We focus on this time period because the inclusion of females in boardrooms and important committees started in the first half of the 21st century (Conyon & He, 2011, 2012; CSRC, 2005). In addition, the data on institutional ownership is available from 2003 onwards. Therefore, we selected the year 2005 as our initial year to be able to compile maximum observations of all variables. We collected data on financial and governance variables from China Stock Market and Accounting Research (CSMAR) database and used the Wind Financial Database (WIND) for data on concentrated ownership, institutional ownership and qualified foreign institutional investors (QFII). Prior studies (Xu et al., 2014; Zhang et al., 2016) from China have used these databases due to their reliability and authenticity of the data. Accordingly, we collected data for our main dependent variable (i.e., stock price crash risk) (weekly stock return) from 2006 to 2015 (at time *t*) and for the rest of the variables (e.g., CEO power, female director critical mass and ownership structure, amongst others) (see the Appendix for definition of all variables used in this study) from 2005 to 2014 (at time *t-1*) for the different industries, while following previous studies (Kim et al., 2011; Xu et al., 2014; Zhang et al., 2016). Following previous studies (Kim et al., 2011; Xu et al., 2014; Zhang et al., 2016), (a) we excluded firms with less than 30 weeks of stock return data and financial firms; (b) we used one year ahead data for weekly stock return to develop future crash risk variable; and (c) we excluded firms with missing observations. Finally, we arrived at a final sample of 13,421 firm year’s observations.

***3.2. Econometric model and variables description***

We employ the following panel-regression models to empirically investigate the suggested hypotheses, while including industry and year fixed-effects. The first model determines the impact of CEO power on crash risk in the presence of the control variables. The first model is as follows:

(1)

The second model determines the impact of CEO power on crash risk in the presence of the moderators (interaction terms) and control variables. The second model is as follows:

(2)

***3.2.1. Dependent variable: Stock price crash risk***

To measure crash risk, we employed two proxies (*NCSKEW, DUVOL*) following previous studies (Kim et al., 2011; Xu et al., 2014; Zhang et al., 2016). For our main proxy of crash risk (*NCSKEW*), we initially measured crash risk by estimating firm-specific weekly returns, indicated by “*W,”* as the natural logarithm of one plus the residual from the expanded market model for each firm and year which is given in the following regression.

(3)

While, “*Ri,t*” indicates the return of stock “*i”* in a week “*t*” and “*Rm,t*” denotes the value-weighted *A*-shares market return (aggregate weekly market returns from *CSMAR*) on week “*t*.” Subsequently, firm-specific weekly returns for the firm “*i*” in a week “*t*” is given by *Wi,t = ln (1+ )*, whereas is the residual from Eq. (3). The main measure of crash risk is the “negative coefficient of skewness”, (*NCSKEW)*, calculated by taking the negative of the third moment of firm-specific weekly returns for each sample year and dividing it by the standard deviation of firm-specific weekly returns raised to the third power (Kim et al., 2011; Xu et al., 2014). Particularly, in the second step, we calculate the *NCSKEW* (crash risk) for each firm ‘*i*’ in year ‘*t*’ as:

(4)

A higher value for *NCSKEW* depicts that a stock is more likely to crash (i.e., “crash-prone” and vice versa).

In addition, we used Eq. (5) to measure the second proxy of crash risk (i.e., down-to-up volatility) (*DUVOL*) for robustness check. The Eq. (5) is as follow:

(5)

In Eq. (5), nu and nd depict the number of up and down weeks. In particular, we followed previous studies (Kim et al., 2011; Xu et al., 2014) as follows. For firm ‘*i*’ in year *‘t,*’ we partitioned all the weeks with firm-specific weekly returns below the annual mean (i.e., down weeks) from those with firm-specific returns above the annual mean (i.e., up weeks). Then, we computed the standard deviation for each of these subsets independently. Finally, we measured the *DUVOL* as the “log of the ratio of the standard deviation of the down weeks to that of the standard deviation of the up weeks” (i.e., down to up volatility). An increase in *DUVOL* depicts that a stock is more likely to crash (i.e., “crash-prone” and vice versa).

* + 1. ***Independent variable: CEO pay slice***

Prior research has used numerous measures for CEO power (e.g., CEO duality, and CEO tenure) (Adams et al., 2005; Hill & Phan, 1991), but the major problem with these measures is the lack of objectivity (as discussed in Bebchuk, Cremers, & Peyer, 2011; Finkelstein, 1992). In relevance to MPT, we followed Bebchuk et al. (2011) and employed the most frequently used measure of CEO power (i.e., CEO pay slice as also used in Choe et al., 2014) (*CPS*), which measures “the ratio of CEO total compensation to the combined total compensation of the top five executives (including CEO) in a firm”. For robustness check, we used previously employed (Adams et al., 2005; Hill & Phan, 1991) CEO tenure, which is measured, as “the number of years CEO holds the office in a firm to the base year”.

***3.3.3. Moderating variables***

***(a) Female directors’ critical mass within board:*** CMT (Konrad et al., 2008; Kramer et al., 2006) suggests that a critical mass is achieved if there are three or more female directors on a board or other important committees. Similarly, Liu et al. (2014) highlight the phenomenon of female directors’ critical mass by saying that “one is a token, two is a presence, and three is a voice” in the organization’s important committees. Accordingly, we use multiple proxies to determine female directors’ critical mass in boards and compensation committees of Chinese listed firms. For instance, whether there is at least one, two, three or more female members on a board (see the Appendix for details).

***(b) Ownership structure:*** To measure different variables of ownership structure, we followed the previous studies on ownership concentration, institutional and foreign ownership (e.g., An & Zhang, 2013; Boone & White, 2015; Boubaker et al., 2014; Callen & Fang, 2013; Gul et al., 2010). These include, (a) concentrated ownership: measured by ‘Herfindahl Indices’ (i.e., sum of squares of shareholding percentage of top five/ten shareholders) (Andreou et al., 2016b; Gul et al., 2010; Van Essen et al., 2015); (b) institutional ownership: measured by percentage of institutional shares to the total number of shares (Boone and White, 2015;Van Essen et al., 2015); (c) foreign ownership: dummy variable equal to ‘1’ in case of presence of foreign ownership and ‘0’ otherwise and QFII (i.e., percentage of qualified foreign institutional shares in the firm) (Douma, George, & Kabir, 2006; McGuinness, Vieito, & Wang, 2017).

***3.3.4. Control variables***

Lastly, similar to preceding studies on crash risk (Callen & Fang, 2013; Gul et al., 2010; Kim et al., 2011; Xu et al., 2014) and CEO power (Adams et al., 2005; Bebchuk et al., 2011; Liu & Jiraporn, 2010), this study includes a number of different relevant control variables, which can affect our econometric models. From CEO power perspective, we controlled for (i) “*CEO age*” equals to natural logarithm of CEOs age (Andreou et al., 2016b); (ii) “*CEO salary*” equals to natural log of total compensation of CEOs (Conyon & He, 2012; Khan et al., 2005); and (iii) “*CEO political connections*” which is a dummy variable equal to ‘1’ if a CEO is a former government official and ‘0’ otherwise (Conyon et al., 2015; Piotroski et al., 2015). In addition, we followed (Callen & Fang, 2013; Kim et al., 2011; Xu et al., 2014) and controlled for (i) lagged values of *NCSKEW/DUVOL*, (ii) *Return* as the mean of firm-specific weekly returns, (iii) *Beta* as the standard deviation of firm-specific weekly returns, (iv) return on assets (i.e., *ROA*), (v) *Leverage* measured as total liability scaled by total assets, (vi) book to market ratio calculated as ratio of total assets divided by market value of equity, (vii) *firm size* measured as natural logarithm of firm’s total assets, (viii) *ABACC* which represents absolute value of discretionary accruals, (ix) *SOE dummy* which is a dummy variable equal to ‘1’ if a firm is state-owned and ‘0’ otherwise (for subsample analysis), (x) *cross listing* which is a dummy variable equal to ‘1’ if a firm also has offshore H-share listings (cross listing) and ‘0’ otherwise, (xi) stock exchange which is a dummy variable equal to ‘1’ if a firm is listed in Shenzhen stock exchange or any of its sub-platform and ‘0’ otherwise and (xii) industry and year dummies to control the industry and year fixed-effects in our analysis. We used modified Jones model of Dechow, Sloan, and Sweeney (1995), which was also employed in previous relevant studies (Kim et al., 2011; Xu et al., 2014) to calculate *ABACC*. For brevity, we have not discussed it in detail, however, the detailed calculation is available upon request from the authors. Moreover, we have used twelve different industries (excluding financial firms) in accordance with Xu et al. (2013) and Zhang et al. (2016). For brevity, we have not reported the detailed table of the industry and year wise breakdown of the sample. The table is available upon request from the authors. The detailed description of all the employed variables and their symbols have been provided in the Appendix.

INSERT TABLE 1 ABOUT HERE

INSERT TABLE 2 ABOUT HERE

1. **Descriptive statistics and empirical results**

As our empirical analysis involves panel data, we employed panel data regression techniques (Wooldridge, 2010), while controlling for industry and fixed-effects. Table 1 provides means, standard deviations, and percentile values. Table 2 presents the correlation values. The descriptive statistics for our main outcome variable (i.e., *NCSKEW*) quitely matches to those of previous studies from China (Xu et al., 2014; Zhang et al., 2016). The CEO pay slice ratio for China is quite high (i.e., 15.70), which implies great exertion of CEO power in the organizational decision-making process. In terms of female presence on corporate boards, it is visible that 92% of the sample has at least one female director and only 20% has exactly three females in the board of directors. In addition, we have sub-divided the descriptives for our main proxy of female critical mass (i.e., the female critical mass) (i.e., Female\_criticalmasst-1) into the (a) overall sample; (b) first sub-sample (from 2005-2009); and (c) second sub-sample (from 2010-2015)[[1]](#footnote-1). It is apparent that at least three female directors are present in 53 percent of firm-year cases. These statistics clearly shows that after the opening of ChiNext market in 2009, the female critical mass has steadily increased. Moreover, institutional ownership is present in around 48%, and foreign ownership is only 5%. It represents a very low percentage of foreign ownership in Chinese firms during the studied period. The rest of the summary statistics are quite similar to those of previous literature from China (e.g., Xu et al., 2014; Zhang et al., 2016). The details about the empirical testing have been discussed as follows.

First, we report the results of our first hypothesis in Table 3. Hypothesis 1 predicts that CEO power increases crash risk. Models (1) and (2) of Table 3 presents the empirical findings of the relationship between CEO pay slice (a proxy for CEO power) and crash risk. There is a positive and significant relationship between our main predictor and outcome variables. In model (1), we used the first proxy (i.e., *NCSKEW*) for crash risk and in model (2), we employed the alternate proxy of crash risk (i.e., *DUVOL)*. The positive and significant coefficients depict that with an increase in CEO pay slice (in comparison to the other top five executives), there is an increase in the crash risk. Our results validate the first hypothesis , showing CEO power measured by CPS is positively related to both proxies (*NCSKEW/DUVOL*) of future crash risk. To control the issue of endogeneity, we employed instrumental variable technique from column (3) to column (6). We used industry average CPS as an instrumental variable which has been previously used in related studies (Bebchuk et al., 2011; Jiraporn, Liu, & Kim, 2014) and estimated two-stage least squares (*2SLS*) following Baum, Schaffer, and Stillman (2007). In the first stage (while using industry average CPS for both *NCSKEW* and *DUVOL*), we found highly significant coefficients showing the aptness of the proxy used (Baum et al., 2007). We find similar positive relationship reaffirming our main analysis that the higher ratios of CEO pay slice ultimately lead to crash risk for firms. In additon, we reported the standard threshold for numerous underidentification and weak identification tests to ensure the consistency in the two-stage regression for endogeneity control. In relevance to the benchmark of Baum et al. (2007), our *Kleibergen-Paap rk LM* statistic is high and significant. Moreover, Cragg-Donald Wald *F* statistic is greater than 10, which represents the strength of the instrument employed (Baum et al., 2007). Overall, Table 3 depicts that CEO power is strongly and positively related to an increase in the crash risk.

INSERT TABLE 3 ABOUT HERE

Second, we report the results of our second hypothesis in the Table 4. Hypothesis 2 predicts that the positive relationship between CEO power and crash risk is mitigated by the female director critical mass in corporate boards. From models (1) to (4) of the table 4, we included different proxies for different level of female directors in the board and examined their moderating impact on the CEO power and crash risk nexus. In model (1), we use dummy of at least one female member as interaction term and found no significant effect for our main effect, as well as for moderation. Although, the coefficient between CEO power and crash risk is positive, it is insignificant, while accounting for a number of control variables included. This finding depicts that in Chinese firms, when there is at least one female director on the board, they cannot exercise enough monitoring power over the top management. Further, in line with our main argument (as discussed in hypothesis 2 section), we include dummies of exactly one female director (model 2), exactly two female directors (model 3), exactly three female directors (model 4) and a female critical mass of three or more directors (model 5) in the rest of the models of Table 4. We found that when a firm has exactly three female directors on its board, there is a significant, but weak coefficient on the interaction term (at 10%). Howerver, when a female critical mass of three or more directors are present in a firm, then, the coefficient for the interaction terms become negative and significant at the 5% level. It implies that the detrimental effect of CEO power on crash risk is mitigated in the presence of a critical mass of female directors with three or more female directors within corporate boards. In other words, we found support for our second hypothesis that less than three female directors denotes either a mere presence or tokenism (Konrad et al., 2008; Kramer et al., 2006) and if a critical mass of three or more female directors is achieved, then, they can have a voice, which can yield positive outcomes for the firm.

INSERT TABLE 4 ABOUT HERE

Third, we present the empirical findings of our third set of hypotheses in Table 5. Hypothesis 3 predicts that the positive relationship between CEO power and crash risk is mitigated by the ownership concentration (Hypothesis 3a), institutional ownership (hypothesis 3b) and foreign ownership (hypothesis 3c) in the firm. From model (1) to (3) of Table 5, we included our main proxies of (i) Herfindahl-5 Index for ownership concentration, (ii) percentage of institutional ownership and (iii) dummy variable for foreign ownership. In model (1), we found a significant and negative coefficient for the interaction between CEO power and concentrated ownership (i.e., 0.006 at the 5% significance level). In model (2), we again found a significant and negative coefficient for the moderation term between CEO pay slice and institutional ownership (i.e., 0.006 at the 10% significance level). However, in the model (3), we did not find the significant results for the interaction term between CEO power and foreign ownership. These results depict that with the presence of concentrated ownership in the firm, the ability of CEO power to cause crash risk decreases and effectively guards the firm against negative financial outcomes. In short, our final results support hypotheses 3a and 3b, but we do not find significant support for hypothesis 3c. In general, these results are in line with the arguments of MPT (Bebchuk & Fried, 2004; Bebchuk et al., 2002). These findings infer that concentrated ownership and institutional ownership are vital in mitigating the negative side of powerful CEOs and their detrimental financial impact on the firm in the form of crash risk.

INSERT TABLE 5 ABOUT HERE

Further, in addition to our main analysis, we argue that CEO power is a relative compensation measure (i.e., determined by a CEO’s compensation in relevance to that of firm’s top five executives) and can have greater resonance for non state-owned firms. Although, CEOs in state-owned firms are likely to have strong political and managerial power, they tend to have very flat compensation structure across the top management compared to non state-owned companies. On the other hand, in non state-owned firms, CEOs are more likely to enjoy a high premium over other top executives. Following this argument, we have conducted additional analyses to determine how our results differ across the sub-sample of state-owned (SOEs) and non state-owned (Non-SOE) firms[[2]](#footnote-2). Panel A of Table 6 presents the results for our main regression and interaction effects, while dividing the data into SOE and non-SOE firms and controlling for all the same control variables, as previously. Our findings (Models 1 and 2) reveal that in non-SOE firms, powerful CEOs have a stronger and significant effect on the crash risk in comparison to SOE firms. This is consistent with our aforementioned arguments. In the rest of the Models in Table 6, we determine the moderating impact of: (a) female director critical mass of three or more (Models 3 and 4), (b) ownership concentration (Models 5 and 6), (c) institutional ownership (Models 7 and 8) and (d) foreign ownership (Models 9 and 10) on stock crash risk. These models depict that the presence or absence of state ownership in firms leads to different results. In particular, for SOE firms: a critical mass of three or more female directors and a higher percentage of institutional ownership are more important factors, while for non-SOE firms: concentrated ownership is more influential in mitigating the positive relationship between CEO power and crash risk.

In Panel B of Table 6, we reported the results for the interaction effect of female critical mass and institutional ownership on the relationship between CEO power and crash risk under different threshlods of state and institutional ownership. In particular, we examined these interaction effects under (a) 10-25%; (b) 25-50% and (c) greater than 50% state and institutional ownership in the firms. We found that female critical mass weakens the power of CEOs to engage in activities that can result in a crash risk when there is 10-25% state ownership in the firms. It implies that in case of more state ownership, the CEOs get more powerful due to their connections with state and managerial power and they are more likely to overwhelm the influence of minority representation on the board. Furthermore, in relevance to the results of the interaction term between CEO power and female critical mass in Table 6, it might be questioned that according to the meaning of the results in Panel B, there should be a stronger interaction effect under model 4 than that of model 3 of Panel A. To clarify, the results of Panel B are further explaining the interaction between CEO power and female critical mass under a different level of state ownership, which implies that a certain level of state ownership (i.e., 10-25%) is necessary in order to have the expected interaction effect of female critical mass. Therefore, it is not actually related to the absence or presence of state ownership, rather it pertains to different level of state ownership (as evident by our results in Table 6). Nevertheless, we found a negative coefficient for model 4 in Panel A as well (with a p-value that is near to the 10% significance level), which implies that Non-SOEs are not as efficient in utilizing the female critical mass in China during our sample period compared with SOEs. On the other hand, we found that the higher percentage (10-25%, and >50%) of institutional ownership is more effective in monitoring CEOs and weakening their power to cause crash risk due to the monitoring role of institutional investors, which is consitent with our third hypothesis (hypothesis 3b). Moreover, we included all the control variables in the sensitivity analysis with industry and year fixed-effects in both panels (Panel A and B of Table 6). We have not reported the results for brevity.

INSERT TABLE 6 ABOUT HERE

Finally, we conducted a number of sensitivity analyses in Table 7 in order to ascertain the impact of alternative proxies of our main predictors and moderating variables on crash risk. In particular, to ensure robustness of our results, we control for possible reverse causality (by using lagged variable for CEO power) in Models (1) and (2) of Table 7. We found similar significant and positive results for CEO power and two main proxies of crash risk (i.e., *NCSKEW* and *DUVOl*). Additionally, we used an alternate proxy to measure CEO power (i.e., CEO tenure) (as used in previous studies (Adams et al., 2005; Hill and Phan, 1991). We again found similar results for our hypothesis 1 (as shown in Models 3 and 4). In Models (5) and (6), we investigated CEO power and crash risk relationship for particular sub-periods. We divided the data into sub-periods as post and pre-global financial crisis periods[[3]](#footnote-3). The findings reveal that in the post-financial crisis period sub-sample, the CEO power and crash risk relationship is significant. It depicts that following the global turmoil and financial crisis, the Chinese CEOs engaged in more information hoarding behavior and led the stock market to crash. Further, we introduced another dummy variable (i.e., more than three female directors) on a board and determined how female director presence beyond critical mass change the CEO power-crash risk nexus. We found a negative coefficient for the interaction term (model 7), which shows that our second hypothesis again holds to some extent. In addition, from Models 8 to 11, we used alternative measures for ownership variables and found quite similar results in uniformity with our main analysis. In particular, the moderation effect of ownership structure (Z-index and Herfindahl\_10 index) are negative and significant at the 5% level, depicting that ownership structure mitigates the ability of powerful CEOs to cause crash risk. Moreover, we included all the control variables in the sensitivity analysis with industry and year fixed-effects. We have not reported the results for brevity. Our overall findings are consistent with our main regression analysis.

INSERT TABLE 7 ABOUT HERE

1. **Discussion**

Recently, research on the dark or negative side of powerful CEOs has gained momentum in accounting and finance research. Yet, existing research on how the decisions and behaviour of such powerful CEOs can lead to negative financial consequences has been largely ignored. Developing an essential bridge within accounting and finance research, this study conjectures that female director critical mass and ownership structure can be vital levers in mitigating the negative implications of powerful CEOs on their firms’ future crash risk. Our empirical results indicate that the negative side of powerful CEOs in causing firms’ stock prices to crash is mitigated when: (a) a female director critical mass of three or more is achieved within corporate boards; and (b) ownership concentration and institutional ownership are apparent in firms (see Tables 4 to 6).

First, as Table 3 shows, powerful CEOs (as involved in the pay-setting process) may enhance the agency problem by compromising on the firm’s financial resources in order to inflate their own compensatory packages. Our main analysis depicts that CEO power increases the information hoarding behaviour of the CEOs, who in order to meet the institutional pressures tend not to reveal negative information that they may have to the market in a timely manner. However, when they suddenly release the crucial information often after hoarding it for a long time, it results in stock price crash risk. This finding supports the arguments underlying neo-institutional (Scott, 2001; Haque & Ntim, 2020) and managerial power (Bebchuk & Fried, 2004; Bebchuk et al., 2002; Elmagrhi et al., 2019) theoretical perspectives. In addition, Al-Mamun et al. (2017) also found similar findings, while examining US-listed firms and employing an alternative theoretical approach to CEO power and the crash risk nexus.

Second, as Table 4 depicts, there is evidence to suggest that female director critical mass of three is crucial in mitigating the above mentioned negative side of CEO power. Our results show further that female presence on boards does not make substantial effect unless a critical mass of three is accomplished. One reason is that a female director critical mass of three or more can ensure that their voices are heard, and they can vote against the wrong or corrupt decisions of their CEOs, and thus inhibiting their power and mitigating the negative consequences of such misuse of power. At the same time, when the female critical mass of three or more directors is attained, the board and committee members may be more motivated to raise their voices against information concealing practices of CEOs, which may result in crucial information being disseminated in a pragmatic manner. Consequently, it may avoid the crash risk and thus minimize any adverse financial outcome. These findings are in congruence with the arguments of CMT (Konrad et al., 2008; Kramer et al., 2006), which indicates that female critical mass of three or more directors within boards or key committees are important catalyst in enhancing corporate governance practices, controlling top management’s misuse of power, and thereby positively affecting their firms’ financial position. Our results are also in line with other studies, who have examined the positive impact of female director critical mass within boards (Cumming et al., 2015; Gul et al., 2011; Liu et al., 2014) in the determination of other financial consequences of the firm.

Third, our findings are consistent with the arguments of MPT (Bebchuk & Fried, 2004; Bebchuk et al., 2002) on the importance of ownership structure for effective monitoring of top executives and for devising a mechanism to curtail the negative side of powerful CEOs. Our empirical evidence (see Table 5) suggests that concentrated ownership and institutional ownership signifies huge ownership stakes of owners in firms, who strive to enhance corporate financial performance. In this drive, they are motivated to keep a check on the CEO and top management via both formal (nomination and voting) and informal (interactions with management) channels in order to influence the decision-making process. These block and institutional investors efficiently monitor the top executives’ compensation and decisions during the compensation-setting process. Further, they are more interested in pertinent information about stocks or the future of the firm’s financial position due to their huge investment in the firm’s stocks. Thus, driven by the financial stakes, they tend to demand to be made aware of positive or negative information about firm’s financial stability and curb the information hoarding behaviour of CEOs and consequently, mitigating the negative financial outcome (i.e., crash risk). In sum, our findings suggest that ownership concentration and institutional ownership can act as a catalyst in mitigating the detrimental effects of CEO power on crash risk. Our findings are in line with those of previous studies, which suggest that concentrated ownership (Boubaker et al., 2014; Core et al., 1999; Gul et al., 2010; Khan et al., 2005) and institutional ownership (An & Zhang, 2013; Boone & White, 2015; Callen & Fang, 2013) have the capacity to check the excessive powers of corporate executives, such as CEOs.

1. **Conclusion**

The negative side of CEO power has gained increasing attention in accounting and finance research. Researchers are attempting to comprehend how CEOs engage in corporate malpractices or frauds and how to mitigate their resulting adverse effects. In particular, in China, the role of governance is very crucial. In addition, due to the nascent stage of corporate governance research, the negative effect of powerful CEOs on their firms’ financial outlook and how to mitigate it can shed valuable new insights. Accordingly, in this study, we have attempted to contribute to the accounting, governance and finance literature by examining the impact of CEO power on stock price crash risk. We have further investigated how this relationship can be moderated by female directors’ critical mass within corporate boards and distinct ownership structures. Our empirical analysis controls for potential endogeneity problems, as well as largely robust to different types of sensitivity analyses.

***6.1. Theoretical contributions***

Our study theoretically contributes to the literature in several ways. First, despite demands (Barkema & Gomez-Mejia, 1998; Chen et al., 2011; Zehnder et al., 2017) to assimilate different theoretical perspectives, previous research is silent on the examination of CEO power–crash risk nexus from an integrative approach. In this case, we have responded to the call of Zehnder et al. (2017) by drawing insights from neo-institutional, critical mass and managerial power theories. To the best of our knowledge, this is the first attempt to investigate how the behaviour and decisions of powerful CEOs can lead to crash risk within the institutionally driven context of China. Specifically and instead of relying on previously widely used agency perspective (Jensen & Meckling, 1976), this study contributes to existing literature by drawing on arguments of neo-institutional (Scott, 2001) and managerial power (Bebchuk & Fried, 2004; Bebchuk et al., 2002) theories to investigate the potential negative side of CEO power on stock price crash risk.

Second, mitigating the negative repercussions of powerful CEOs is an important strategic agenda for accounting, finance and governance scholars. Accordingly, we contribute to the extant literature by integrating critical mass (Konrad et al., 2008; Kramer et al., 2006) and managerial power (Bebchuk et al., 2002) theoretical approaches in examining the mitigating effects of the critical mass of three or more female directors within corporate boards. To the best of our knowledge, such moderating impact of female directors’ critical mass on CEO power and crash risk nexus is missing from the prior literature. Our empirical findings suggest that female participation within boards can act as a crucial tool in curtailing the misuse of the CEO’s power. In addition, our findings suggest that female directors are more compassionate and ethical who strive to follow the code of good corporate governance and inhibit the misuse of power. Previously, limited evidence exists relating to the extent to which we understand the role of board gender in such scenarios (Brick et al., 2006; Dezsö & Ross, 2012; Lam, McGuinness, & Vieito, 2013). Thus, our integrative approach arguably sheds new insights on how the power of CEOs can be mitigated and thereby minimizing their negative effects on the stock price.

Third, this study provides evidence on the moderating role of ownership concentration and institutional ownership on the CEO power–crash risk relationship. Our theoretical arguments are drawn from the MPT (Bebchuk & Fried, 2004; Bebchuk et al., 2002). Observably, concentrated owners have more financial stakes in firms, and therefore, are able to challenge the decisions of the top managers in order to safeguard their financial interests. In doing so, they serve as a lever and restrain powerful CEOs from engaging in corporate malpractices and misusing the power-held by influential decision-makers. Our empirical findings further extend those of previous studies (An & Zhang, 2013; Boone & White, 2015; Boubaker et al., 2014; Gul et al., 2010) by offering the moderating effect of ownership structure on the positive relationship between CEO power and crash risk instead of previously widely examined firm’s financial performance.

Fourth, this study presents theoretical and empirical findings from the world’s fastest-growing economy (i.e., China). Overall, our study has been conducted in the institutional context, where CEOs are very influential; compensation and ownership structure are unique, and female’s participation within corporate boards is improving since the middle of the last decade (Conyon & He, 2011; Gul et al., 2010; Xu et al., 2014). The theoretical integration proposed in this study is pertinent in the reformed institutional context of China, and it will offer a new understanding of the institutionally driven Chinese listed firms. To the best of our knowledge, we are the first one to offer such integrative theoretical insights from China, and our findings suggest different ways to control and mitigate the adverse impact of CEO power on crash risk in the often volatile, but highly vibrant Chinese capital market.

* 1. ***Policy recommendations***

In addition to theoretical contributions, our study also offers some policy recommendations. The globalized world has witnessed the role of female directors as a substantial factor in bringing new ideas and dimension to organizational growth. Our results depict that female director representation in the decision making positions, such as in the corporate boards, compensation committee, and at CEO level moderates the positive relationship between CEO power and crash risk in favor of the firm. Previously, the participation of female directors in Chinese firms is not that significant in comparison to their male counterparts (Conyon & He, 2011; 2012). Driven by previous literature (Adams & Ferreira, 2009; Gul et al., 2011; Konard et al., 2008; Kramer et al., 2006, etc.) and the empirical findings of our study, we suggest that organizations should encourage the female director representation on the key positions of the firm. Consequently, they may help: a) improve the corporate governance mechanism, b) bring more experience and new insights to the board, c) improve firm legitimacy practices, and d) more effectively monitor the top management by questioning their excessive compensation packages and misuse of power. In addition, firms should have at least three female directors within their corporate boards, as they may help eliminate the label of tokenism to voices (whistleblowing), as well as can help increase the implementation of better governance practices.

Moreover, our study depicts that institutional ownership and ownership concentration also helps in modifying the relationship between CEO power and crash risk. Consequently, we recommend that firms should encourage block and institutional ownership for a number of reasons. First, firms should pay close attention to the concentrated ownership as these owners have more stakes in the firms and are mainly interested in positive financial outcomes. Therefore, they strive to effectively monitor the CEOs and can force them to make value-enhancing decisions not only for themselves, but also for the organization. Second, although institutional investors often hold a small fraction of shares in the Chinese listed firms (Gul et al., 2010), yet they have to efficiently perform their duties in order to increase their clients return. Consequently, they attempt to improve corporate governance by actively monitoring the top management and will be more able to constrain CEO power than individual investors.

* 1. ***Limitations and future research***

This study is subject to certain limitations that offer interesting research avenues for future research. This study employs widely used a proxy for CEO power (i.e., CEO pay slice) (Bebchuk et al., 2011; Choe et al., 2014), which is comprised of the total cash compensation (including salaries, bonuses, and commissions) in ratio to the total compensation of top five executives. Besides the cash compensation, CEOs are also offered other forms of compensation (e.g., equity, stocks, and options), which tends to tie the interest of CEOs in firms over a longer period of time. However, within the Chinese context, the data on these forms of compensation is difficult to acquire (Conyon & He, 2011; 2012). Future research on the effect of CEO power on financial outcomes in the presence of the CEO’s equity ownership and stock options, amongst others, can shed new insights within the literature. Furthermore, future research can examine the personal traits and biological features (e.g., ethnicity, gender and appearance) of powerful CEOs, and how these factors can be influential in the determination of CEO power and their aftermath on corporate outcomes.

In conclusion, this study provides new insights on how to mitigate the negative repercussions of powerful CEOs on crash risk in Chinese listed firms. Our findings may stimulate future research to further investigate the conditions under which firms can benefit from female director participation within corporate boards, related committees and at leadership positions besides varying ownership structure.

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**Table 1**

Descriptive statistics

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Variables | N | MEAN | SD | P5 | P50 | P95 |
| *Dependent Variables:-* |  |  |  |  |  |  |
| Ncskewt | 13421 | -0.19 | 0.95 | -1.76 | -0.18 | 1.31 |
| Duvolt | 13421 | -0.14 | 0.39 | -0.70 | -0.07 | 0.59 |
| *Independent Variables:-* |  |  |  |  |  |  |
| CPSt-1 | 13421 | 15.70 | 7.46 | 6.43 | 14.29 | 29.13 |
| CEO\_tenure t-1 | 13366 | 32.95 | 27.93 | 3 | 25 | 91 |
| *Interaction Variables:-* |  |  |  |  |  |  |
| FD\_At least one t-1 | 13421 | 0.92 | 0.27 | 0 | 1 | 1 |
| FD\_onet-1 | 13421 | 0.17 | 0.38 | 0 | 0 | 1 |
| FD\_two t-1 | 13421 | 0.22 | 0.41 | 0 | 0 | 1 |
| FD\_three t-1 | 13421 | 0.20 | 0.40 | 0 | 0 | 1 |
| Female\_criticalmass t-1: |  |  |  |  |  |  |
| 1. For Overall Sample | 13421 | 0.53 | 0.50 | 0 | 1 | 1 |
| 1. For Sub-sample (from 2005-2009) | 5788 | 0.47 | 0.50 | 0 | 0 | 1 |
| 1. For Sub-sample (from 2010-2015) | 7633 | 0.58 | 0.49 | 0 | 1 | 1 |
| Highfemale\_criticalmass t-1 | 13421 | 0.33 | 0.47 | 0 | 0 | 1 |
| Z-Index t-1 | 13420 | 15.41 | 34.02 | 1.10 | 4.78 | 61.35 |
| Herfindahl\_5\_I t-1 | 13421 | 0.17 | 0.12 | 0.03 | 0.14 | 0.41 |
| Herfindahl\_10\_I t-1 | 13421 | 0.17 | 0.12 | 0.03 | 0.14 | 0.41 |
| Institution\_%age t-1 | 13421 | 35.10 | 23.86 | 1.25 | 33.44 | 75.93 |
| Institutional\_d t-1 | 13421 | 0.48 | 0.50 | 0 | 0 | 1 |
| Foreign\_d t-1 | 13421 | 0.05 | 0.21 | 0 | 0 | 1 |
| QFII t-1 | 1284 | 1.98 | 2.29 | 0.21 | 1.26 | 6.31 |
| *Control Variables:-* |  |  |  |  |  |  |
| Ceo\_age t-1 | 13414 | 47.92 | 6.26 | 38 | 48 | 58 |
| Ceo\_salary t-1 | 13421 | 546000 | 587000 | 96000 | 400000 | 1430000 |
| Ceo\_govtconn t-1 | 13421 | 0.30 | 0.46 | 0 | 0 | 1 |
| Returnt-1 | 13421 | 0.55 | 1.45 | -1.43 | 0.43 | 2.79 |
| Beta t-1 | 13421 | 0.07 | 0.05 | 0.04 | 0.06 | 0.11 |
| ROA t-1 | 13421 | 0.05 | 0.20 | -0.03 | 0.05 | 0.13 |
| Leverage t-1 | 13421 | 0.48 | 0.60 | 0.11 | 0.47 | 0.81 |
| Book\_T\_Market t-1 | 13421 | 0.98 | 0.93 | 0.20 | 0.69 | 2.75 |
| Firm\_size t-1 | 13421 | 21.79 | 1.26 | 20.12 | 21.65 | 24.11 |
| ABACC t-1 | 13421 | 0.08 | 0.34 | 0.01 | 0.05 | 0.21 |
| SOE dummyt-1 | 13421 | 0.50 | 0.50 | 0 | 0 | 1 |
| Cross listing t-1 | 13399 | 0.03 | 0.16 | 0 | 0 | 1 |
| Stock exchange t-1 | 13421 | 0.54 | 0.50 | 0 | 1 | 1 |

Note: See “the Appendix” for the detailed description of the variables.

**Table 2**

Correlation table

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S.No | Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 1 | Ncskewt | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | Duvolt | 0.92\* | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3 | CPSt-1 | 0.01 | 0.01 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4 | CEO\_tenure t-1 | -0.02 | -0.02\* | 0.03\* | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 | FD\_At least one t-1 | -0.01 | -0.01 | 0.01 | 0.04\* | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | FD\_onet-1 | -0.01 | 0.01 | -0.02\* | -0.04\* | 0.13\* | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7 | FD\_two t-1 | 0.01 | 0.01 | 0.04\* | -0.01 | 0.15\* | -0.24\* | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8 | FD\_three t-1 | -0.01 | -0.01 | 0.02\* | 0.03\* | 0.14\* | -0.23\* | -0.26\* | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 9 | Female\_criticalmass t-1 | -0.01 | -0.01 | -0.01 | 0.06\* | 0.31\* | -0.49\* | -0.57\* | 0.47\* | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 10 | Foreign\_d t-1 | 0.02\* | 0.02\* | 0.07\* | -0.03\* | 0.01 | 0.01 | -0.01 | 0.01 | 0.01 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 11 | Institution\_%age t-1 | 0.04\* | 0.05\* | -0.05\* | 0.12\* | -0.01 | -0.03\* | 0.01 | -0.01 | 0.01 | -0.05\* | 1 |  |  |  |  |  |  |  |  |  |  |  |  |
| 12 | Z-Index t-1 | -0.05\* | -0.04\* | 0.01 | -0.03\* | -0.04\* | 0.02 | -0.01 | 0.01 | -0.02\* | -0.07\* | 0.02\* | 1 |  |  |  |  |  |  |  |  |  |  |  |
| 13 | Herfindahl\_5\_I t-1 | -0.02\* | -0.01 | -0.03\* | -0.04\* | -0.06\* | 0.02\* | 0.01 | 0.01 | -0.05\* | 0.04\* | 0.28\* | 0.35\* | 1 |  |  |  |  |  |  |  |  |  |  |
| 14 | Ceo\_age t-1 | -0.01 | 0.01 | 0.04\* | 0.22\* | 0.01 | 0.02\* | -0.01 | -0.01 | -0.01 | 0.01 | 0.11\* | 0.01 | 0.03\* | 1 |  |  |  |  |  |  |  |  |  |
| 15 | Ceo\_salary t-1 | 0.01 | 0.02 | 0.20\* | 0.18\* | 0.03\* | -0.04\* | 0.01 | 0.01 | 0.04\* | 0.05\* | 0.24\* | -0.04\* | 0.02\* | 0.12\* | 1 |  |  |  |  |  |  |  |  |
| 16 | Ceo\_govtconn t-1 | 0.02\* | 0.02\* | 0.05\* | -0.06\* | -0.01 | 0.03\* | -0.01 | -0.01 | -0.02\* | 0.05\* | -0.19\* | -0.03\* | -0.03\* | -0.01 | -0.07\* | 1 |  |  |  |  |  |  |  |
| 17 | Returnt-1 | 0.07\* | 0.04\* | 0.03\* | -0.02 | -0.01 | 0.03\* | -0.01 | -0.02\* | -0.02\* | -0.01 | -0.04\* | -0.01 | -0.01 | -0.06\* | -0.05\* | 0.27\* | 1 |  |  |  |  |  |  |
| 18 | Beta t-1 | -0.01 | -0.02 | 0.06\* | -0.13\* | -0.01 | 0.04\* | -0.01 | -0.01 | -0.03\* | 0.01 | -0.13\* | 0.02\* | 0.01 | -0.08\* | -0.08\* | -0.08\* | 0.55\* | 1 |  |  |  |  |  |
| 19 | ROA t-1 | 0.03\* | 0.03\* | -0.01 | 0.01 | 0.01 | 0.01 | -0.01 | -0.02\* | -0.01 | 0.01 | 0.06\* | -0.01 | 0.04\* | 0.01 | 0.05\* | 0.02\* | 0.04\* | -0.01 | 1 |  |  |  |  |
| 20 | Leverage t-1 | -0.02\* | -0.02\* | 0.01 | -0.05\* | -0.01 | -0.01 | 0.01 | -0.01 | -0.01 | -0.03\* | 0.01 | 0.02\* | -0.03\* | -0.01 | 0.01 | -0.02\* | 0.01 | 0.02\* | -0.27\* | 1 |  |  |  |
| 21 | Book\_T\_Market t-1 | -0.12\* | -0.10\* | -0.11\* | 0.02\* | -0.05\* | 0.03\* | 0.01 | -0.03\* | -0.06\* | -0.05\* | 0.07\* | 0.13\* | 0.10\* | 0.05\* | 0.11\* | -0.08\* | -0.25\* | -0.10\* | -0.05\* | 0.16\* | 1 |  |  |
| 22 | Firm\_size t-1 | -0.01 | 0.01 | -0.20\* | 0.09\* | -0.07\* | 0.04\* | 0.01 | -0.03\* | -0.07\* | -0.02\* | 0.39\* | 0.11\* | 0.30\* | 0.13\* | 0.37\* | -0.07\* | -0.07\* | -0.12\* | 0.05\* | 0.04\* | 0.57\* | 1 |  |
| 23 | ABACC t-1 | 0.01 | 0.01 | 0.01 | -0.04\* | 0.02 | -0.01 | -0.01 | -0.01 | 0.02\* | 0.01 | -0.02\* | -0.01 | 0.01 | -0.01 | -0.01 | -0.01 | 0.05\* | 0.07\* | -0.01 | 0.03\* | -0.01 | -0.01 | 1 |

Note: This table presents the Pearson correlation for all the main variables of the study at full sample. \* denotes significance at 0.05 level. See “the Appendix” for the detailed description of the variables.

**Table 3** Regression results and endogeneity check for the impact of CEO power on crash risk

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Dependent Variable: Stock Price Crash Risk (Ncskewt) | | | | | |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
| Variables | Ncskewt | Duvolt | Ncskewt | | Duvolt | |
|  |  |  | 2SLS-  1st Stage | 2SLS-  2nd Stage | 2SLS-  1st Stage | 2SLS-  2nd Stage |
| **CPSt-1** | **0.003\*\*** | **0.001\*\*** |  | **0.037\*\*** |  | **0.013\*\*** |
|  | **[0.027]** | **[0.016]** |  | **[0.015]** |  | **[0.037]** |
| **Ind\_Avg\_CPS t-1** |  |  | **0.543\*\*\*** |  | **0.543\*\*\*** |  |
|  |  |  | **[0.000]** |  | **[0.000]** |  |
| *Control Variables:-* |  |  |  |  |  |  |
| Ceo\_age t-1 | -0.039 | -0.003 | 2.619\*\*\* | -0.121 | 2.619\*\*\* | -0.029 |
|  | [0.538] | [0.917] | [0.000] | [0.105] | [0.000] | [0.335] |
| Ceo\_salary t-1 | -0.027\*\* | -0.014\*\*\* | 4.078\*\*\* | -0.169\*\*\* | 4.079\*\*\* | -0.063\*\* |
|  | [0.026] | [0.005] | [0.000] | [0.008] | [0.000] | [0.016] |
| Ceo\_govtconn t-1 | -0.005 | -0.002 | 0.129 | -0.010 | 0.128 | -0.004 |
|  | [0.831] | [0.800] | [0.443] | [0.676] | [0.444] | [0.681] |
| Ncskew t-1 | 0.038\*\*\* |  | 0.005 | 0.041\*\*\* |  |  |
|  | [0.000] |  | [0.937] | [0.000] |  |  |
| Duvol t-1 |  | 0.028\*\*\* |  |  | -0.037 | 0.031\*\*\* |
|  |  | [0.006] |  |  | [0.839] | [0.003] |
| Return t-1 | 0.096\*\*\* | 0.039\*\*\* | 0.094 | 0.097\*\*\* | 0.078 | 0.039\*\*\* |
|  | [0.000] | [0.000] | [0.392] | [0.000] | [0.515 ] | [0.000] |
| Beta t-1 | -1.641\*\*\* | -0.635\*\*\* | 2.898 | -1.818\*\*\* | 3.125 | -0.696\*\*\* |
|  | [0.000] | [0.000] | [0.328] | [0.000] | [0.298] | [0.000] |
| ROA t-1 | 0.037 | 0.009 | -0.471 | 0.059\* | -0.471 | 0.017\* |
|  | [0.131] | [0.220] | [0.433] | [0.073] | [0.433] | [0.081] |
| Leverage t-1 | 0.013 | 0.006 | 0.078 | 0.010 | 0.078 | 0.005 |
|  | [0.381] | [0.130] | [0.771] | [0.297] | [0.772] | [0.178] |
| Book\_T\_Market t-1 | -0.180\*\*\* | -0.080\*\*\* | 0.881\*\*\* | -0.208\*\*\* | 0.882\*\*\* | -0.091\*\*\* |
|  | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] |
| Firm\_size t-1 | 0.107\*\*\* | 0.053\*\*\* | -2.366\*\*\* | 0.185\*\*\* | -2.366\*\*\* | 0.080\*\*\* |
|  | [0.000] | [0.000] | [0.000] | [0.000] | [0.00] | [0.000] |
| ABACC t-1 | 0.004\*\*\* | 0.001\* | 0.036\*\*\* | 0.003\* | 0.036\*\*\* | 0.001 |
|  | [0.009] | [0.058] | [0.008] | [0.076] | [0.008] | [0.224] |
| SOE dummy t-1 | -0.012 | -0.002 | -0.809\*\*\* | 0.008 | -0.811\*\*\* | 0.005 |
|  | [0.495] | [0.835] | [0.000] | [0.735] | [0.000] | [0.561] |
| Cross\_listing t-1 | -0.141\*\* | -0.054\*\* | -0.576\*\* | -0.147\*\* | -0.577\*\* | -0.053\*\* |
|  | [0.015] | [0.028] | [0.050] | [0.014] | [0.049] | [0.034] |
| Stock Exchange t-1 | 0.071\*\*\* | 0.035\*\*\* | -0.651\*\*\* | 0.100\*\*\* | -0.649\*\*\* | 0.045\*\*\* |
|  | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] |
| Constant | -1.760\*\*\* | -0.897\*\*\* | -2.850 | -1.893\*\*\* | -2.845 | -0.962\*\*\* |
|  | [0.000] | [0.000] | [0.252] | [0.000] | [0.253] | [0.000] |
| Industry FE | YES | YES | NO | NO | NO | NO |
| Year FE | YES | YES | YES | YES | YES | YES |
| Observations | 13,392 | 13,392 | 13,392 | 13,392 | 13,392 | 13,392 |
| R-squared | 0.076 | 0.099 | 0.016 | 0.016 | 0.058 | 0.058 |
| Under Identification tests: |  |  |  |  |  |  |
| Kleibergen-Paap rk LM statistic |  |  | 71.410\*\*\* | 71.410\*\*\* | 71.473\*\*\* | 71.473\*\*\* |
| Weak identification tests: |  |  |  |  |  |  |
| Cragg-Donald Wald F statistic |  |  | 94.721 | 94.721 | 94.826 | 94.826 |
| Kleibergen-Paap rk LM statistic |  |  | 75.479 | 75.479 | 75.565 | 75.565 |
| Stock-Yogo weak ID test critical values: | | | | | | |
| 10% maximal IV size |  |  | 16.38 | 16.38 | 16.38 | 16.38 |

Note: This table represents the regression results for the impact of CEO power on crash risk. Robust p-value are given in brackets. \*, \*\*, and \*\*\* indicate significance at 0.1, 0.05 and 0.01 levels, respectively. See “the Appendix” for the detailed description of the variables. For brevity we do not report coefficients for industry and years fixed-effects.

**Table 4** Regression results for the interaction effects of female critical mass (on corporate boards) on the relationship between CEO power and stock price crash risk

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | Dependent Variable: Stock Price Crash Risk (Ncskewt) | | | | | | | | |
| VARIABLES | | (1) | | (2) | | (3) | (4) | | (5) | |
|  | |  | |  | |  |  | |  | |
| **CPS t-1** | | 0.002 | | **0.003\*\*** | | **0.002\*** | **0.003\*\*\*** | | **0.003\*\*\*** | |
|  | | [0.588] | | **[0.040]** | | **[0.088]** | **[0.007]** | | **[0.002]** | |
| FD\_At least one t-1 | | -0.045 | |  | |  |  | |  | |
|  | | [0.531] | |  | |  |  | |  | |
| CPS t-1 ×FD\_At least one t-1 | | 0.000 | |  | |  |  | |  | |
|  | | [0.925] | |  | |  |  | |  | |
| FD\_onet-1 | |  | | 0.003 | |  |  | |  | |
|  | |  | | [0.957] | |  |  | |  | |
| CPS t-1 × FD\_onet-1 | |  | | 0.000 | |  |  | |  | |
|  | |  | | [0.971] | |  |  | |  | |
| FD\_two t-1 | |  | |  | | -0.008 |  | |  | |
|  | |  | |  | | [0.854] |  | |  | |
| CPS t-1 × FD\_twot-1 | |  | |  | | 0.001 |  | |  | |
|  | |  | |  | | [0.611] |  | |  | |
| FD\_three t-1 | |  | |  | |  | 0.049 | |  | |
|  | |  | |  | |  | [0.292] | |  | |
| **CPS t-1 × FD\_threet-1** | |  | |  | |  | **-0.004\*** | |  | |
|  | |  | |  | |  | **[0.078]** | |  | |
| Female\_criticalmass t-1 | |  | |  | |  |  | | 0.015 | |
|  | |  | |  | |  |  | | [0.490] | |
| **CPS t-1 × Female\_criticalmass t-1** | |  | |  | |  |  | | **-0.003\*\*** | |
|  | |  | |  | |  |  | | **[0.042]** | |
| *Control Variables:-* |  | |  | |  | | |  | |
| Ceo\_age t-1 | | -0.038 | | -0.039 | | -0.038 | -0.040 | | -0.045\*\* | |
|  | | [0.542] | | [0.533] | | [0.546] | [0.526] | | [0.044] | |
| Ceo\_salary t-1 | | -0.026\*\* | | -0.026\*\* | | -0.026\*\* | -0.027\*\* | | -0.030\*\*\* | |
|  | | [0.028] | | [0.026] | | [0.027] | [0.026] | | [0.005] | |
| Ceo\_govtconn t-1 | | -0.004 | | -0.005 | | -0.005 | -0.005 | | -0.007 | |
|  | | [0.863] | | [0.831] | | [0.835] | [0.826] | | [0.744] | |
| Ncskew t-1 | | 0.038\*\*\* | | 0.038\*\*\* | | 0.038\*\*\* | 0.038\*\*\* | | 0.038\*\* | |
|  | | [0.000] | | [0.000] | | [0.000] | [0.000] | | [0.014] | |
| Return t-1 | | 0.095\*\*\* | | 0.096\*\*\* | | 0.096\*\*\* | 0.096\*\*\* | | 0.095\*\*\* | |
|  | | [0.000] | | [0.000] | | [0.000] | [0.000] | | [0.000] | |
| Beta t-1 | | -1.634\*\*\* | | -1.642\*\*\* | | -1.639\*\*\* | -1.644\*\*\* | | -1.630\*\*\* | |
|  | | [0.000] | | [0.000] | | [0.000] | [0.000] | | [0.001] | |
| ROA t-1 | | 0.037 | | 0.037 | | 0.037 | 0.035 | | 0.037 | |
|  | | [0.130] | | [0.131] | | [0.132] | [0.151] | | [0.231] | |
| Leverage t-1 | | 0.013 | | 0.013 | | 0.013 | 0.013 | | 0.014 | |
|  | | [0.382] | | [0.380] | | [0.381] | [0.382] | | [0.393] | |
| Book\_T\_Market t-1 | | -0.181\*\*\* | | -0.180\*\*\* | | -0.181\*\*\* | -0.180\*\*\* | | -0.181\*\*\* | |
|  | | [0.000] | | [0.000] | | [0.000] | [0.000] | | [0.000] | |
| Firm\_size t-1 | | 0.107\*\*\* | | 0.107\*\*\* | | 0.107\*\*\* | 0.108\*\*\* | | 0.107\*\*\* | |
|  | | [0.000] | | [0.000] | | [0.000] | [0.000] | | [0.000] | |
| ABACC t-1 | | 0.004\*\*\* | | 0.004\*\*\* | | 0.004\*\*\* | 0.004\*\*\* | | 0.004\* | |
|  | | [0.008] | | [0.009] | | [0.008] | [0.009] | | [0.072] | |
| SOE dummy t-1 | | -0.013 | | -0.012 | | -0.013 | -0.013 | | -0.018 | |
|  | | [0.461] | | [0.494] | | [0.482] | [0.484] | | [0.222] | |
| Cross\_listing t-1 | | -0.140\*\* | | -0.141\*\* | | -0.142\*\* | -0.141\*\* | | -0.144\*\*\* | |
|  | | [0.017] | | [0.015] | | [0.015] | [0.016] | | [0.009] | |
| Stock Exchange t-1 | | 0.071\*\*\* | | 0.071\*\*\* | | 0.071\*\*\* | 0.071\*\*\* | | 0.070\*\*\* | |
|  | | [0.000] | | [0.000] | | [0.000] | [0.000] | | [0.009] | |
| Constant | | -1.712\*\*\* | | -1.758\*\*\* | | -1.759\*\*\* | -1.763\*\*\* | | -1.720\*\*\* | |
|  | | [0.000] | | [0.000] | | [0.000] | [0.000] | | [0.000] | |
| Industry FE | | YES | | YES | | YES | YES | | YES | |
| Year FE | | YES | | YES | | YES | YES | | YES | |
| Observations | | 13,392 | | 13,392 | | 13,392 | 13,392 | | 13,391 | |
| R-squared | | 0.076 | | 0.076 | | 0.076 | 0.077 | | 0.076 | |

Note: This table represents the regression results for the interaction effect of female critical mass (in corporate boards) on the relationship between CEO power and crash risk. Robust p-value are given in brackets. \*, \*\*, and \*\*\* indicate significance at 0.1, 0.05 and 0.01 levels, respectively. See “the Appendix” for the detailed description of the variables. For brevity we do not report coefficients for industry and years fixed-effects.

**Table 5** Regression results for the interaction effects of ownership structures on the relationship between CEO power and stock price crash risk

|  |  |  |  |
| --- | --- | --- | --- |
| VARIABLES | Dependent Variable: Stock Price Crash Risk (Ncskewt) | | |
|  | (1) | (2) | (3) |
| **CPS t-1** | **0.110\*\*** | **0.030\*\*** | 0.011 |
|  | **[0.026]** | **[0.042]** | [0.362] |
| **Herfindahl\_5\_I t-1** | **0.143\*\*** |  |  |
|  | **[0.014]** |  |  |
| **CPS t-1 × Herfindahl\_5\_I t-1** | **-0.006\*\*** |  |  |
|  | **[0.046]** |  |  |
| **Institution\_%age t-1** |  | **0.107\*** |  |
|  |  | **[0.060]** |  |
| **CPS t-1 ×Institution\_%age t-1** |  | **-0.006\*** |  |
|  |  | **[0.083]** |  |
| Foreign\_d t-1 |  |  | -0.515 |
|  |  |  | [0.256] |
| CPS t-1 × Foreign\_d t-1 |  |  | 0.036 |
|  |  |  | [0.199] |
| *Control Variables:-* |  |  |  |
| Ceo\_age t-1 | -0.032 | -0.029 | -0.033 |
|  | [0.613] | [0.643] | [0.593] |
| Ceo\_salary t-1 | -0.017 | -0.017 | -0.018 |
|  | [0.120] | [0.107] | [0.102] |
| Ceo\_govtconn t-1 | -0.005 | -0.004 | -0.005 |
|  | [0.839] | [0.878] | [0.843] |
| Ncskew t-1 | 0.039\*\*\* | 0.037\*\*\* | 0.038\*\*\* |
|  | [0.000] | [0.000] | [0.000] |
| Return t-1 | 0.097\*\*\* | 0.094\*\*\* | 0.098\*\*\* |
|  | [0.000] | [0.000] | [0.000] |
| Beta t-1 | -1.654\*\*\* | -1.586\*\*\* | -1.660\*\*\* |
|  | [0.000] | [0.000] | [0.000] |
| ROA t-1 | 0.039 | 0.037 | 0.037 |
|  | [0.103] | [0.120] | [0.131] |
| Leverage t-1 | 0.013 | 0.012 | 0.013 |
|  | [0.409] | [0.424] | [0.392] |
| Book\_T\_Market t-1 | -0.179\*\*\* | -0.176\*\*\* | -0.177\*\*\* |
|  | [0.000] | [0.000] | [0.000] |
| Firm\_size t-1 | 0.101\*\*\* | 0.098\*\*\* | 0.101\*\*\* |
|  | [0.000] | [0.000] | [0.000] |
| ABACC t-1 | 0.004\*\*\* | 0.004\*\*\* | 0.004\*\*\* |
|  | [0.007] | [0.007] | [0.008] |
| SOE dummy t-1 | -0.015 | -0.018 | -0.012 |
|  | [0.418] | [0.307] | [0.510] |
| Cross\_listing t-1 | -0.142\*\* | -0.140\*\* | -0.141\*\* |
|  | [0.015] | [0.016] | [0.016] |
| Stock Exchange t-1 | 0.071\*\*\* | 0.072\*\*\* | 0.069\*\*\* |
|  | [0.000] | [0.000] | [0.000] |
| Constant | -4.444\*\*\* | -2.149\*\*\* | -1.881\*\*\* |
|  | [0.000] | [0.000] | [0.000] |
|  | 0.110\*\* | 0.030\*\* | 0.011 |

|  |  |  |  |
| --- | --- | --- | --- |
| Industry FE | YES | YES | YES |
| Year FE | YES | YES | YES |
| Observations | 13,392 | 13,385 | 13,392 |
| R-squared | 0.076 | 0.076 | 0.076 |

Note: This table represents the regression results for the interaction effect of ownership structure on the relationship between CEO power and crash risk. Robust p-value are given in brackets. \*, \*\*, and \*\*\* indicate significance at 0.1, 0.05 and 0.01 levels, respectively. See “the Appendix” for the detailed description of the variables. For brevity we do not report coefficients for industry and years fixed-effects.

**Table 6** Additional analysis-regression results for the main and interaction effect under sub-sample of state and non-state owned firms

**Panel A:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Dependent Variable: Stock Price Crash Risk (Ncskewt) | | | | | | | | | |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|  |  |  |  |  |  |  |  |  |  |  |
| VARIABLES | SOE firms | Non SOE firms | SOE firms | Non- SOE firms | SOE firms | Non- SOE firms | SOE firms | Non- SOE firms | SOE firms | Non- SOE firms |
|  |  |  |  |  |  |  |  |  |  |  |
| CPS t-1 | 0.002 | **0.003\*** | **0.003\*\*\*** | **0.003\*** | 0.061 | **0.357\*\*\*** | **0.059\*\*\*** | 0.010 | **0.028\*** | -0.009 |
|  | [0.270] | **[0.070]** | **[0.008]** | **[0.064]** | [0.369] | **[0.000]** | **[0.007]** | [0.617] | **[0.079]** | [0.629] |
| Female\_criticalmass t-1 |  |  | 0.039 | 0.039 |  |  |  |  |  |  |
|  |  |  | [0.146] | [0.454] |  |  |  |  |  |  |
| CPS t-1 × Female\_criticalmass t-1 |  |  | **-0.003\*** | -0.002 |  |  |  |  |  |  |
|  |  |  | **[0.084]** | [0.110] |  |  |  |  |  |  |
| Herfindahl\_5\_I t-1 |  |  |  |  | 0.082 | **0.402\*\*\*** |  |  |  |  |
|  |  |  |  |  | [0.325] | **[0.000]** |  |  |  |  |
| CPS t-1 × Herfindahl\_5\_I t-1 |  |  |  |  | -0.002 | **-0.022\*\*\*** |  |  |  |  |
|  |  |  |  |  | [0.637] | **[0.000]** |  |  |  |  |
| Institution\_%age t-1 |  |  |  |  |  |  | **0.174\*\*** | 0.112 |  |  |
|  |  |  |  |  |  |  | **[0.046]** | [0.160] |  |  |
| CPS t-1 ×Institution\_%age t-1 |  |  |  |  |  |  | **-0.010\*** | -0.007 |  |  |
|  |  |  |  |  |  |  | **[0.064]** | [0.183] |  |  |
| Foreign\_d t-1 |  |  |  |  |  |  |  |  | -1.548 | -0.275 |
|  |  |  |  |  |  |  |  |  | [0.191] | [0.575] |
| CPS t-1 × Foreign\_d t-1 |  |  |  |  |  |  |  |  | 0.099 | 0.021 |
|  |  |  |  |  |  |  |  |  | [0.175] | [0.490] |
| *Control Variables:-* |  |  |  |  |  |  |  |  |  |  |
| Ceo\_age t-1 | -0.202\*\* | 0.082 | -0.201\* | 0.078 | -0.197\*\* | 0.086 | -0.198\*\* | 0.094 | -0.200\*\* | 0.089 |
|  | [0.038] | [0.314] | [0.077] | [0.177] | [0.043] | [0.288] | [0.042] | [0.248] | [0.041] | [0.276] |
| Ceo\_salary t-1 | -0.016 | -0.029 | -0.016 | -0.031 | -0.011 | -0.016 | -0.013 | -0.015 | -0.012 | -0.016 |
|  | [0.326] | [0.111] | [0.154] | [0.111] | [0.463] | [0.295] | [0.401] | [0.351] | [0.426] | [0.318] |
| Ceo\_govtconn t-1 | 0.017 | -0.019 | 0.018 | -0.018 | 0.016 | -0.018 | 0.018 | -0.016 | 0.016 | -0.017 |
|  | [0.657] | [0.520] | [0.403] | [0.495] | [0.670] | [0.542] | [0.630] | [0.574] | [0.675] | [0.570] |
| Ncskew t-1 | 0.055\*\*\* | 0.015 | 0.054\*\*\* | 0.020 | 0.055\*\*\* | 0.015 | 0.053\*\*\* | 0.014 | 0.055\*\*\* | 0.015 |
|  | [0.000] | [0.257] | [0.007] | [0.145] | [0.000] | [0.252] | [0.000] | [0.292] | [0.000] | [0.263] |
| Return t-1 | 0.102\*\*\* | 0.066\*\*\* | 0.102\*\*\* | 0.068\*\* | 0.103\*\*\* | 0.069\*\*\* | 0.100\*\*\* | 0.064\*\*\* | 0.105\*\*\* | 0.068\*\*\* |
|  | [0.000] | [0.001] | [0.000] | [0.011] | [0.000] | [0.000] | [0.000] | [0.001] | [0.000] | [0.001] |
| Beta t-1 | -2.295\*\*\* | -1.085\*\*\* | -2.311\*\* | -1.144\*\* | -2.305\*\*\* | -1.098\*\*\* | -2.239\*\*\* | -1.031\*\*\* | -2.330\*\*\* | -1.098\*\*\* |
|  | [0.002] | [0.003] | [0.048] | [0.032] | [0.002] | [0.002] | [0.003] | [0.005] | [0.002] | [0.002] |
| ROA t-1 | 0.125 | 0.026 | 0.127 | 0.028 | 0.128 | 0.030 | 0.116 | 0.025 | 0.129 | 0.024 |
|  | [0.205] | [0.182] | [0.166] | [0.141] | [0.198] | [0.113] | [0.252] | [0.190] | [0.193] | [0.227] |
| Leverage t-1 | 0.116\*\* | 0.006 | 0.119\*\* | 0.008 | 0.119\*\* | 0.005 | 0.120\*\* | 0.005 | 0.118\*\* | 0.006 |
|  | [0.038] | [0.556] | [0.020] | [0.529] | [0.032] | [0.664] | [0.032] | [0.629] | [0.033] | [0.583] |
| Book\_T\_Market t-1 | -0.163\*\*\* | -0.225\*\*\* | -0.163\*\*\* | -0.218\*\*\* | -0.162\*\*\* | -0.224\*\*\* | -0.159\*\*\* | -0.219\*\*\* | -0.162\*\*\* | -0.218\*\*\* |
|  | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] |
| Firm\_size t-1 | 0.090\*\*\* | 0.123\*\*\* | 0.089\*\*\* | 0.125\*\*\* | 0.087\*\*\* | 0.114\*\*\* | 0.082\*\*\* | 0.111\*\*\* | 0.087\*\*\* | 0.113\*\*\* |
|  | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] |
| ABACC t-1 | 0.009\*\* | 0.001 | 0.009\* | 0.001 | 0.009\*\* | 0.001 | 0.009\*\* | 0.001 | 0.009\*\* | 0.001 |
|  | [0.019] | [0.414] | [0.089] | [0.603] | [0.018] | [0.329] | [0.015] | [0.341] | [0.018] | [0.441] |
| Cross\_listing t-1 | -0.105\* | -0.323\*\* | -0.105\*\* | -0.323\*\*\* | -0.106\* | -0.332\*\* | -0.104 | -0.330\*\* | -0.105 | -0.327\*\* |
|  | [0.098] | [0.040] | [0.015] | [0.000] | [0.097] | [0.034] | [0.104] | [0.035] | [0.100] | [0.037] |
| Stock Exchange t-1 | 0.069\*\*\* | 0.071\*\*\* | 0.069\*\* | 0.068\*\* | 0.070\*\*\* | 0.067\*\* | 0.072\*\*\* | 0.070\*\*\* | 0.069\*\*\* | 0.067\*\* |
|  | [0.004] | [0.009] | [0.047] | [0.011] | [0.003] | [0.013] | [0.002] | [0.010] | [0.004] | [0.013] |
| Constant | -0.990\*\* | -2.418\*\*\* | -1.010\*\* | -2.474\*\*\* | -2.920\* | -8.897\*\*\* | -1.814\*\*\* | -2.510\*\*\* | -1.399\*\*\* | -2.219\*\*\* |
|  | [0.024] | [0.000] | [0.022] | [0.000] | [0.072] | [0.000] | [0.001] | [0.000] | [0.006] | [0.000] |
| All Control Variables | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Industry FE | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Observations | 6,678 | 6,714 | 6,678 | 6,714 | 6,678 | 6,714 | 6,674 | 6,711 | 6,678 | 6,714 |
| R-squared | 0.065 | 0.099 | 0.065 | 0.094 | 0.065 | 0.101 | 0.066 | 0.099 | 0.066 | 0.099 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Panel B:** |  |  |  |  |  |  |
|  | Dependent Variable: Stock Price Crash Risk (Ncskewt) | | | | | |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
| VARIABLES | 10-25%  State Ownership | 25-50%  State Ownership | >50%  State Ownership | 10-25% Institutional Ownership | 25-50% Institutional Ownership | >50% Institutional Ownership |
|  |  |  |  |  |  |  |
| **CPS t-1** | **0.017\*\*** | 0.014 | **0.001\*\*** | **0.003\*\*** | 0.006 | **0.103\*\*\*** |
|  | **[0.016]** | [0.685] | **[0.030]** | **[0.018]** | [0.862] | **[0.001]** |
| **Female\_criticalmass t-1** | **0.534\*\*\*** | 0.383 | -0.045 |  |  |  |
|  | **[0.001]** | [0.507] | [0.576] |  |  |  |
| **CPS t-1 × Female\_criticalmass t-1** | **-0.021\*\*** | -0.024 | -0.001 |  |  |  |
|  | **[0.021]** | [0.537] | [0.616] |  |  |  |
| **Institution\_%age t-1** |  |  |  | **0.007\*\*** | 0.034 | **0.299\*** |
|  |  |  |  | **[0.017]** | [0.783] | **[0.066]** |
| **CPS t-1 ×Institution\_%age t-1** |  |  |  | **-0.001\*** | -0.003 | **-0.020\*** |
|  |  |  |  | **[0.088]** | [0.721] | **[0.071]** |
| *Control Variables:-* |  |  |  |  |  |  |
| Ceo\_age t-1 | -0.077 | 0.053 | -0.474\*\* | -0.151 | 0.066 | -0.377 |
|  | [0.762] | [0.783] | [0.043] | [0.542] | [0.732] | [0.104] |
| Ceo\_salary t-1 | -0.033 | 0.014 | 0.029 | -0.019 | 0.016 | 0.035 |
|  | [0.489] | [0.625] | [0.492] | [0.457] | [0.586] | [0.384] |
| Ceo\_govtconn t-1 | -0.025 | 0.074 | 0.080 | 0.015 | 0.074 | 0.058 |
|  | [0.801] | [0.303] | [0.517] | [0.860] | [0.302] | [0.617] |
| Ncskew t-1 | -0.029 | 0.012 | 0.032 | -0.010 | 0.015 | 0.042 |
|  | [0.467] | [0.661] | [0.393] | [0.625] | [0.593] | [0.250] |
| Return t-1 | 0.019 | 0.067\*\* | 0.028 | 0.019 | 0.073\*\* | 0.041 |
|  | [0.734] | [0.047] | [0.568] | [0.630] | [0.032] | [0.384] |
| Beta t-1 | -1.146 | -2.725\*\* | -0.475 | -0.238 | -2.875\*\* | -1.134 |
|  | [0.647] | [0.033] | [0.688] | [0.910] | [0.026] | [0.333] |
| ROA t-1 | -0.311 | -0.016 | 0.484 | -0.375 | -0.029 | 0.282 |
|  | [0.604] | [0.963] | [0.463] | [0.410] | [0.935] | [0.672] |
| Leverage t-1 | -0.223 | 0.001 | 0.103 | -0.207 | -0.004 | 0.204 |
|  | [0.289] | [0.993] | [0.622] | [0.320] | [0.980] | [0.298] |
| Book\_T\_Market t-1 | -0.187\*\*\* | -0.198\*\*\* | -0.123\*\* | -0.146\*\*\* | -0.204\*\*\* | -0.098\* |
|  | [0.001] | [0.000] | [0.036] | [0.003] | [0.000] | [0.078] |
| Firm\_size t-1 | 0.163\*\*\* | 0.114\*\*\* | 0.065\* | 0.109\*\*\* | 0.119\*\*\* | 0.045 |
|  | [0.001] | [0.000] | [0.054] | [0.005] | [0.000] | [0.168] |
| ABACC t-1 | 0.003\* | 0.004\*\* | 0.010\*\*\* | 0.004\*\* | 0.004\*\* | 0.010\*\*\* |
|  | [0.051] | [0.013] | [0.002] | [0.020] | [0.010] | [0.001] |
| Cross\_listing t-1 | -0.739\*\* | -0.243\* | 0.164 | -0.661\*\*\* | -0.249\* | 0.159 |
|  | [0.022] | [0.089] | [0.191] | [0.000] | [0.080] | [0.188] |
| Stock Exchange t-1 | 0.065 | 0.050 | 0.121\* | 0.095\* | 0.048 | 0.146\*\* |
|  | [0.305] | [0.245] | [0.050] | [0.053] | [0.263] | [0.015] |
| Constant | -2.702\*\* | -3.097\*\*\* | -0.357 | -1.350 | -3.127\*\*\* | -1.734 |
|  | [0.019] | [0.002] | [0.768] | [0.144] | [0.002] | [0.162] |
|  |  |  |  |  |  |  |
| Observations | 837 | 1,611 | 943 | 821 | 1,607 | 980 |
| R-squared | 0.116 | 0.093 | 0.072 | 0.103 | 0.093 | 0.061 |

Note: Panel A of this table represents the regression results for the main and interaction effect under sub-sample of state and non-state owned firms. Panel B of this table represents the regression results for interaction effect of female critical mass and institutional ownership under different threshold of state and institutional ownership. Robust p-value are given in brackets. \*, \*\*, and \*\*\* indicate significance at 0.1, 0.05 and 0.01 levels, respectively. See “the Appendix” for the detailed description of the variables. For brevity we do not report coefficients for industry and years fixed-effects.

**Table 7** Sensitivity analysis-regression results of the interaction effects of alternate governance variables on the relationship between CEO power and stock price crash risk

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
|  | NCSKEW | DUVOL | NCSKEW | DUVOL | NCSKEW | NCSKEW | NCSKEW | NCSKEW | NCSKEW | NCSKEW | NCSKEW |
| VARIABLES | Lagged CEO Power | Lagged CEO Power | CEO Tenure | CEO Tenure | Post Financial Crises (post 2008) | Pre Financial Crises (Pre 2008) | More than 3 females directors | Z-Index | Herfindahl 10-Index | Dummy for Institutional Ownership | QFII |
| **Lagged CPSt-1** | **0.034\*\*** | **0.001\*** |  |  |  |  |  |  |  |  |  |
|  | **[0.017]** | **[0.075]** |  |  |  |  |  |  |  |  |  |
| CEO\_tenure t-1 |  |  | 0.007 | 0.003 |  |  |  |  |  |  |  |
|  |  |  | [0.469] | [0.502] |  |  |  |  |  |  |  |
| CPSt-1 |  |  |  |  | **0.003\*\*** | 0.001 | **0.003\*** | 0.018 | **0.111\*\*** | 0.018 | 0.024 |
|  |  |  |  |  | **[0.028]** | [0.807] | **[0.057]** | [0.122] | **[0.026]** | [0.152] | [0.607] |
| Highfemale\_criticalmassst-1 |  |  |  |  |  |  | -0.043 |  |  |  |  |
|  |  |  |  |  |  |  | [0.266] |  |  |  |  |
| CPS t-1 × Highfemale\_criticalmassst-1 |  |  |  |  |  |  | -0.002 |  |  |  |  |
|  |  |  |  |  |  |  | [0.295] |  |  |  |  |
| **Z-Index t-1** |  |  |  |  |  |  |  | **0.006\*** |  |  |  |
|  |  |  |  |  |  |  |  | **[0.058]** |  |  |  |
| **CPS t-1 × Z-Index t-1** |  |  |  |  |  |  |  | **-0.001\*\*** |  |  |  |
|  |  |  |  |  |  |  |  | **[0.019]** |  |  |  |
| **Herfindahl\_10\_I t-1** |  |  |  |  |  |  |  |  | **0.144\*\*** |  |  |
|  |  |  |  |  |  |  |  |  | **[0.014]** |  |  |
| **CPS t-1 × Herfindahl\_10\_I t-1** |  |  |  |  |  |  |  |  | **-0.006\*\*** |  |  |
|  |  |  |  |  |  |  |  |  | **[0.046]** |  |  |
| Institutional\_d t-1 |  |  |  |  |  |  |  |  |  | 0.247 |  |
|  |  |  |  |  |  |  |  |  |  | [0.255] |  |
| CPS t-1 × Institutional\_d t-1 |  |  |  |  |  |  |  |  |  | -0.014 |  |
|  |  |  |  |  |  |  |  |  |  | [0.297] |  |
| QFII t-1 |  |  |  |  |  |  |  |  |  |  | -0.169 |
|  |  |  |  |  |  |  |  |  |  |  | [0.236] |
| CPS t-1 × QFII t-1 |  |  |  |  |  |  |  |  |  |  | 0.011 |
|  |  |  |  |  |  |  |  |  |  |  | [0.198] |
| Constant | -2.816\*\*\* | -1.188\*\*\* | -1.662\*\*\* | -0.866\*\*\* | -2.010\*\*\* | -0.778 | -1.715\*\*\* | -2.006\*\*\* | -4.443\*\*\* | -1.933\*\*\* | -2.379\*\* |
|  | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.200] | [0.000] | [0.000] | [0.000] | [0.000] | [0.038] |
| All Control Variables | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Industry FE | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Observations | 10,716 | 10,716 | 13,332 | 13,332 | 10,304 | 1,920 | 13,392 | 13,391 | 13,392 | 13,392 | 1,281 |
| R-squared | 0.083 | 0.105 | 0.076 | 0.099 | 0.076 | 0.040 | 0.076 | 0.078 | 0.076 | 0.076 | 0.090 |

Note: This table represents the regression results for the sensitivity analysis of the main relationship between CEO power and crash risk and interaction effect of female critical mass and ownership structure. Robust p-value are given in brackets. \*, \*\*, and \*\*\* indicate significance at 0.1, 0.05 and 0.01 levels, respectively. See “the Appendix” for the detailed description of the variables. For brevity we do not report coefficients for industry and years fixed-effects.

**Appendix**

**Variables’ description**

| **Variables** | **Symbols** | **Details** |
| --- | --- | --- |
| ***Dependent Variable:-*** | | |
| **Stock Price Crash Risk** | Ncskewt | The negative coefficient of skewness, (*NCSKEW*) calculated from the equation Eq. (4). |
| Duvolt | Down to up volatility (*DUVOL*) calculated from the equation Eq. (5). |
| ***Independent Variable:-*** | | |
| **CEO Power** | CPSt-1 | CEO pay slice (CPS), measured as the ratio between CEO total compensation and combined total compensation of the top five executives (inclusive of CEO) in a firm (Bebchuk et al., 2011). |
| CEO\_tenure t-1 | CEO tenure, measured as the number of years a CEO holds the office in a firm to the base year (Adams et al., 2005; Hill & Phan, 1991). |
| ***Interaction Variables:-*** | | |
| ***(a) Female Critical Mass in Board*** | FD\_At least one t-1 | Dummy variable equals to ‘1’ if at least one director of the board is female and ‘0’ otherwise. |
| FD\_onet-1 | Dummy variable equals to ‘1’ if there is exactly one female director serving on a board and ‘0’ otherwise. |
| FD\_two t-1 | Dummy variable equals to ‘1’ if there are exactly two female directors serving on a board and ‘0’ otherwise. |
| FD\_three t-1 | Dummy variable equals to ‘1’ if there are exactly three female directors serving on a board and ‘0’ otherwise. |
| Female\_criticalmass t-1  Highfemale\_criticalmass t-1 | Dummy variable (main proxy for female critical mass) equals to ‘1’ if there are at least three female directors (i.e., greater than two female directors) serving on a board and ‘0’ otherwise.  For sensitivity analysis, it is a dummy variable which equals to ‘1’ if there are more than three female directors (i.e., greater than three female directors) serving on a board and ‘0’ otherwise. |
| ***(b) Ownership Structure*** | Herfindahl\_5\_I t-1  Herfindahl\_10\_I t-1  Z-Index t-1  Institution\_%age t-1  Institutional\_d t-1  Foreign\_d t-1 | Herfindahl\_5 Index: Sum of squares of shareholding percentage of top five shareholders.  Herfindahl\_10 Index: Sum of squares of shareholding percentage of top ten shareholders.  The ratio of the shareholding percentage of the largest shareholder to that of the second-largest shareholder.  Percentage of institutional shares to the total number of shares.  Dummy variable which equals to ‘1’ if the percentage of the institutional ownership in the firm is above mean and ‘0’ otherwise.  Dummy variable which equals to ‘1’ if there is a foreign ownership of shares in a firm and ‘0’ otherwise. |
| QFII t-1 | Percentage of qualified foreign institutional shares in a firm. |
|  |  |
| ***Instrument variable:-*** | | |
| **Industry Mean CEO Power** | Ind\_Avg\_CPS t-1 | Industry mean CPS has been used as an instrumental variable for endogeneity check in line with previous studies (Bebchuk et al., 2011; Jiraporn et al., 2014). |
| ***Control Variables:-*** | | |
| **CEO Age** | Ceo\_age t-1 | Natural log of a CEO age. |
| **CEO Salary** | Ceo\_salary t-1 | Natural log of total compensation of a CEO. |
| **CEO Political Connection** | Ceo\_govtconn t-1 | Dummy variable that is equal to ‘1’ if CEO is a former government official and ‘0’ otherwise. |
| **Lagged Stock Price Crash Risk** | NCSKEWt-1 | Lagged value of NCSKEW. |
| DUVOLt-1 | Lagged value of DUVOL. |
| **Return** | Returnt-1 | Mean of firm-specific weekly returns. |
| **Beta** | Beta t-1 | The standard deviation of firm-specific weekly returns. |
| **Return on Assets** | ROA t-1 | Return on assets calculated as earnings before interest and taxes scaled by total assets. |
| **Leverage** | Leverage t-1 | Total liability scaled by total assets. |
| **Book to Market Value** | Book\_T\_Market t-1 | Book to market ratio calculated as ratio of total assets divided by market value of equity. |
| **Firm Size** | Firm\_size t-1 | Natural logarithm of firm’s total assets. |
| **ABACC** | ABACC t-1 | Absolute value of discretionary accruals calculated from modified Jones model (Dechow et al., 1995). |
| **SOE Dummy** | SOE dummy t-1 | A dummy variable which is equal to ‘1’ if firm is state-owned and ‘0’ otherwise. |
| **Cross-listing** | Cross\_listing t-1 | A dummy variable equal to ‘1’ if the firm also has offshore H-share listings (cross-listing) and ‘0’ otherwise. |
| **Stock Exchange** | Stock exchanget-1 | A dummy variable which is equal to ‘1’ if firm is listed on the Shenzhen stock exchange or any of its sub-platform (Main Board, SME or GEM) and ‘0’ in case the firm is listed on the Shanghai Stock Exchange. |
| **Industry** | Industry FE | Industry dummies to control for industry effects. |
| **Year** | Year FE | Year dummies to control for year effects. |

1. We would like to thank an anonymous reviewer for this helpful suggestion. [↑](#footnote-ref-1)
2. We would like to thank an anonymous reviewer for this helpful suggestion. [↑](#footnote-ref-2)
3. We would like to thank an anonymous reviewer for this helpful suggestion. [↑](#footnote-ref-3)