**CEO POWER AND FIRM RISK AT THE ONSET OF THE 2007 FINANCIAL CRISIS AND THE COVID-19 HEALTH CRISIS:** **INTERNATIONAL EVIDENCE**

By Hamad Aldawsari, Taufiq Choudhry, and Di Luo

**Abstract**

We investigate the association between CEO power and firm risk at the onset of the global financial crisis in 2007 and the COVID-19 pandemic health crisis in 2020. Examining an international sample of publicly listed firms in the G7 nations between 2006 and 2021, we show that firms led by CEOs with greater power are exposed to higher risk than firms led by CEOs with lesser power. The result is primarily driven by the impact of CEO power on idiosyncratic risk rather than systematic risk. Further, we find that powerful CEOs tend to be more cautious and conservative during crises that they have no reference for or experience of, as in the case of the pandemic, during which the positive power-risk associations are less pronounced. Nevertheless, the power-risk association remains relatively unchanged during the more familiar financial crisis. This study has important implications for firms, investors, regulators, and policymakers.

Key Words: CEO power; Risk-taking; Financial crisis; COVID-19 pandemic

JEL Classification: G30; G32; G02; J33; G01; J16

1. **INTRODUCTION**

Chief executive officers (CEOs), the highest-level decision-makers in corporations, are responsible for a range of strategic duties. These include decisions on strategic operations and planning; managing, reviewing, and revising organizational structures; managing productivity and profitability; communicating and maintaining stakeholder relationships; and most importantly, controlling, assessing, and evaluating risk levels. Risk management is a fundamental aspect that directly influences firms’ financial performance, survival, and long-term growth. CEOs are the agents that carry full responsibility for this.

According to the risk-return framework of Markowitz (1952), higher risk is compensated for by potentially higher return. This implies that a higher risk level is not necessarily a suboptimal outcome if it yields better returns that assist in shareholder wealth maximization as an objective. On the other hand, firms acting conservatively through carrying too little risk can irritate shareholders, who are often viewed as risk-seeking principals. This is because conservative managers may choose to forgo value-enhancing but risky projects and commit to safer yet value-damaging investment strategies. Consequently, the risk management role at CEO level is indeed challenging and effort-provoking.

Given the significance, whether and how CEO characteristics impact firm risk-taking and firm risk outcomes have attracted extensive interest from both academic researchers and practitioners over recent decades (e.g., Çolak and Korkeamäki, 2021; Brisley et al., 2021; Fan et al., 2021; Neyland, 2020; Serfling, 2014). Among the many CEO role characteristics, the institutional power they possess particularly influences a firm’s overall operations and strategic decisions (Grinstein and Hribar, 2004; Lewellyn and Muller-Kahle, 2012; Sheikh, 2019), and especially firm risk (Fernandes et al., 2021; Pathan, 2009; Sheikh, 2019; Lewellyn and Muller-Kahle, 2012). Extending the limited and inconclusive literature on the relation between CEO power and firm risk, this study aims to further investigate this relation on an international scale and in the face of economic, financial, and health turbulence.

This study employs a cross-country panel data sample containing publicly listed firms in the G7 countries: the United States, United Kingdom, Germany, France, Italy, Canada, and Japan. The investigation covers a period from 2006 to 2021 with 12,836 firm-year observations. This period saw the global financial crisis of 2007 and the COVID-19 health crisis. The G7 members represent more than 60% of the world’s net wealth and around 50% of the world’s gross domestic product (Climate Transparency, 2018). The considerable population sizes and solid economies give advantage to the participating G7 members to be key players in global markets and maintain solid political, environmental, economic, cultural, and diplomatic relations to strengthen their economic situations and support the world’s weaker economies, given the availability of the means of production and manpower within their borders.

The association between CEO power and firm risk is built on the theory of behavioural agency (Wiseman and Gomez-Mejia, 1998) and the approach/inhibition theory of power (Keltner et al., 2003). The former enhances the agency-based model (Wiseman and Gomez-Mejia, 1998) by suggesting that executives are not solely risk-averse agents but can also exhibit risk-seeking attitudes and behaviours. Together with this view, the approach/inhibition model conceptualizes that executives with power tend to act following their behavioural approach system, triggering them to focus more on positive outcomes, such as winning, achievements, and rewards (Magee and Galinsky, 2008; Keltner et al., 2003). Indeed, the social psychology literature strongly supports the idea that CEO power is associated with higher risk-taking decisions as they are more optimistic and exposed to higher judgment error in their risk evaluation (Adams et al., 2005; Sah and Stiglitz, 1991; Anderson and Galinsky, 2006). Consequently, it is expected that firms led by more powerful CEOs have higher risk levels compared to those led by less powerful CEOs, indicating a positive association. Empirically, the studies of Sheikh (2019) and Lewellyn and Muller-Kahle (2012) support this view, using non-financial and non-banking samples.

Throughout and beyond the global financial crisis of 2007, risk management has received a crucial echo in the media (Huber and Scheytt, 2013), with interest in it gradually increasing through the 20 years leading up to the financial crisis. Both instrumental and social discussions of risk and risk management practice have overwhelmed not only academic journals, but also non-academic content published by practitioners in the field, indicating that the practice has now become ubiquitous (ibid.). Accordingly, policymakers constantly attempt to develop conditions that impose requirements to monitor firm activities involving risk (Sheikh, 2019), specifically during crises. The financial crisis of 2007 and the pandemic of 2020 are considered the riskiest events to impact the world’s economy since the Great Depression of 1929-1932 (Moschonas, 2020). In this regard, both events have revealed the global economy’s vulnerability and its impact on firms’ risk-taking. Therefore, it is necessary to continuously reassess the determinants of firm risk today more than ever before.

The topic of CEO power and corporate risk during and after both the financial and COVID-19 crises are important for different reasons. First, financial, and global health crises can have dramatic economic and social impacts, such as job losses and economic hardship. Thus, understanding the relationship between CEO power and corporate risk-taking can determine the required effort to reduce risk-taking and mitigate the impact of crises. Second, financial, and global health crises can significantly impact investors. Research on CEO power and corporate risk can help shape investment decisions. Third, financial and global health crises can dramatically impact corporate leaders. For instance, studies have shown that firms with more powerful CEOs are more likely to engage in risky behaviours (Sheikh, 2019), which may result in negative consequences during a crisis. Hence, understanding the relationship between CEO power and corporate risk can provide insight into a corporate leaders’ decisions to implement strategies that balance CEO power so as to alleviate risk and improve their firms’ resilience during a crisis.

In this paper, to examine the impact of CEO power on firm risk, a baseline Ordinary Least Square (OLS) with various robustness checks are applied to corroborate the findings obtained from the baseline methods. These include the fixed effect model, the lagged approach, the generalized method of moments (GMM), and 2SLS, to account for endogeneity issues, and models with alternative dependent variables as well as independent variables. Furthermore, to investigate the effects of the financial and COVID-19 crises on the association, difference in differences (DiD) method and models on different subsamples with Chow’s test are employed (Contessi et al., 2014). The results indicate that CEO power is positively associated with firm risk. Particularly, when CEO power increases by 1%, the firm’s total risk increases by approximately 10%. This association is mainly driven by the influence of CEO power on firm-specific risk, rather than on market-based risk, from the economic significance perspective. Furthermore, the association between CEO-power and firm risk is less pronounced during times of turbulence, namely both financial and global health crises. This may be because, with uncertainty, CEOs tend to be more cautious, even when they possess great institutional power. Accordingly, optimism, confidence, and risk error judgment are all lower than usual, leading to lower risk levels.

The contributions of this study are thus twofold. First, extant studies on CEO power and corporate risk have been conducted in a single country. This means that the findings are likely to apply specifically to firms that operate there. Extending the research stream, the current study is conducted on an international sample from G7 countries, so the findings will be more generalizable and relevant to a broader context. Second, this study employs the most updated dataset for the period between 2006 and 2021, which is important after a series of market impacting events like the COVID-19 pandemic and the many related changes in governance codes around the globe. Furthermore, the chosen investigated timeframe includes both the financial crisis of 2007 and the COVID health crisis of 2020. These two are barely assessed in this way and have never been juxtaposed in relevant previous studies. Thus, the results of this study will indicate whether the association between CEO power and firm risk is either unaffected, stronger, or weaker in different types of turbulence. As such, they will confirm and extend the results of relevant previous studies.

Results obtained conclude that CEO power is significantly positively correlated with firm risk. The study also finds that the association between CEO power and risk is stronger in non-crisis periods. This suggests that power may allow and incline CEOs to take more risk in times of financial stability and discourage them (or at least encourage caution) in taking risk during crises. A distinction is made between the 2007 global financial crisis and 2020 COVID crisis. Particularly, the increased risk with CEO power remains relatively unchanged across financial crises and non-financial crises. However, such an effect only remains during non-COVID crises and disappears during COVID crises. This may be because the optimism and confidence of powerful CEOs is reduced during turbulence that they are unfamiliar with and have no reference to or experience of, which was the COVID case. Conceivably, CEOs with power are more reluctant to increase firm risk during new or ‘strange’ occurrences like a pandemic.

This study has important implications for firms, investors, regulators, and policymakers. For instance, policymakers can proactively use evidence from this study as a tool to anticipate the impact of crises on investors and markets by analysing how CEO power affects corporate risk. Regulators may establish improved rules and regulations to minimize risk and prevent future turbulence. Firms and investors can get deeper insights into how to manage the risks associated with powerful CEOs, based on the recommendations. This study is also helpful for enhancing senior managers’ hiring criteria, and understanding the risks associated with powerful CEOs during crises. Further, boards of directors and top management are encouraged to delegate more power to CEOs to avoid value-damage by conservative CEOs, and hence stimulate positive firm outcomes, given that CEO power is expected to work effectively and help achieve a reasonable return on investment. At the same time, the board of directors should pay attention to risk-taking by powerful CEOs attempting to assure related value-enhancing strategies, because higher risk can eventually lead to excessive risk, which is detrimental to firms if not subject to cautious surveillance.

The remaining of the paper is structured as follows. Section 2 explains the underlying theoretical background of the association between CEO power and risk. Subsequently, Section 3 thoroughly reviews the literature on CEO characteristics, particularly CEO power, and firm risk. Section 4 explains the sample and analytical methodology employed in the study. Finally, the results are discussed, and the conclusions stated in Section 5.

1. **THEORETICAL FRAMEWORK**

In relation to the direction of the association between CEO power and firm risk, the prominent theoretical foundation is provided by agency theory. In brief, agency theory postulates the existence of conflict in the relationship between firms’ principals (shareholders) and agents (managers) leading to agency costs (Amihud and Lev, 1981; Eisenhardt, 1989; Sheikh, 2019).

One major assumption underlying agency theory acting as a key source of agency conflict is the risk-averse nature of managers (Bosse and Philips, 2016; Eisenhardt, 1989). This has been claimed to play a dominant role in explaining the association between CEO power and firm risk (Lewellyn and Muller-Kahle, 2012; Liu and Jiraporn, 2010; Pathan, 2009; Sheikh, 2019). Specifically, it has been assumed that shareholders (the principals) are risk-neutral or risk-seeking, whilst the managers are risk-averse, or at least more risk-averse than what shareholders expect them to be (Wiseman and Gomez-Mejia, 1998; Carpenter et al., 2003; Eisenhardt, 1989; Amihud and Lev, 1981), the reason being that shareholders tend to diversify their own investment portfolios and hence receive unlimited payoffs in successful projects and only limited losses when projects do not perform well. In contrast, managers exhibit poorly diversified human and financial capital because their primary source of income ties exclusively to the performance and survival of the firms they work for. As a result, once a manager reaches the top executive role as a CEO, which tends to yield a relatively more generous compensation and benefits package as well as personal reputation, image, and experience, they are likely to become protective over their position. This can lead to a risk-averse attitude in corporate decision-making, of which a consequence is to drive them to accept low-risk but value-destroying projects and reject risky but value-enhancing projects (Grinstein and Hribar, 2004; Lewellyn and Muller-Kahle, 2012). Building on this perspective of agency theory, the literature in CEO power and firm risk (e.g., Grinstein and Hribar, 2004; Lewellyn and Muller-Kahle, 2012; Sheikh, 2019; Liu and Jiraporn, 2010) surmises that the power of CEOs provides them with the ability and freedom (relative to their boards and other management team members) to influence the firm’s strategic decisions, including the overall level of corporate risk; most importantly, the monitoring on their behaviour is lessened with power (Fernandes et al., 2021; Pathan, 2009). In other words, powerful CEOs possess more leeway and the ability to pursue actions for their best self-interests while harming the interests of shareholders. Applying this to the assumption of risk avoidance as a characteristic of senior managers for employment and reputational reasons, powerful CEOs tend to adopt more risk-averse decisions around risk, leading to lower firm risk (Pathan, 2009).

Whilst agency theory supports the negative association between CEO power and firm risk based on the risk-averse agent assumption, it also brings to light some competing views. Particularly, it fails to consider the contexts in which managers can exhibit managerial risk-seeking behaviours (Lewellyn and Muller-Kahle, 2012; Sheikh, 2019). Consequently, the behavioural agency model (BAM) of risk-taking (Wiseman and Gomez-Mejia, 1998) in combination with the approach/inhibition theory of power (Keltner et al., 2003) can provide an alternative theoretical foundation for the association between CEO power and firm risk.

The BAM integrates agency theory and the prospect theory of Kahneman and Tversky (1979) to enhance the explanatory values of agency-based models of executive risk-taking behaviour (Wiseman and Gomez-Mejia, 1998). Prospect theory conceptualizes that individuals do not exhibit a constant risk preference but rather can be risk-averse or risk-seeking based on a reference point. Particularly, people tend to be risk-seeking in a loss domain and risk-averse in a gain domain (i.e., different problem framing). The gain domain is when “available options of varying risk and returns generally promise acceptable expected values” and the loss domain occurs “when available options generally promise unacceptable expected values” (Wiseman and Gomez-Mejia, 1998, pp.135). This is to say, CEOs as individuals can be both risk-seeking and risk-averse (Sawers et al., 2011). Applying the BAM framework to the context of CEO power, we can see that the inhibition/approach theory of power conceptualizes power as a critical source of human interaction that “transforms basic psychological processes” of individuals, and in particular, their behavioural approach system (Magee and Galinsky, 2008, pp. 366; Keltner et al., 2003). Distinct from the behavioural inhibition system, this approach system triggers individuals to focus more on positive outcomes like rewards and achievements (Keltner et al., 2003; Karniol and Ross, 1996). Social psychologists, for example Anderson and Galinsky (2006), provide experimental evidence supporting that the propensity for risk-taking behaviour increases with power because powerful individuals tend to be more optimistic in their perception of risk. Indeed, CEOs with a sense of power are often overconfident about their ability. This causes greater concern for judgment error in risky decisions (Adams et al., 2005; Sah and Stiglitz, 1991).

Consequently, it can be posited that powerful CEOs with more resources, less scrutiny, and fewer constraints would focus their motivations, actions, and emotions more on potential achievements and rewards (the trigger of the CEO approach system). They are thus more likely to commit risk-seeking behaviours because their activated cognitive bias can cause the potential loss or threat to be overlooked (Lewellyn and Muller-Kahle, 2012; Keltner et al., 2003; Anderson and Berhahl, 2002). Accordingly, corporate risk is heightened. Overall, by relaxing the restrictive risk-aversion assumption of the agency-based theory, the behavioural agency model together with the inhibition/approach theory propose an additional positive association between CEO power and firm risk.

1. **LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT**
	1. ***CEO power and firm risk***

There is a growing line of research with a focus on the association between CEO power and risk-taking, and hence, firm risk as a consequence. Nevertheless, the findings remain inconclusive. The relevant of these studies will be discussed in this section, and hypotheses will be developed.

Fernandes et al. (2021) and Pathan (2009) use bank samples, namely publicly listed European banks and large US banks, respectively. They both employ CEO duality as the main measure of CEO power, while Pathan (2009) also use internal hiring of the CEO. Regarding the risk measure, both studies employ total risk, measured by stock return volatility, and Pathan (2009) also considers systematic and idiosyncratic risk of firms. Their findings indicate that banks led by powerful CEOs tend to exhibit lower risk. This holds for periods of crisis and non-crisis. A negative association between CEO power and corporate risk is supported by the agency-based view which holds that CEOs’ wealth is mostly concentrated and tends to depend on the firms they lead. Furthermore, if CEOs receive fixed wages, they do not enjoy so much financial gain if the banks do well, but in the event of bankruptcy, they can lose their job and reputation. They are expected, therefore, to protect their wealth by making corporate safe choices, which can be harmful and value-damaging for firms (Smith and Stulz, 1985). Therefore, if CEOs possess greater power to exert their voice in corporation decision-making and influence the monitoring of the board and other senior management leaders, they are able and likely to act in a conservative and protective manner when it comes to investment, which will be compatible with their self-interest (Johnson et al., 1993) and lower risk.

While CEO power is empirically found to be negatively associated with corporate risk in banks, the association is found to be positive in non-banking firms (Sheikh, 2019; Lewellyn and Muller-Kahle, 2012). A rationale for this is that banks are highly levered corporations so highly exposed to bankruptcy risk. The employment and reputational risk for CEOs in banks are thus more intrinsic to their industry than in others. This drives CEOs towards risk-averse behaviours (Pathan, 2009; Parrino et al., 2005), leading to lower corporate risk. To provide more detail on the non-banking studies, Sheikh (2019) scrutinizes the relationship between powerful CEOs and their corporate risk about market competition and corporate governance. The paper examined US non-banking firms for the years from 1992 through to 2015. Results suggest that significant market competition and effective corporate governance may increase risk-taking tendencies among CEOs with power. Based on the total and idiosyncratic analysis of risk, the results of this study showed that CEOs who had power preferred to take more risks. However, CEOs with more power tended to develop a significant risk-taking disposition mainly when the market competition is high and corporate governance is strong. Lewellyn and Muller-Kahle (2012) also reveal that CEO power and firm risk showed a significantly positive link in the subprime lending industry. Their consistent positive CEO power-risk associations are supported by the behavioural agency theory of Wiseman and Gomez-Mejia (1998), which relaxes the restrictive risk-aversion assumption of agency theory. With the view that CEOs exhibit risk preference ranking from risk-averse to risk-seeking, in combination with the approach/inhibition theory of power (Keltner et al., 2003), it is stipulated that more powerful CEOs are often more optimistic about their decisions’ intrinsic payoffs, while simultaneously disregarding the associated potential downside or risk (Anderson and Galinsky, 2006). As a result, the variability of firm value and risk is higher for firms led by powerful CEOs (Hirshleifer et al., 2012). Lewellyn and Muller-Kahle (2012) also explain their finding that powerful CEOs tended to have “failed to consider the well-established view that subprime mortgages [were] likely to end up in default”, leading them to commit heavily in such high-risk lending.

Since the current study employs a non-banking sample, the prediction on the study findings is based on the previous non-banking studies. Accordingly, the following hypothesis will be tested:

*H1: CEO power is significantly positively correlated with firm risk.*

* 1. ***The 2007 financial crisis and the COVID-19 pandemic crisis***

To delve more into the association between CEO power and firm risk, this study further assesses whether it remains unchanged during crises. CEO power has been documented thus far as increasing firm risk, since CEOs tend to be more optimistic and overlook risk when they have more power. Nevertheless, during the corporate financial distress caused by market-borne crises, corporations are exposed to much greater uncertainty, given that such conditions can raise the awareness of powerful CEOs, reducing their optimism and risk-taking propensity. We therefore expect that the positive power-risk association reduces during crises.

We further examine the effects of the global financial crisis of 2007 (the GFC) and the COVID-19 crisis during 2020-21. The two crises imposed disastrous and knock-on consequences to the global economic and especially financial markets. Their influences extended beyond the economy to affect households’ standards of living, real estate values, tourism, healthcare, collateral health and social concerns, finance, and education. The economic recessions associated with the two crises were relatively comparable. For instance, both emerged in industrialized economies (the United States in 2008 and China at the end of 2019) and their impact then spread worldwide. Such a global impact is difficult to predict and avoid because of its embedded but hidden uncertainty (Knight, 1921; Strauss-Kahn, 2020).

Despite the similarities between the two phenomena in terms of their overall global gravity, the nature and impact of the two have distinctions, and hence possibly different implications on the operations and financial positions of corporations around the globe. For example, the origin of the financial crisis was innately economic – the household-debt bubble – whilst the COVID-19 pandemic health crisis derived from an outbreak external to the economic system (KOF, 2021), and the extent and length of their impacts vary widely in terms of global trade and industrial output. While the damage downstream caused by the two crises is relatively similar, economic recovery post-COVID has proven to be speedier and stronger than that post-GFC (KOF, 2021). This is because the COVID crisis saw global and national responses targeted at controlling the outbreak to directly improve the situation. Overall, due to their distinct natures, it is important to identify whether the two crises have different influences on the way and extent that powerful CEOs might be associated with firm risk.

Therefore, this study focuses on the context of the GFC of 2007 and the COVID-19 pandemic of 2020-21 to find out whether the influence of CEO power on firm risk is mitigated under uncertain and distressed market conditions; the following hypothesis will be tested:

*H2: Crises such as the global financial crisis and COVID crisis negatively affect* *the association between CEO power and firm risk.*

1. **METHODOLOGY**
	1. ***Sample formation***

The study employs a cross-country panel data sample containing publicly listed firms in the G7 countries: the United States, United Kingdom, Germany, France, Italy, Canada, and Japan. The investigation covers the period from 2006 to 2021, throughout which both the global financial crisis 2007 and the COVID-19 crisis are very relevant occurrences. The financial, governance composition, and macro-economic data are obtained from several databases. Particularly, firms’ accounting data and daily stock prices are collected from the Refinitiv Datastream database. The governance-related data, including board composition and CEO characteristics, are obtained from WRDS BoardEx. Lastly, macroeconomic data are from various sources, including the World Bank and International Monetary Fund databases. After dealing with missing values, the final sample employed in this study contains 12,836 firm-year observations. All accounting variables are winsorized at the 1st and 99th percentiles to tackle the potential issue of outliers.

* 1. ***Dependent variable: Firm risk***

To measure firm risk, the study employs three proxies, namely total risk (TR), systematic risk (Risk\_Sys), and idiosyncratic risk (Risk\_Idio). These three measures of corporate risk have been widely used in the literature (Bernile et al., 2018; Anderson and Fraser, 2000; Pathan (2009); inter alia). Following Anderson and Fraser (2000), the risk measures are computed as follows:

Total risk (TR) is equal to the standard deviation of each firm’s daily stock returns for each year. A firm’s daily stock return can be measured as , where Rit is the daily stock return of firm i for day t; Pit and Pi,t-1 are firm i’s closing stock price for day t and day t-1, respectively. The firm total risk captures the volatility of a firm’s stock returns each year, providing the perceptions of market participants about the risks exposed by the firm. Idiosyncratic risk (Risk\_Idio) is measured as the standard deviation of the residuals obtained from the single-index market model, as presented in Equation 1:

 Rit = α + β\*RM,t + ϵi,t (1)

where Rit is the daily stock return of firm i for day t, RM,t is the daily return of the market index for day t, the market index is the main index of each country, and ϵi,t is the error terms. Idiosyncratic risk is the firm-specific risk capturing the influences of firm-specific factors and conditions on the firm’s stock volatility. Systematic risk (Risk\_Sys) is equal to total risk – idiosyncratic risk. This risk is the market risk, capturing the impacts of the whole market conditions on firms.

* 1. ***Main independent variable: CEO power***

CEO power is not a characteristic that can be directly observable (Liu and Jirapor, 2010) so the literature has been debating on more objective proxies, measures, or indicators to capture it (Pfeffer, 1981; Salancik and Pfeffer, 1974; Provan, 1980). Several proxies have been employed by the extant literature. These include: CEO duality, where a firm appoints the same person for both chairman and CEO roles (Haynes and Hillman, 2010; Pathan, 2009); CEO tenure, which captures the length in years they have been in their positions, with logarithm values taken (Onali et al., 2016); and board independence, which measures the proportion of independent (outside) board members (Lewellyn and Muller‐Kahle, 2012; Daily and Johnson, 1997).

In the current study, the main proxy employed for CEO power is the CEO Pay Slice (CPS), which measures the CEO’s relative compensation among top executives. It captures the CEOs’ relative significance in the management team in terms of their contribution, power, and ability. The CPS as a proxy of CEO power has been increasingly used in recent years by, for example, Liu and Jiraporn (2010) and Vo and Canil (2019). It has been claimed to be a more objective, useful, and advantageous measure in comparison to others, due to its ability to capture “the relative centrality of the CEO in the top management team” (Liu and Jiraporn, 2010, pp.748; Finkelstein, 1992) as well as its strong explanatory power for a firm’s corporate outcomes (Bebchuk et al., 2009). Furthermore, CPS is constructed using the compensation of executive directors in the same company, thereby any firm-specific characteristics are controlled for (Bebchuk et al., 2009).

Following the same approach employed in the literature, the CEO pay slice (CPS) is computed as the percentage of a CEO’s total compensation to the total compensation of the top-five executives in each firm. The computation can be written as follows:

 (2)

* 1. ***Controlling variables***

Following the literature (Yung and Chen, 2018; Coles et al., 2006), four groups of controlling variables are employed, namely firm-level characteristics, CEO characteristics, corporate governance composition, and country-level controls. For the firm-specific controls, the study uses firm size (the logarithm of firm total asset), sales growth (annual sale growth, as a percentage), profitability (EBITDA/total asset), research and development expense (the percentage R&D to total asset), growth opportunity (market-to-book ratio), asset tangibility (the percentage of net fixed asset to total asset), market leverage, dividend cut (dummy variable), and cash surplus (the percentage of surplus cash to total asset). For corporate governance and CEO characteristics, the study uses board size (number of board directors), female board representation (the percentage of female directors on board), CEO age, CEO gender, CEO wealth delta, CEO tenure, and CEO education. Lastly, macroeconomic variables are controlled for, including annual GDP growth rate, annual inflation rate, foreign direct investment, trade per capita GDP, financial crisis, and COVID-19 crisis dummies. Table 1 provides detailed computations and explanations of these variables.

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| ***TABLE 1: DEFINITIONS AND MEASURES OF CONTROLLING VARIABLES*** |
| ***VARIABLES (ABBREVIATION)*** | ***DEFINITIONS & MEASURES*** | ***CITATIONS*** |
| Firm size (SIZE) | Firm total asset = ln(TA) | Yung and Chen (2018), Bernile et al. (2018), Coles et al. (2006). |
| Sales growth (Growth) | Annual growth rate in sales = ln | Yung and Chen (2018), Fan et al. (2021). |
| Profitability (Profit) | Corporate earnings =  | Yung and Chen (2018), Bernile et al. (2018). |
| R&D expense (R&D%) | % research and development expense to total asset =  | Yung and Chen (2018), Bernile et al. (2018), Coles et al. (2006). |
| Growth opportunity | Market-to-book value ratio | Yung and Chen (2018), Coles et al. (2006), Bernile et al. (2018). |
| Asset tangibility (CAPEX) | % net fixed asset to total asset =  | Yung and Chen (2018), Bernile et al. (2018), Coles et al. (2006). |
| Market leverage (Leverage) | % of debt financing to firm market value =  | Yung and Chen (2018), Bernile et al. (2018), Coles et al. (2006). |
| Surplus cash (Cash\_surp) | % surplus cash to total asset =  | Yung and Chen (2018), Bernile et al. (2018), Fan et al. (2021). |
| Dividend cut (Div\_cut) | Dummy variable taking the value of 1 if there is a reduction in annual dividend payout, and 0 otherwise | Yung and Chen (2018). |
| Board size (Board\_size) | Number of directors on the firm board of directors | Yung and Chen (2018), Fan et al. (2021). |
| Female representation (%female) | The fraction of female directors on board | Chen et al. (2019), Liu, Tian, and Zhang (2023).

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| CEO age (CEO\_Age) | The biological age of the CEO (in years) | Coles et al. (2006), Fan et al. (2021), Serfling (2014). |
| CEO tenure (CEO\_Tenure) | Number of years that the CEO has been holding their position | Coles et al. (2006), Hirshleifer et al. (2012), Onali, et al. (2016), Lo, and Shiah-Hou, (2022). |
| CEO gender (CEO\_fem) | Dummy variable taking the value of 1 if the CEO is female and 0 otherwise | Fan et al. (2021), Liu, Tian, and Zhang (2023) |
| CEO wealth delta (Delta) | The change in dollar value of the CEO’s wealth for one percentage point change in stock price | Yung and Chen (2018), Coles et al. (2006). |
| CEO education(CEO\_Edu) | Dummy variable taking the value of 1 if the CEO has a masters or higher and 0 otherwise | Fan et al. (2021), Kim and Lu (2011). |
| Financial crisis (Crisis\_F) | Dummy variable taking the value of unity if the firm-year observations fall in the GFC period 2007-2009, and 0 otherwise |  Demirguc‐Kunt et al. (2013). |
| Covid crisis (Crisis\_C) | Dummy variable takes the value of unity if the firm-year observations fall in the COVID-19 crisis period 2020-2021, and 0 otherwise | Garel and Petit-Romec (2021).

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* 1. ***Data analysis: Estimation models***

The study employs the Ordinary Least Square (OLS) with clustered standard error at the firm level as the baseline method. The following regression models will be performed:

TRi,t/Risk\_Idioi,t/Risk\_Sysi,t = αi,t + β1\*CPSi,t + + Year.FE + Industry.FE + Country.FE + ϵi,t,

(3)

The dependent variables are the three primary risk measures capturing the total risk, idiosyncratic risk, and systematic risk of firm I for year t (TRi,t, Risk\_Idioi,t, Risk\_Sysi,t, respectively). CPSi,t is the main independent variable, which is the CEO power proxied by the CEO pay slice (CPS) so β1 captures the potential association between CEO power and firm risk. are all controlling variables accounted for and explained in the previous section, and are their corresponding associations with firm risk. The regression estimation also considers year fixed effect, industry fixed effect, and country fixed effect. These dummy variables tackle the *time-invariant* omitted or unobservable issues that are related to each industry and country. Furthermore, the clustered standard error option is used to deal with the issue of heteroskedasticity and autocorrelation, namely inconstant and correlated error terms, respectively. This cluster option has been claimed to provide true standard errors even when the error terms are not independently and identically distributed (i.i.d), as per White (1980) and Abadie et al. (2022).

* 1. ***Robustness checks***

To provide further assurance to the findings obtained from the baseline method, several robustness checks are performed, which can be classified in the following ways:

* + 1. *Robustness checks with alternative dependent variables*

Three additional risk measures are employed. These are (1) assets return risk (ARR) and (2) bankruptcy risk (Z\_score), and (3) operating risk (SD\_ROA). Following Flannery and Rangan (2008) and Pathan (2009), the ARR measure is computed as follows:

 ARR = SD(Rit) \* \* (4)

On the other hand, the insolvency risk is measured by the Z-score as follows:

 Z\_Score = (5)

where EBIT is the earnings before interest and tax. The higher the Z-score, the lower the bankruptcy risk (Altman, 1983; Altman et al., 2017). Lastly, the operating risk can be measured as the standard deviation of return on assets over the previous 4-year period (t-4, t), following Yung and Chen (2018).

 SD\_ROA = ϭ(ROAt-4,t) (6)

* + 1. *Robustness checks with alternative independent variables*

In addition to the CPS as the main independent variable, this paper will also employ other measures of CEO power, namely the CEO power index, CEO duality, and board independence as robustness checks to provide further assurance to the findings. Their computations are explained below.

The paper constructs an index for CEO power, which is the sum of three CEO-power dummy proxies: CEO pay slice (Cpower\_D), CEO duality, and board independence. The board independence dummy takes the value of 1 if the percentage of independent directors on the board is lower than the median of the sample, and 0 otherwise. Notably, lower board independence is claimed to be associated with higher CEO power, since it is a determinant of board effectiveness. Secondly, Cpower\_D is a dummy variable equal to 1 if the CEO pay slice (CPS) is above the median value of the sample, and 0 otherwise. Lastly, CEO duality is a dummy variable that equals one if the firm’s CEO and chairman roles are held by the same person, and 0 otherwise. By taking the sum of these three dummies, the CEO power index is an ordinary variable with the value 0, 1, 2, or 3. The higher the index, the higher the CEO power.

CEO duality (CEO\_DUAL) is a dummy variable equal to 1 if a firm’s CEO and chairman roles are held by the same person, and 0 otherwise (Lewellyn and Muller-Kahle, 2012). CEO duality occurs when a firm’s CEO is also the board chair, which appears to strengthen the CEO’s position and weaken board monitoring. Perhaps, CEO duality promotes well-informed decision-making and leadership. However, such duality may increase CEO power and a firm’s risk-taking in parallel by decreasing board oversight and their effectiveness in monitoring their CEO’s management activity. Thus, duality may serve CEOs’ interests, but it does not best serve shareholders’ interests. In other words, CEO duality may result in CEO overconfidence, firm risk-taking, and even bankruptcy (Li and Tang, 2010; Lewellyn and Muller-Kahle; 2012).

Board independence (Board\_INDEP\_%) is the fraction of board members who are independent, so not affiliated with the firm (Lewellyn and Muller-Kahle, 2012). Its computation is as follows:

 (7)

CEOs may appoint interdependent boards of directors to act in their favour, but they may not appoint independent boards. Theoretically, a firm’s board should maintain an independent majority to serve the best interests of shareowners and promote independent decision-making to reduce any possible conflicts of interest that may occur between firms and their CEOs (Lewellyn and Muller-Kahle, 2012). Such conflicts arise because interdependent directors are more likely to provide the CEO with more power and less monitoring (Lewellyn and Muller-Kahle, 2012). Therefore, board independence appears to be decisive factor in a firms’ risk-taking. A higher number of independents directors on boards indicates less power for the CEO because independent directors are more likely to reduce the CEO power, imposing greater monitoring to serve the best interests of shareholders (Lewellyn and Muller-Kahle, 2012).

* + 1. *Robustness checks with alternative model estimation approaches*

Whilst cluster standard error can tackle the issues of heteroskedasticity and autocorrelation by providing more efficient and true standard errors, these two statistical issues do not yield biased coefficients. On the other hand, the endogeneity issue in regression can provide biased estimates. Endogenous variables indicate whether a variable is correlated or causes a particular effect. In this regard, simultaneity bias occurs when one or more factors are determined in equilibrium, so that it can plausibly be argued that either factor has the same effect (Roberts and Whited, 2013). Omitted variables are any variables that should be included in the directory of explanatory variables, but for some reason are not (Roberts and Whited, 2013). Measurement errors refers to proxies used for any difficulties in quantifying or observing variables. Such errors in quantifying variables may lead to measurement errors (Roberts and Whited, 2013).

To tackle this problem, five estimation models are employed including the lagged approach and fixed/random effect, the system General Method of Moment (GMM), the instrumental 2-stage least square (2SLS) approach, and the propensity score matching (PSM) approach. First, the lagged approach aims to tackle the issue of simultaneity (reverse causality) by using 1-year lagged independent variables (Chen, 2014). The rationale behind this approach is that explanatory factors this year cannot affect the risk level of a firm in the previous year. The fixed effect is employed if the model is exposed to unobservable variables that do not change over time (time-invariant) (Chen, 2014). If the unobservable variables change across time, the random effect model is more appropriate. The choice between fixed effect and random effect will be decided based on the Hausman test (Guggenberger, 2010). Generally, this approach helps when variable omission is the source of endogeneity.

Furthermore, it is possible that the characteristics of high-power CEOs exhibit distinct patterns that are different from those of low-power CEOs. Such differences can be attributed to the firm risk rather than the power of a CEO per se. Therefore, the PSM method may be able to tackle this issue of selection bias, another source of endogeneity (Shipman et al., 2017).[[1]](#footnote-2) Lastly, the system GMM and 2SLS approaches will be performed, having been claimed to tackle all three sources of endogeneity (Ullah et al., 2018; Gretz, and Malshe, 2019).

* 1. ***Additional analyses: CEO power and firm risk during global financial and health crises***

To examine the differences in the relationship between CEO power and firm risk across financial and non-financial crises and across COVID and non-COVID periods, two approaches are employed:

* + 1. *Difference-in-difference approach*

A difference-in-difference (DiD) approach will also be employed. The CEO power variable (CPS) will be converted to a dummy variable (Cpower\_D), which will take a value of 1 if the firm’s CPS is higher than the industry median (i.e., firms run by a powerful CEOs), and 0 otherwise (i.e., firms run by non-powerful CEOs). An interaction term between the CPS dummy and COVID dummy (Cpower\_Covid) and between the CPS dummy and financial crisis dummy (Cpower\_Crisis) will be included in the baseline OLS Equation 3 (see Equation 7):

TRi,t/Risk\_Idioi,t/Risk\_Sysi,t = αi,t + β1\*Cpower\_Di,t +β2\* Cpower\_Covid + β3\* Crisis\_C + β4\* Cpower\_Crisis + β5\* Crisis\_F + + Year.FE +Firm.FE+ Industry.FE + Country.FE + ϵi,t,

(7)

The DiD approach aims to examine the differences in a response variable (i.e., firm risk) across a group with treatment (i.e., firms run by powerful CEOs) and without treatment (i.e., firms run by non-powerful CEOs) over two distinct periods of time (the global financial crisis and the pandemic health crisis).

* + 1. *OLS cluster estimation on four sub-samples*

The same OLS cluster regression as in Equation 3 will be performed separately on the financial crisis, non-financial crisis, COVID, and non-COVID samples. Subsequently, a Chow’s test will be run to examine the differences in the coefficients of CEO power (CPS) across financial and non-financial crisis samples, and across COVID and non-COVID samples.

* + 1. *Difference-in-difference approach with propensity score matching (PSM)*

A difference-in-difference (DiD) approach with PSM will also be employed. To implement this test, similar to the PSM approach, the CEO power variable (CPS) will be converted to a dummy variable (Cpower\_D), which will take a value of 1 if the firm’s CPS is higher than the industry median (i.e., firms run by powerful CEOs), and 0 otherwise (i.e., firms run by non-powerful CEOs). An interaction term between the CPS dummy and COVID dummy (Cpower\_Covid) and between the CPS dummy and financial crisis dummy (Cpower\_Crisis) will be included in the baseline OLS Equation 3 (see Equation 8):

TRi,t/Risk\_Idioi,t/Risk\_Sysi,t = αi,t + β1\*Cpower\_Di,t + β2\*Cpower\_COVID + β3\*Cpower\_Crisis + + Year.FE + Industry.FE + Country.FE + ϵi,t,

(8)

* + 1. *Association between CEO power and risk across firms with different growth opportunities and R&D* *expenditure*

The OLS cluster regression explained in Equation 3 will be performed separately across different characteristics and conditions of firms: high (low) growth opportunity and high (low) research and development (R&D) intensity. For this purpose, firms will be categorized into those with high growth opportunity, those with low growth opportunity, those with high R&D expenditure, and those with low R&D expenditure. This categorization is essential to observe any significant change in the relationship between a CEO’s power and firm risk across the growth and R&D expenditure spectrum. (Carline et al., 2023)

* + 1. *Association between CEO power and risk across non-financial and financial firms*

Lastly, the OLS cluster regression discussed in Equation 3 will be performed separately across firms. For this purpose, firms will be categorized into financial and non-financial firms. This is necessary to observe any significant changes in the relationship between a CEO’s power and firm risk between financial and non-financial firms.

* 1. **EMPIRICAL FINDINGS**
		1. *Descriptive statistics*

Table 1 illustrates descriptive statistics for all variables during the years from 2006 through 2021. The table comprises a univariate analysis for each dependent variable, independent variable, and control variable. All variables are winsorised at the one percent level to reduce the impact of any potential outliers on the employed variables, following Kim and Lu (2011). Total risk (TR), idiosyncratic risk (Risk\_Idio), and systematic risk (Risk\_sys) exhibit right-skewed distributions; hence, log transformations were employed for them. The three variables have average values of -1.997, -2.007, and -2.289. These are equivalent to 0.035, 0.034, and 0.001, respectively. For the main independent variable, particularly the CEO pay slice (CPS), there is indication that on average CEOs receive a total compensation package that is around 25% of the total top five earning directors of companies; thus, CEOs are commonly the highest earners among these top five. This statistic is similar to that in a study by Li et al. (2018). Regarding control variables, the average CEO age was 63, ranging from 41 to 85. In terms of CEO gender, female CEOs represented around 5% of all the firm-year observations. The average delta of CEOs’ wealth was around 2.9, and the maximum delta was around 9. This indicates that, on average, every one percentage point increase in stock price of a CEO’s operating firm, their wealth (in dollar terms) will increase by 3 percentage points, which is triple the stock price increase. Also, the average CEO tenure was around 1.3 years, a median of 1.20 years, a minimum of 0 years (less than 1 year, newly appointed), and a maximum of 3 years. It also shows that more than half of the CEOs in the full sample had an education master's degree or higher (Mean (CEO\_edu) = 53.5%).

Regarding firm characteristics, the average firm size in the sample was 12.425 (log term) with a minimum value of 5.7 and maximum value of 18.6. The average sales growth rate (Growth) was around 15%, while the median was around 9%. The average of profitability was around -9%, while the median was 5%. The R&D variable has an average of 13%, signifying that firms spend on average around 13% of their total assets on R&D projects. Growth opportunity was the market to book ratio, with a mean of 2.86 and median of 1.69. This implies that market participants value the stock of the sampled firms 300% higher than their book values. This represents the trust and belief of market investors in the future growth of firms. The tangibility of firms is measured by the proportion of total fixed assets to total asset. The average value was around 29% of firms’ total assets are tangible assets such as plants, equipment, buildings, or vehicles. Next, leverage had an average value of 15.5% for the full sample, and a median value of around 10%, ranging from 0% (for unlevered firms) to approximately 74.5%. Cash surplus (cash\_surp) recorded an average value of 25% for the full sample and a median value of around 15%. As shown in the results of the employed data, dividend cut was used as a dummy variable generating the value of 1 if there was a reduction in annual dividend pay-out, and 0 otherwise. The mean value was 16.7% indicating that 16.7% of firm-year observations show a dividend cut over a one-year period. The median value of this variable is 0%. This reveals that firms are very cautious in implementing a dividend cut policy as it is associated with great market sensitivity due to the signalling effects of dividends.

Moving on to board composition, firms appoint an average of 8 directors on the board with a median value of 7. As shown by the data, the average female representation was 10.7% and the median was around 8%, which indicates the proportion of female directors on boards generally. In relation to the global financial crisis, it was employed as a dummy variable with a value of 1 if the firm-year observations fell between 2007 and 2009, or 0 otherwise. In the present study, the total number of observations summed around 49,256, which represented around 19% of the complete observations. For the global health crisis, the COVID variable (Crisis\_C) was employed as a dummy variable generating the value one if the firm-year observations fell between 2020 and 2021, or 0 otherwise. As shown in the data, the total number of observations is 32,912, representing 13% of the whole sample.

|  |
| --- |
| **Table 1: Variable Descriptive Statistics for Full Sample**Table 1 provides the descriptive statistics of all variables employed in the study. **TR** refers to the firm total risk measured by the natural logarithm of the standard deviation of an individual firm’s daily stock returns yearly, **Risk\_Idio** refers to the firm idiosyncratic risk measured by the natural logarithm of the standard deviation of the residuals obtained from the single-index market model, and **Risk\_Sys** refers to the market risk measured by the natural logarithm of the difference between TR and Risk\_Idio. **CPS** captures the percentage of a CEO’s total compensation to the total compensation of the top-five executives in each firm. **CEO\_Age** is thebiological age of the CEO (in years). **CEO\_ female** carries the value1 if the CEO is female and 0 otherwise. **Delta** is the natural logarithm of the change in dollar value of CEOs’ wealth for a one percentage point change in stock price. **CEO\_Tenure** is the natural logarithm of the number of years the CEO has held the position. **CEO\_Edu** is equal to 1 if the CEO has a master’s degree or higher or 0 otherwise. **Size** refers to the logarithm of firm total asset. **Growth** captures the percentage annual growth rate in sales. **Profit** is the ratio of earnings before interest payments and income taxes to total assets. **R&D%** is the R&D expenses to total assets. **Growth\_oppo** is the market-to-book ratio. **CAPEX** captures the percentage of net fixed asset to total asset. **Div\_cut** is a dummy equal to 1 if there is a reduction in annual dividend payout, and 0 otherwise. **Board\_size** is the number of directors on the firm’s board of directors. **%Female** is the fraction of female directors on board. **Financial and COVID crisis** is equal to 1 if the firm-year observations fall in the period 2007-2009 and 2020-2021, and 0 otherwise. **GDP\_growth** measures the percentage growth in GDP for each country. **Inflation\_rate** is the percentage annual change in the consumer price index (CPI) of each country. **Foreign\_Inv** measures foreign direct investment as a percentage of GDP for each country, and **Trade (% of GDP)** measures the percentage of a country’s GDP stemming from trade. |
| **Variable** | **N** | **Mean** | **p50** | **Std.Dev** | **Min** | **Max** | **Skewness** | **Kurtosis** |
| **TR** | 250956 | -1.997 | -2.099 | .417 | -2.303 | .178 | 3.476 | 16.522 |
| **Risk\_Idio** | 250610 | -2.007 | -2.115 | .418 | -2.303 | .177 | 3.498 | 16.596 |
| **Risk\_Sys** | 250610 | -2.289 | -2.299 | .022 | -2.303 | -2.186 | 2.596 | 10.327 |
| **CPS** | 75537 | .241 | 0.222 | .137 | 0 | .75 | .984 | 4.702 |
| **CEO\_Age** | 252493 | 63.456 | 63.800 | 9.023 | 41 | 85.111 | -.106 | 2.824 |
| **CEO\_ female** | 119806 | .049 | 0.000 | .215 | 0 | 1 | 4.196 | 18.608 |
| **Delta** | 76848 | 2.914 | 2.226 | 2.345 | 0 | 8.543 | .613 | 2.215 |
| **CEO\_Tenure** | 263532 | 1.287 | 1.194 | .746 | 0 | 3.199 | .451 | 2.639 |
| **CEO\_Edu** | 99867 | .535 | 1.000 | .499 | 0 | 1 | -.142 | 1.02 |
| **SIZE** | 239488 | 12.435 | 12.473 | 2.603 | 5.681 | 18.553 | -.11 | 2.85 |
| **Growth** | 222624 | .145 | 0.088 | .44 | -1.222 | 2.19 | 1.403 | 9.959 |
| **Profit** | 232304 | -.088 | 0.048 | .504 | -3.315 | .417 | -4.166 | 23.671 |
| **R&D %** | 128272 | .133 | 0.030 | .27 | 0 | 1.797 | 3.906 | 21.038 |
| **Growth\_oppo** | 233888 | 2.869 | 1.690 | 7.286 | -26.49 | 48.35 | 2.601 | 22.652 |
| **CAPEX** | 234496 | .289 | 0.413 | .839 | -5.713 | .997 | -5.016 | 33.25 |
| **Leverage** | 237264 | .155 | 0.099 | .172 | 0 | .745 | 1.351 | 4.383 |
| **Cash\_surp** | 127024 | .25 | 0.149 | .283 | -.119 | .961 | .978 | 2.875 |
| **Div\_cut** | 136902 | .167 | 0.000 | .373 | 0 | 1 | 1.786 | 4.191 |
| **Board\_size** | 239020 | 8.04 | 7.333 | 3.102 | 3 | 18.571 | 1.003 | 3.987 |
| **%Female** | 263532 | .107 | 0.083 | .121 | 0 | .5 | 1.072 | 3.577 |
| **Crisis\_F** | 49256 | .187 | 0.000 | .39 | 0 | 1 | 1.606 | 3.58 |
| **Crisis\_C** | 32912 | .125 | 0.000 | .331 | 0 | 1 | 2.269 | 6.15 |
| **GDP\_ Growth** | 119548 | 1.052 | 1.880 | 2.62 | -9.396 | 6.869 | -2.067 | 7.393 |
| **Inflation\_Rate** | 119548 | 1.785 | 1.850 | .955 | -2.312 | 5.348 | .331 | 7.021 |
| **Foreign\_ Inv** | 119548 | 2.275 | 1.761 | 1.987 | -1.17 | 11.929 | 2.656 | 11.299 |
| **Trade (% of GDP)** | 119548 | 42.208 | 30.790 | 17.45 | 23.376 | 88.434 | .595 | 1.983 |

*N.B: The observation (N) is for each variable, which can be different with the observation of the regressions due to missing data once all variables are included in an estimation model.*

**Table 2: Pairwise correlations matrix**

Table 2 presents the correlation between all the variables analysed in this present study. Bold coefficients signify statistically significant correlations at the 5% critical level or below.

Definitions for variables in the Table are provided in section 5.3 and 5.4. The sample period is from 2006 to 2021.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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) CPS** | 1.000 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(2) CEO\_Age** | **-0.008** | 1.000 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(3) CEO\_ female** | **-0.071** | **-0.086** | 1.000 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(4) Delta** | **0.348** | **0.089** | **-0.127** | 1.000 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(5) CEO\_Tenure** | **0.075** | **0.317** | **-0.049** | **0.164** | 1.000 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(6) CEO\_edu** | **0.058** | **0.019** | 0.004 | **0.190** | **-0.013** | 1.000 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(7) SIZE** | **0.157** | **0.179** | **-0.006** | **0.586** | **0.113** | **0.033** | 1.000 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(8) Growth** | **-0.029** | **-0.100** | **-0.011** | **-0.044** | **-0.118** | **0.010** | **-0.120** | 1.000 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(9) Profit** | **0.028** | **0.121** | **-0.006** | **0.225** | **0.163** | **-0.045** | **0.468** | **-0.075** | 1.000 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(10) R&D %** | **-0.034** | **-0.122** | **0.014** | **-0.125** | **-0.148** | **0.108** | **-0.388** | **0.071** | **-0.652** | 1.000 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **(11) Growth\_oppo** | **0.011** | **-0.075** | **0.008** | **0.111** | **-0.064** | **0.026** | **-0.060** | **0.039** | **0.007** | **0.032** | 1.000 |  |  |  |  |  |  |  |  |  |  |  |  |
| **(12) CAPEX** | **-0.027** | **0.075** | **0.021** | **-0.012** | **0.126** | **0.022** | **0.173** | **-0.026** | **0.505** | **-0.495** | **0.063** | 1.000 |  |  |  |  |  |  |  |  |  |  |  |
| **(13) Leverage** | **0.025** | **0.070** | **-0.022** | **0.054** | **0.044** | **-0.023** | **0.327** | **-0.066** | **0.147** | **-0.209** | **-0.108** | **-0.109** | 1.000 |  |  |  |  |  |  |  |  |  |  |
| **(14) Cash\_surp** | -0.002 | **-0.205** | **0.017** | **-0.017** | **-0.148** | **0.126** | **-0.342** | **0.138** | **-0.350** | **0.449** | **0.108** | **-0.098** | **-0.440** | 1.000 |  |  |  |  |  |  |  |  |  |
| **(15) Div\_cut** | **-0.026** | **0.015** | **0.037** | **-0.084** | **0.042** | **-0.048** | **0.162** | **-0.135** | **0.098** | **-0.116** | **-0.046** | **0.015** | **0.114** | **-0.146** | 1.000 |  |  |  |  |  |  |  |  |
| **(16) Board\_size** | **0.213** | **0.194** | **-0.025** | **0.635** | **0.069** | **0.052** | **0.675** | **-0.097** | **0.222** | **-0.184** | **-0.014** | 0.001 | **0.142** | **-0.206** | **0.084** | 1.000 |  |  |  |  |  |  |  |
| **(17) %Female** | **0.034** | **-0.168** | **0.295** | **0.183** | **-0.046** | **0.030** | **0.205** | **-0.030** | **0.050** | **0.019** | **0.036** | **-0.034** | 0.003 | **0.023** | **0.083** | **0.203** | 1.000 |  |  |  |  |  |  |
| **(18) Crisis\_F** | **-0.010** | **0.023** | **-0.021** | **-0.015** | **-0.006** | **-0.007** | **-0.012** | **-0.010** | **-0.007** | **0.009** | -0.003 | -0.002 | **0.015** | 0.001 | **0.023** | 0.002 | **-0.034** | 1.000 |  |  |  |  |  |
| **(19) Crisis\_C** | 0.005 | **-0.047** | **0.050** | -0.003 | 0.003 | 0.003 | **0.034** | **-0.025** | **0.004** | **-0.019** | -0.002 | **0.012** | **0.012** | 0.005 | **0.062** | **-0.014** | **0.062** | **-0.129** | 1.000 |  |  |  |  |
| **(20) GDP\_ Growth** | **0.043** | **0.163** | **-0.057** | **0.137** | **0.018** | **0.025** | **0.033** | **0.125** | **0.041** | -0.003 | **0.029** | **0.008** | **-0.033** | **-0.009** | **-0.169** | **0.071** | **-0.159** | **-0.275** | **-0.755** | 1.000 |  |  |  |
| **(21) Inflation\_Rate** | **-0.064** | **0.112** | **0.034** | **-0.153** | **-0.027** | **-0.016** | **-0.119** | **0.095** | **0.009** | 0.005 | **0.018** | **0.018** | **-0.043** | 0.001 | **-0.054** | **-0.070** | **-0.069** | **0.007** | **0.053** | 0.001 | 1.000 |  |  |
| **(22) Foreign\_ Inv** | **-0.130** | **0.061** | **0.007** | **-0.264** | **-0.043** | **-0.070** | **-0.146** | **0.058** | **-0.028** | 0.000 | 0.005 | **0.011** | **-0.038** | **-0.046** | **-0.030** | **-0.152** | **-0.127** | **0.139** | **-0.157** | **0.197** | **0.156** | 1.000 |  |
| **(23) Trade (% of GDP)** | **-0.245** | **-0.159** | **0.052** | **-0.726** | -0.003 | **-0.132** | **-0.191** | -0.004 | **-0.050** | **-0.031** | **-0.024** | **0.038** | **-0.020** | **-0.114** | **0.112** | **-0.238** | **0.028** | **-0.034** | **0.009** | **-0.111** | **-0.042** | **0.295** | 1.000 |
|  |

Table 2 displays the Pearson correlation matrix between the employed independent variables. As seen, most correlation pairs are within the weak zone (< 0.5) with a few exceptions. These are Profitability and CAPEX (0.505); Size and CEO Delta (0.586); board size and delta (0.635); board size and growth opportunity (0.675); and GDP growth and COVID crisis (-0.755). The positively correlated value of Profitability and CAPEX can be explained such that when firms achieve a higher profitability, they tend to reinvest their earned returns for future growth on fixed assets. Additionally, the positive associations between firm size and CEO delta, and board size and CEO delta, may be because larger firms and firms with bigger boards provide better compensation and/or incentive packages for CEOs which are linked to stock performance. Furthermore, a positive correlation between board size and growth opportunity supports the literature on the efficiency of bigger boards enhancing the growth opportunity of their firms (Dalton et al. 1999). Lastly, regarding GDP Growth and COVID crisis, it is apparent that the correlation is coincident since the COVID crisis dummy is determined by the years, but not by other characteristics of the crisis.

According to Sharma (2005), any correlation value higher than 0.8 indicates a concern of multicollinearity in the analysed data. In the present study, the highest correlation was around 75%. Therefore, the issue of multicollinearity is not a concern. For greater assurance, additional Variance Inflation Factor (VIF) tests are employed when running regressions and all returned VIF values are less than 10. This once again confirms that the multicollinearity issue is not a significant concern with the employed dataset. These results are available on request from the authors.

* + 1. *CEO power and firm risk: Baseline OLS cluster at firm level.*

Table 3 shows the results of the baseline estimation model (Eq. 3) that was performed using the Ordinary Least Squares (OLS) with clustered standard error at the firm level. First, the association between CEO power and total risk (TR) is captured in Columns 1-4. These represent four variation models. The first includes solely CEO power as the main independent variable with year, industry, and country fixed effects. The second variation model takes into account other CEOs’ characteristics as controlling variables. These are a CEO’s age, gender, delta, tenure, and education. The third variation model additionally controls for firms’ specific characteristics and their boards’ characteristics, including firm size, sales growth, profitability, R&D expense, growth opportunity, asset tangibility, surplus cash, dividend cut, board size, and female directors on the board. The last variation model is the full model containing all variables described in Sections 4.2, 4.3, and 4.4: CEO characteristics, firm characteristics, board characteristics, and microeconomics variables. Across the four model variations, the adjusted R-squared increases and the highest value are obtained for the last full model (Column 4) where all other variables were included. Accordingly, the finding is interpreted based on this full model. The last two columns (Columns 5-6) of Table 3 show the results of the association between CEO power and the two components of total risk, idiosyncratic (Risk\_Idio) and systematic (Risk\_Sys) risk, respectively. These two models contain all variables as included in the full model for total risk (Column 4).

As seen in Table 3, the coefficient β1 of the CEO power variable (CPS) (see Eq.3) shows a positive value of 0.146, 0.18, 0.093, and 0.092 for the four model variations (Columns 1-4), respectively. All these coefficients are statistically significant at the 1% level or below. This indicates a consistent finding on the positive association between CEO power and firm total risk, consistent with Hypothesis 1. Specifically, for every one percent increase in CEO power (measured by a one percent increase in the CEO’s pay, relative to the total pay of the top five directors) would be associated with an approximate 10% increase in firm total risk. Our findings are consistent with Sheikh (2019) and Lewellyn and Muller-Kahle (2012). An explanation for this positive association is that CEOs who are awarded more power tend to be more confident and optimistic about their decision-making, and at the same time, they tend to overlook and underestimate any downside risk associated with their decisions (Anderson and Galinsky, 2006). This justification is built on the approach/inhibition theory of power (Keltner et al., 2003)

Decomposing total risk into idiosyncratic risk and systematic risk, the results of Columns 5-6 indicate that the positive influence of CEO power on firm risk is mainly driven by its influence on firm-specific risk rather than market risk. This can be drawn from the economic significance of the CEO power association with the two risk components. Particularly, although both coefficients are statistically significant at 5% or below (β1 = 0.89 and 0.007, Columns 5-6, respectively), the magnitude of the coefficient in the idiosyncratic risk model is much higher than that in the systematic risk model; it is closer to that of the total risk model. Idiosyncratic risk refers to risk borne by firm decisions so related exclusively to each firm, whilst systematic risk relates to market-borne factors independent of firm strategy or decisions. It is understandable that a powerful CEO will influence and exert greater control over the firm’s strategic decision-making processes, and hence alter the overall risk level of that firm. However, such CEO power seems hardly likely to affect market-borne risks. This may be the reason Sheikh (2019) only focuses on the idiosyncratic risk , a risk that is primarily born by firm-specific factors.

Regarding control variables, the analysis shows that firm total risk is negatively affected by CEO delta, CEO tenure, firm size, profitability, and dividend cut policy, while it is positively affected by firm leverage and tends to be higher during crises. These findings are consistent with the literature (Yung and Chen 2018).

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| **Table 3: Influences of CEO power on firm risk – The baseline estimation model**Table 3 presents the results of the estimation of baseline methods (OLS) with clustered standard error at the firm level from 2006 through to 2021. The dependent variables are total risk (TR) in Columns 1-4; idiosyncratic risk (**Risk\_idio**) in Column 5; and systematic risk (**Risk\_Sys**) in Column 6. **TR** refers to the firm total risk measured by the natural logarithm of the standard deviation of an individual firm’s daily stock returns yearly, **Risk\_Idio** refers to the firm idiosyncratic risk measured by the natural logarithm of the standard deviation of the residuals obtained from the single-index market model, and **Risk\_Sys** refers to the market risk measured by the natural logarithm of the difference between TR and Risk\_Idio. **CPS** captures the percentage of a CEO’s total compensation to the total compensation of the top-five executives in each firm. **CEO\_Age** is thebiological age of the CEO (in years). **CEO\_ female** equals1 if the CEO is female, and 0 otherwise. **Delta** is the natural logarithm of the change in dollar value of a CEO’s wealth for a one percentage point change in stock price. **CEO\_Tenure** is the natural logarithm of the number of years the CEO has held the position. **CEO\_Edu** is equal to 1 if the CEO has a master’s degree or higher, or 0 otherwise. **Size** refers to the logarithm of firm total asset. **Growth** captures the percentage annual growth rate in sales. **Profit** is the ratio of earnings before interest payments and income taxes to total assets. **R&D%** is the R&D expenses to total assets. **Growth\_oppo** is the market-to-book ratio. **CAPEX** captures the percentage of net fixed asset to total asset. **Div\_cut** is a dummy equal to 1 if there is a reduction in annual dividend payout, and 0 otherwise. **Board\_size** is the number of directors on the firm’s board of directors. **%Female** the proportion of female directors on the board. **Financial and COVID crisis** is equal to 1 if the firm-year observations fall in the period 2007-2009 and 2020-2021, and 0 otherwise. **GDP\_growth** measures the percentage growth in GDP of each country, while **Inflation\_rate** is the percentage annual change in the consumer price index (CPI) of each country. **Foreign\_Inv** measures the percentage of GDP that is foreign direct investment for each country, and **Trade (% of GDP)** measures the percentage of each country’s GDP derived from trade. |
| **Variable** | **(1)****TR** | **(2)****TR** | **(3)****TR** | **(4)****TR** | **(5)****Risk\_Idio** | **(6)****Risk\_Sys** |
| **CPS** | .146\*\*\* | .18\*\*\* | .093\*\*\* | .092\*\*\* | .089\*\* | .007\*\*\* |
|  | (0.00) | (0.00) | (.008) | (.008) | (.011) | (.001) |
| **CEO\_Age** |  | -.002\*\*\* | 0.0003 | 0.0003 | 0.0004 | 0.00003 |
|  |  | (0.00) | (.495) | (.519) | (.49) | (.376) |
| **CEO\_ female** |  | -.093\*\*\* | -.005 | -.007 | -.007 | .001 |
|  |  | (0.00) | (.686) | (.565) | (.547) | (.569) |
| **Delta** |  | -.035\*\*\* | -.013\*\*\* | -.013\*\*\* | -.013\*\*\* | -.001\*\*\* |
|  |  | (0.00) | (0.00) | (0.00) | (0.00) | (.003) |
| **CEO\_Tenure** |  | -.015\*\*\* | -.012\*\*\* | -.012\*\*\* | -.013\*\*\* | -.00009 |
|  |  | (0.00) | (.01) | (.009) | (.006) | (.816) |
| **CEO\_Edu** |  | .001 | .01 | .009 | .009 | 0.0002 |
|  |  | (.822) | (.185) | (.197) | (.208) | (.671) |
| **SIZE** |  |  | -.043\*\*\* | -.043\*\*\* | -.048\*\*\* | .004\*\*\* |
|  |  |  | (0.00) | (0.00) | (0.00) | (0.00) |
| **Growth** |  |  | -.01 | -.009 | -.01 | 0.0002 |
|  |  |  | (.47) | (.506) | (.481) | (.527) |
| **Profit** |  |  | -.164\*\*\* | -.164\*\*\* | -.163\*\*\* | -.002\*\* |
|  |  |  | (0.00) | (0.00) | (0.00) | (.046) |
| **R&D %** |  |  | -.008 | -.009 | -.015 | .003 |
|  |  |  | (.908) | (.896) | (.83) | (.21) |
| **Growth\_oppo** |  |  | -.001 | -.001 | -.001 | 0.00006\* |
|  |  |  | (.102) | (.133) | (.105) | (.066) |
| **CAPEX** |  |  | -.024 | -.025 | -.025 | -.001\*\* |
|  |  |  | (.303) | (.274) | (.289) | (.033) |
| **Leverage** |  |  | .169\*\*\* | .168\*\*\* | .178\*\*\* | -.006\* |
|  |  |  | (.001) | (.001) | (0.00) | (.067) |
| **Cash\_surp** |  |  | -.053 | -.053 | -.059\* | .004\*\* |
|  |  |  | (.128) | (.134) | (.099) | (.01) |
| **Div\_cut** |  |  | -.04\*\*\* | -.042\*\*\* | -.045\*\*\* | .003\*\*\* |
|  |  |  | (0.00) | (0.00) | (0.00) | (0.00) |
| **Board\_size** |  |  | .001 | .001 | .001 | -.0001 |
|  |  |  | (.51) | (.557) | (.417) | (.357) |
| **%Female** |  |  | -.12\*\*\* | -.119\*\*\* | -.109\*\* | -.009\*\*\* |
|  |  |  | (.008) | (.009) | (.017) | (.006) |
| **Crisis\_F** |  |  | .152\*\*\* | .246\*\*\* | .219\*\*\* | .033\*\*\* |
|  |  |  | (0.00) | (0.00) | (0.00) | (0.00) |
| **Crisis\_C** |  |  | .137\*\*\* | .2\*\*\* | .183\*\*\* | .016\*\*\* |
|  |  |  | (0.00) | (0.00) | (.001) | (0.00) |
| **GDP\_ Growth** |  |  |  | .008 | .006 | .001\*\*\* |
|  |  |  |  | (.182) | (.29) | (0.00) |
| **Inflation\_Rate** |  |  |  | .021\*\*\* | .022\*\*\* | -.001 |
|  |  |  |  | (.004) | (.003) | (.301) |
| **Foreign\_ Inv** |  |  |  | -.001 | -.001 | .001\*\*\* |
|  |  |  |  | (.787) | (.561) | (0.00) |
| **Trade (% of GDP)** |  |  |  | .005\*\*\* | .004\*\*\* | .001\*\*\* |
|  |  |  |  | (.004) | (.01) | (0.00) |
| **Constant** | -2.003\*\*\* | -1.675\*\*\* | -1.227\*\*\* | -1.608\*\*\* | -1.492\*\*\* | -2.429\*\*\* |
|  | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| **Year fixed effect** | Yes | Yes | Yes | Yes | Yes | Yes |
| **Industry fixed effect** | Yes | Yes | Yes | Yes | Yes | Yes |
| **Country fixed effect** | Yes | Yes | Yes | Yes | Yes | Yes |
|  |   |  |  |  |   |  |
| **Observations** | 35267 | 27887 | 12836 | 12836 | 12685 | 12685 |
| **R-squared** | 0.105 | 0.142 | 0.250 | 0.251 | 0.263 | 0.464 |
| **F-statistic** | 52.808 | 42.017 | 21.255 | 32.699 | 26.238 | 60.48 |

* + 1. *Robustness Check*

As stated earlier, several different sets of robustness tests are conducted. To assure the findings obtained above by the baseline estimations, the fixed effect model and lagged approach are employed to deal with the issues of endogeneity. To identify the choice between fixed effect and random effect models, the Hausman test is employed (Guggenberger, 2010). This test helps deal with the source of omitted variable endogeneity. All Hausman tests yield significant Chi-square values, which indicate that the fixed effect model should be used rather than the random effect model. Second, the lagged approach aims to manage the simultaneity (reverse causality) issue of endogeneity by utilising 1-year lagged independent variables. The rationale behind this is simply that future events cannot influence an event in the past. Particularly, the explanatory factors in the model (CEO power last year (year t-1)) cannot be affected by the dependent variable (firm risk in the current year (year t)). Consistent with the findings of the baseline method, the fixed effect and lagged models show that CEO power is significantly positively associated with all three risks: total risk, idiosyncratic risk and systematic risk.

Further, the paper also employs a two-step system Generalized Method of Moments (GMM) estimator and the instrumental 2-stage least square (2SLS) approach as another robustness estimation. As stated earlier, the fixed effect tackles time-invariant omitted variables, and the lagged approach deals with any reverse causality from endogeneity. The GMM and 2SLS, on the other hand, are employed to tackle all three varieties of endogeneity (Ullah et al.2018; Gretz, and Malshe, 2019). The results of the GMM model show that CEO pay slice (CEO power) recorded positive significant coefficients across all tested GMM models. Nevertheless, we employed the instrumental 2-stage least square (2SLS) approach as well. For its implementation, we adopt two instrumental variables: the median of CPS at the country and industry levels, and CEO retirement (Fan et al., 2021; Chintrakarn et al., 2015). The two key criteria of an instrumental variable (IV) are that the variable is (1) exogenous, and (2) significantly related to the investigated explanatory variable, firm risk. The median value of CEO power (CPS) is employed by other studies (Chintrakarn et al., 2015). The rationale is that median CPS across each industry and country is likely to be positively related to the CPS of the firm, which may be because of similar criteria in the appointment of CEOs in that industry and country, and the relative compensation (relative power) assigned to CEOs should be similar. At the same time, the CPS median value is not a firm characteristic, and is hence likely to be exogenous. We further employ CEO retirement as another instrumental variable, which carries a value of 1 if the time to retirement age of a CEO is less than two years or negative (beyond their retirement age). This variable is exogenous because its key determination is the country’s retirement law and the biological age of the CEO. We predict that this factor is positively related to CEO power because the closer the time to retirement, the more experience CEOs have as a CEO in a corporate environment. Consequently, the higher power is accumulating. In our regression analysis, we report the results of the 2SLS estimator. In the first stage, we regress CEO power on the two IVs: retirement and CPS\_med. The coefficients of CPS\_med and CEO retirement are positive as expected, but the latter is not statistically significant. In the second stage, we regress firm risk variables on fitted values obtained from the first-stage regressions. All results show a positive and significant impact of CEO power on firm risk and its components at the 1% level or below.

The GMM and 2SLS results imply that higher CEO power is expected to lead to higher firm risk. These findings are consistent with those of the baseline method, fixed effect, and lagged approach. Overall, the four alternative estimation models tackling the endogeneity issue presented in this section assure and confirm the findings obtained by the OLS baseline models, supporting the positive association between CEO power and risk.

Robustness checks are further conducted using three alternative measures of firm risk (the dependent variable) and clustered standard error at the firm level. These are the standard deviation of return on asset (STD-ROA), the bankruptcy risk (Z-score), and the accounting rate of return (ARR). Particularly, while the main measure of total risk (TR) focuses more on the fluctuation of stock values (the overall market value of shareholder’s wealth), these three alternative measures of risk capture the accounting risk of firms. The results confirm the main finding that CEO power is positively associated with firm risk. Overall, this robustness test implies that firms awarding CEOs with more power tend to be exposed to higher risks from both book and market aspects.

Another robustness check is implemented with alternative independent variables (CEO power), using clustered standard error at the firm level. The first alternative measure is CEO duality (Lewellyn and Muller-Kahle, 2012), which assumes that firms led by CEOs who are also the board chairman tend to exhibit greater power compared to firms with separate CEOs and chairmen. Results show that firms led by a powerful CEO (proxied by CEO-chairman duality) are exposed to higher risk than firms led by non-powerful CEOs. Consistently, this association is driven by idiosyncratic risk rather than systematic risk. Clearly, CEO power tends to influence firm-specific risk, primarily. Secondly, a firm’s level of board independence is employed as another alternative measure of CEO power, which refers to the proportion of board members that are independent directors. This measure is a reverse proxy of CEO power, such that the higher the board independence value, the less power CEOs possess. The negative coefficients of the board independence variable across the three risk types support the positive effect of CEO power on firm risk, as found in the main findings and other tests. Nevertheless, the associations are statistically insignificant. Lastly, the study constructs an index for CEO power, which is the sum of three CEO-power dummy proxies: CEO pay slice (Cpower\_D), CEO duality, and board independence. Results indicate that a one unit increase in the CEO power index will lead to an increase in total risk, idiosyncratic risk, and systematic risk. Overall, these findings confirm all the tests performed above, which support Hypothesis 1. All these results are not presented here to save space, but they are available from the authors.

* + 1. *Difference in difference approach (DiD)*

For further insight into the association between CEO power and firm risk, we also investigate whether it may hold or differ during turbulences, such as the financial crisis of 2007 and the COVID-19 health crisis of 2020 (Hypothesis 2). The difference in difference (DiD) approach is employed for all three risk measures: total risk, idiosyncratic risk, and systematic risk, as explained earlier. The results are shown in Table 4. Looking at the coefficients of the two crisis dummies (Crisis\_C, and Crisis\_F, for the COVID crisis and financial crisis), the positive and statistically significant coefficients indicate that firm risk tends to be higher during both crises by approximately 10-13% for total risk and idiosyncratic risk (Columns 1-2). This is understandable because during turbulent times, corporations are exposed to greater uncertainty, and hence their stock price fluctuates, symptomatic of firm risk. The economic significance of these two variables has two indications: (1) the risk level of firms is different (particularly, higher) in crisis compared to non-crisis, and (2) the differences in firm risk between crisis and non-crisis are almost the same for both types of crisis.

Nevertheless, when it comes to whether crises influence the association between CEO power and firm risk, a different interpretation is obtained. First, the Cpower\_D yields consistently positive coefficients for all three risks. This indicates that firms run by powerful CEOs are exposed to 2.5% greater risk compared to that of firms run by non-powerful CEOs (for total risk and idiosyncratic risk). This confirms the impact of CEO power on firm risk, which the study has confirmed thus far using different analyses. The interaction terms between the COVID crisis and CEO power and between the global financial crisis and CEO power are statistically insignificant. This implies that both financial and health crises do not exhibit statistically significant influences on the association between CEO power and risk. In other words, firms run by powerful CEOs remain exposed to 2.4% higher risk than firms run by non-powerful CEOs regardless of whether the firms are operating in crisis or non-crisis periods (either health or financial). The findings show that if CEOs have great power and control over their firms, they are likely to exercise it in the same way, and perhaps their views and inclinations within risk-related decision-making also remain the same (optimistic and overlooking uncertainty) during both normal operating and turbulent periods. Consequently, the economic, financial, or public health conditions behind the markets would not influence the association between CEO power and firm risk.

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| **Table 4: CEO power and firm risk across financial and health crises – Difference in Difference (DiD)**Table 4 presents the results of the associations between CEO power and firm risk during the global financial crisis and COVID crises, in comparison to non-crisis periods using the difference in difference (DiD) approach. **TR** refers to the firm total risk measured by the natural logarithm of the standard deviation of an individual firm’s daily stock returns yearly, **Risk\_Idio** refers to the firm idiosyncratic risk measured by the natural logarithm of the standard deviation of the residuals obtained from the single-index market model, and **Risk\_Sys** refers to the market risk measured by the natural logarithm of the difference between TR and Risk\_Idio. **Cpower\_D** is a dummy variable valued at 1 if the CEO pay slide (CPS) is greater than the median value of the sample, and 0 otherwise. **Crisis\_C** and **Crisis\_F** capture the financial and COVID crises, and are equal to 1 if the firm-year observations fall in the period 2007-2009 and 2020-2021, and 0 otherwise. **CEO\_Age** is the biological age of the CEO (in years). **Cpower\_covid** is the interaction term between the Cpower\_D and the Crisis\_C. **Cpower\_crisis** is the interaction term between Cpower\_D and Crisis\_F. **CEO\_ female** equals1 if the CEO is female and 0 otherwise. **Delta** is the natural logarithm of the change in dollar value of the CEO’s wealth for a one percentage point change in stock price. **CEO\_Tenure** is the natural logarithm of the number of years the CEO has held the position. **CEO\_Edu** is equal to 1 if the CEO has a master’s degree or higher, and 0 otherwise. **Size** refers to the logarithm of firm total asset. **Growth** captures the percentage annual growth rate in sales. **Profit** is the ratio of earnings before interest payments and income taxes to total assets. **R&D%** is the R&D expenses to total assets. **Growth\_oppo** is the market-to-book ratio. **CAPEX** captures the percentage of net fixed asset to total asset. **Div\_cut** is the dummy 1 if there is a reduction in annual dividend payout, and 0 otherwise. **Board\_size** is the number of directors on the firm’s board. **%Female** is the proportion of female directors on the board. **GDP\_growth** measures the percentage growth in GDP of each country. **Inflation\_rate** is the percentage annual change in the consumer price index (CPI) of each country. **Foreign\_Inv** measures the percentage of GDP that is foreign direct investment for each country, and **Trade (% of GDP)** measures the percentage of each country’s GDP arising from trade. |
| **Variable** | **TR** | **Risk\_Idio** | **Risk\_Sys** |
| **Cpower\_D** | .024\*\*\* | .023\*\*\* | .002\*\*\* |
|  | (.007) | (.009) | (0.000) |
| **cpower\_covid** | -.018 | -.016 | -.001 |
|  | (.468) | (.525) | (.787) |
| **Crisis\_C** | .119\*\* | .125\*\* | -.009 |
|  | (.039) | (.034) | (.107) |
| **cpower\_crisis** | .018 | .016 | .002 |
|  | (.222) | (.29) | (.186) |
| **Crisis\_F** | .13\*\*\* | .127\*\*\* | .008\* |
|  | (.006) | (008) | (.083) |
| **CEO\_Age** | 0.0002 | 0.0002 | 0.00004 |
|  | (.658) | (.627) | (.253) |
| **CEO\_ female** | -.015 | -.014 | -.001 |
|  | (.217) | (.253) | (.67) |
| **Delta** | -.008\*\*\* | -.008\*\*\* | -0.0004\*\* |
|  | (.001) | (.002) | (.048) |
| **CEO\_Tenure** | -.012\*\*\* | -.013\*\*\* | -0.00005 |
|  | (.009) | (.006) | (.896) |
| **CEO\_Edu** | .012\* | .012\* | 0.0002 |
|  | (.091) | (.094) | (.71) |
| **SIZE** | -.042\*\*\* | -.047\*\*\* | .005\*\*\* |
|  | (0.000) | (0.000) | (0.000) |
| **Growth** | -.038\* | -.04\* | .001 |
|  | (.083) | (.073) | (.332) |
| **Profit** | -.169\*\*\* | -.168\*\*\* | -.003\*\*\* |
|  | (0.000) | (0.00) | (.005) |
| **R&D %** | -.011 | -.017 | .003 |
|  | (.876) | (.805) | (.157) |
| **Growth\_oppo** | -.001\* | -.001\* | 0.00005 |
|  | (.066) | (.054) | (.145) |
| **CAPEX** | -.025 | -.024 | -.001\* |
|  | (.286) | (.299) | (.053) |
| **Leverage** | .172\*\*\* | .181\*\*\* | -.005 |
|  | (.001) | (0.000) | (.12) |
| **Cash\_surp** | -.036 | -.043 | .005\*\*\* |
|  | (.302) | (.226) | (.003) |
| **Div\_cut** | -.045\*\*\* | -.048\*\*\* | .003\*\*\* |
|  | (0.000) | (0.000) | (0.000) |
| **Board\_size** | .003\*\* | .003\*\* | 0.00004 |
|  | (.02) | (.016) | (.745) |
| **%Female** | -.104\*\* | -.097\*\* | -.006\* |
|  | (.02) | (.032) | (.052) |
| **GDP\_ Growth** | -0.0004 | .001 | -.001\*\* |
|  | (.944) | (.911) | (.019) |
| **Inflation\_Rate** | .003 | .008 | -.004\*\*\* |
|  | (.628) | (.261) | (0.000) |
| **Foreign\_ Inv** | -.002 | -.003 | .001\*\*\* |
|  | (.216) | (.103) | (0.000) |
| **Trade (% of GDP)** | -0.0003 | -0.0004 | 0.0001\*\*\* |
|  | (.316) | (.134) | (.002) |
| **Constant** | -1.503\*\*\* | -1.43\*\*\* | -2.377\*\*\* |
|  |  | (0.000) | (0.000) |
| **Year fixed effect** | Yes | Yes | Yes |
| **Industry fixed effect** | Yes | Yes | Yes |
| **Country fixed effect** | Yes | Yes | Yes |
|  |  |  |  |
| **Observations** | 12836 | 12685 | 12685 |
| **R-squared** | 0.244 | 0.256 | 0.451 |
| **F-statistic** | 30.730 | 24.389 | 53.377 |

* + 1. *Subsample approach[[2]](#footnote-3)*

The paper also repeats the tests with four subsamples to check for changes in the results. The OLS models with clustered standard error at the firm level (Eq.3) are performed on four sub-samples: financial crisis, non-financial crisis, COVID, and pre-COVID samples. By performing on crisis and non-crisis subsamples, four coefficients of CEO power (CPS) in each subsample are obtained. Subsequently, Chow’s test is performed to examine whether those CEO power coefficients are statistically different across different subsamples. The results are provided in Table 5.

Regarding the association between CEO power and risk, between financial crisis and non-financial crisis, two CPS coefficients, 0.132 and 0.085 (p-value < 0.1 and 0.05, respectively), indicate that during the financial crisis periods, every one percent increase in CEO power leads to a 13.2% increase in firm total risk. However, during the non-financial crisis period, such an impact fall to 8.5%. Clearly, the positive impact of CEO power on firm risk remains relatively similar across both financial and non-financial crises. This finding is consistent with the DiD approach.

However, findings obtained for the health crisis show that CEOs seem to only exercise their power to increase firm risk during pre-COVID times (β­CPS = 0.101, p-value < 0.01, Table 5, Column 4). However, during the pandemic, CEO power lost its influence on firm risk (β­CPS = 0.015, insignificant, Table 5, Column 3). According to Chow’s test, the difference in the relationship between CEO power and firm risk during COVID and pre-COVID periods is statistically significant.

Overall, using the subsample method, Hypothesis 2 is supported in that the positive effects of CEO power on firm risk are negatively moderated by crises. However, the effects are different between the global financial crisis of 2007 and global health crisis of 2020. Particularly, CEO power loses its effect on firm risk during the COVID crisis but remains unchanged during financial crisis and non-financial crisis. As explained previously, CEOs with more power tend to be more optimistic and underestimate the uncertainty involved with their risk-related decision-making, leading to riskier decisions and hence higher risk outcomes. Nevertheless, it is sensible that during turbulence CEOs should be much more cautious with their risk decision-making due to the surrounding uncertainty caused by the crisis. As a result, CEOs with more power should be more cautious and conservative in their risk-related decision-making during the crises. Nevertheless, the moderating effects are only recorded for the COVID crisis but not the financial crisis.

The inconclusive findings between the two methods (DID OLS and subsample OLS) are partially due to the different in analytical methods and the measures employed. Particularly, for the DiD, CEO pay slice (CPS) is converted into a dummy, while the sub-sample methods employ the original CPS. Therefore, additional checks are performed to clarify the findings and draw a final conclusion on the matter. Specifically, with the same use of the dummy CEO power, we employ the DiD with propensity score matching (PSM) to retest for both Hypothesis 1 and Hypothesis 2.

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| **Table 5: CEO power and firm risk across financial and Covid crises – Sub-sample regressions**Table 5 presents the results of the associations between CEO power and firm risk during the global financial crisis and COVID-19 crisis, using sub-samples of financial crisis, non-financial crisis, COVID and non-COVID periods (together with Chow’s test). The dependent variable employed is **TR** whichrefers to the firm total risk measured by the natural logarithm of the standard deviation of an individual firm’s daily stock returns yearly. **CPS** is the percentage of a CEO’s total compensation to the total compensation of the top-five executives in each firm. **CEO\_Age** is the biological age of the CEO (in years). **CEO\_ female** takes the value1 if the CEO is female, and 0 otherwise. **Delta** the natural logarithm of the change in dollar value of a CEO’s wealth for a one percentage point change in stock price. **CEO\_Tenure** is the natural logarithm of the number of years the CEO has held the position. **CEO\_Edu** equals 1 if the CEO has a master’s degree or higher, and 0 otherwise. **Size** refers to the logarithm of firm total asset. **Growth** captures the percentage annual growth rate in sales. **Profit** is the ratio of earnings before interest payments and income taxes to total assets. **R&D%** is the R&D expenses to total assets. **Growth\_oppo** is the market-to-book ratio. **CAPEX** captures the percentage of net fixed asset to total asset. **Div\_cut** is a dummy equal to 1 if there is a reduction in annual dividend payout, and 0 otherwise. **Board\_size** is the number of directors on the board. **%Female** is the proportion of female directors on the board. **Financial and COVID crisis** is set at 1 if the firm-year observations fall in the period 2007-2009 and 2020-2021, respectively, and 0 otherwise. **GDP\_growth** measures the percentage GDP growth of each country, **Inflation\_rate** is the percentage annual change in the consumer price index (CPI) of each country. **Foreign\_Inv** is the percentage of GDP that is foreign direct investment in each country, and **Trade (% of GDP)** is the percentage of each country’s GDP stemming from trade. |
|  | **Financial Crisis vs Non-Financial crisis** | **COVID and non-COVID crisis** |
| **Variable** | **(1)****Financial Crisis** | **(2)****Non-Financial crisis** | **(3)****COVID** | **(4)****Non-COVID** |
| **CPS** | .132\* | .085\*\* | .015 | .101\*\*\* |
|  | (.069) | (.023) | (.889) | (.003) |
| **CEO\_Age** | -.001 | .001 | .001 | 0.0003 |
|  | (.437) | (.263) | (.534) | (.606) |
| **CEO\_ female** | -.07\*\*\* | .001 | -.024 | -.004 |
|  | (.009) | (.93) | (.366) | (.769) |
| **Delta** | -.012\*\*\* | -.013\*\*\* | -.023\*\*\* | -.012\*\*\* |
|  | (.009) | (0.000) | (.001) | (0.000) |
| **CEO\_Tenure** | -.012 | -.012\*\* | -.01 | -.012\*\*\* |
|  | (.202) | (.019) | (.587) | (.008) |
| **CEO\_Edu** | .018 | .008 | .032 | .007 |
|  | (.233) | (.306) | (.163) | (.322) |
| **SIZE** | -.037\*\*\* | -.044\*\*\* | -.054\*\*\* | -.042\*\*\* |
|  | (0.000) | (0.000) | (0.000) | (0.000) |
| **Growth** | -.024 | -.005 | -.006 | -.009 |
|  | (.306) | (.768) | (.91) | (.549) |
| **Profit** | -.132\*\*\* | -.177\*\*\* | -.121 | -.166\*\*\* |
|  | (.003) | (0.000) | (.139) | (0.000) |
| **R&D %** | -.2\*\* | .059 | .416\* | -.035 |
|  | (.037) | (.465) | (.051) | (.637) |
| **Growth\_oppo** | -.002 | -0.0002 | -.002\*\* | -.001 |
|  | (.143) | (.542) | (.029) | (.289) |
| **CAPEX** | -.053 | -.018 | -.038 | -.026 |
|  | (.108) | (.505) | (.628) | (.208) |
| **Leverage** | .186\*\* | .156\*\*\* | .383\*\*\* | .151\*\*\* |
|  | (.018) | (.005) | (.006) | (.003) |
| **Cash\_surp** | -.015 | -.065\* | .005 | -.055 |
|  | (.777) | (.076) | (.954) | (.125) |
| **Div\_cut** | -.056\*\*\* | -.039\*\*\* | -.088\*\*\* | -.036\*\*\* |
|  | (.001) | (0.000) | (.001) | (0.000) |
| **Board\_size** | .001 | .001 | .003 | .001 |
|  | (.746) | (.494) | (.428) | (.692) |
| **%Female** | -.071 | -.117\*\* | -.079 | -.113\*\* |
|  | (.334) | (.015) | (.54) | (.011) |
| **Crisis\_C** | 0 | .221\*\*\* | - | - |
|  | . | (.001) | - | - |
| **Crisis\_F** | - | - | 0 | .189\*\*\* |
|  | - | - | . | (0.000) |
| **GDP\_ Growth** | -.012 | .008 | .011 | -.005 |
|  | (.397) | (.276) | (.887) | (.497) |
| **Inflation\_Rate** | .037 | .018\* | -.004 | .032\*\*\* |
|  | (.178) | (.082) | (.957) | (0.000) |
| **Foreign\_ Inv** | -.004 | .001 | .015 | -0.0004 |
|  | (.734) | (.745) | (.904) | (.831) |
| **Trade (% of GDP)** | .006 | .006\*\*\* | -.001 | .005\*\*\* |
|  | (.601) | (.007) | (.819) | (.004) |
| **Constant** | -1.543\* | -1.685\*\*\* | -1.064\*\*\* | -1.595\*\*\* |
|  | (.081) | (0.000) | (0.000) | (0.000) |
| **Year fixed effect** | Yes | Yes | Yes | Yes |
| **Industry fixed effect** | Yes | Yes | Yes | Yes |
| **country fixed effect** | Yes | Yes | Yes | Yes |
|  |  |  |  |  |
| **Observations** | 2671 | 10165 | 967 | 11869 |
| **R-squared** | 0.215 | 0.261 | 0.292 | 0.245 |
| **F-statistic** | 38.798 | 26.612 | 6.321 | 22.587 |
| **Chow test** | F (2, 1540) = 13.42\*\*\* | F (2, 1540) = 7.51\*\*\* |

* + 1. *Difference in difference (DiD) with propensity score matching (PSM)*

We further employ the propensity score matching (PSM) approach to re-examine the influences of CEO power on firm risk. PSM tackles sample selection bias. More specifically, according to the logistic test with the CEO power dummy as the dependent variable, the powerful CEO sample tends to be younger, female, and with lower tenure, employed by smaller firms, to mention a few. This implies that the powerful CEO sample may possess distinct characteristics that may contribute to higher firm risk, instead of the CEO power effect per se. Furthermore, we also conduct the same model on the difference sub-sample: financial crisis, non-financial crisis, COVID, and non-COVID crisis, based on which difference in difference statistics are computed to examine the differences in the association between CEO power and risk across different turbulences. The results are presented in Table 6.

First, we test for the ‘balancing property’ of the match using the Rubin’s B and the Rubin’s R (Rosenbaum and Rubin, 1985). According to Rubin (2001) for a successful and effective matching, Rubin’s B should be lower than 25% and Rubin’s R lies between 0.5 and 2. Our results were 18.5% for Rubin’s B, and 0.84 for Robin’s R. In Panel A, the result indicates that after matching powerful CEOs with non-powerful CEOs of the same characteristics (matched by propensity score), the average firm risk of the powerful CEO sample is significantly higher than that of the matched non-powerful CEO sample (**Δ =** 0.0248, p-value < 0.01). This confirms the main findings from the baseline OLS estimation and various robustness checks (Section 6.2). Once again, the PSM result supports Hypothesis 1 in that firms led by powerful CEOs exhibit higher risk than those led by non-powerful CEOs.

Re-examining Hypothesis 2 on the moderating effect of CEO power on firms, we use a DID approach with PSM. The results are shown in Panels B and C for the financial crisis and for COVID crisis, respectively. For the financial crisis, firms led by powerful CEOs are associated with higher risk for both crisis and non-crisis periods (**Δ =** 0.0396 and 0.0247, p-value < 0.05). Using the DID method, the difference in the CEO power effect between crisis and non-crisis is statistically insignificant (Δcrisis – Δnon-crisis = 0.01494, ns). This shows that the effect of CEO power on risk remains unchanged for both crisis periods, which is consistent with the DID OLS and subsample OLS models. Regarding the COVID health crisis (Table 6, Panel C), consistent with the sub-sample approach (Section 6.3.2), CEO power only increases firm risk during a non-COVID crisis and has no significant effect on firm risk during the COVID crisis (Δcovid = 0.0184, ns; Δnon-covid = 0.0293, p-value < 0.01). Computing the DID t-statistic, the difference in a CEO power effect between health crisis and non-health crisis is statistically significant at the 1% level (Δcovid – Δnon-covid = -0.0109, p-value < 0.01).

Overall, after employing a number of tests on the moderating effects of crises, separating financial from health crises, it is concluded that crises tend to mitigate the effects of CEO power on firm risk. As explained in previous sections, during turbulence, CEOs are less optimistic and confident with market conditions due to excessive uncertainty, and so are more cautious and reluctant to exercise their power to increase firm risk. This supports our second hypothesis.

However, this phenomenon only occurs for the COVID health crisis, which may be because of its sudden, unexpected, and unfamiliar nature to corporations and economies. Without much reference and experience in dealing with such crises, executives faced challenges in predicting uncertainties. This put upward pressure on CEOs in strategic decision-making, causing their reluctance in committing to higher risk. For the financial crisis, although the consequences of the crisis were and are prominent and contagious, the nature of the crisis is not a new concept, and in many circumstances, not so unpredictable. Therefore, powerful CEOs’ optimism and confidence remains.

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|  **Table 6: Propensity score matching (PSM) on CEO power and risk – Moderating effects of crises**The table presents the PSM results of the average treatment effects (ATE) and the average treatment effect on the treated (ATT) with 1:1 matching. The ATE and ATT of CEO power on firm risk (Δ) are estimated by the difference between the mean changes of firms with powerful CEOs (Column “Treated”) and that of matched firms with non-powerful CEOs (Column “Non-treated”). T-statistics with robust standard errors are in the final column. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. |
|  |  |  | **Treated**  | **Control** | **Δ**  | **S.E.** | **T-stat** |
| *Panel A: PSM on CEO power and firm risk* |
| *Full sample* | ***TR*** | Unmatched | -2.0445 | -2.0074 | -0.0371\*\*\* | 0.0058 | -6.29 |
| Matched - ATT | -2.0444 | -2.0693 | 0.0248\*\*\* | 0.0090 | 2.75 |
| *Panel B: Difference in difference with PSM: financial and non-financial crisis* |
| *Financial Crisis* | ***TR*** | Unmatched | -1.9790 | -1.9592 | -0.0199 | 0.0141 | -1.41 |
| Matched - ATT | -1.9792 | -2.0188 | 0.0396\*\* | 0.0195 | 2.03 |
| *Non-financial Crisis* | ***TR*** | Unmatched | -2.0558 | -2.0144 | -0.0414\*\*\* | 0.0069 | -5.99 |
| Matched - ATT | -2.0558 | -2.0806 | 0.0247\*\* | 0.0102 | 2.42 |
| **DiD (Δcrisis – Δnon-crisis)** | 0.01494 |  | 0.65 |
| *Panel C: Difference in difference with PSM: COVID and non-COVID crisis* |
| *COVID Crisis* | ***TR*** | Unmatched | -1.9519 | -1.8993 | -0.0527\*\* | 0.02676 | -1.97 |
| Matched - ATT  | -1.9519 | -1.9704 | 0.01840 | 0.03781 | 0.49 |
| *Non-COVID Crisis* | ***TR*** | Unmatched | -2.0459 | -2.0130 | -0.0329\*\*\* | 0.0064 | -5.17 |
|  | Matched - ATT  | -2.0459 | -2.0752 | 0.0293\*\*\* | 0.0091 | 3.21 |
| **DiD (Δcrisis – Δnon-crisis)** | -0.0109 |  | 2.803\*\*\* |

* + 1. *Additional analysis: CEO power on firm risk across non-financial and financial firms and CEO power and firm risk across firms with different growth opportunity and R&D Expenses*

We provide additional analysis. The results are not provided to save space but are available on request from the authors. We provide the differences in the effect of CEO power and firm risk across non-financial firms and financial firms. The results indicate that the association between CEO power and firm risk is statistically significant and positive only in the non-financial firms. In other words, the findings obtained thus far are driven mainly by the non-financial firms. The reason may be that financial firms are strictly followed by analysts and are exposed to considerable regulations and guidelines.

Lastly, we extend the analysis to examine the effects of CEO power on firm risk across different levels of a firm’s current R&D expenses, and growth opportunity. The results show that the positive effects of CEO power on firm risk remains unchanged across high-growth and low-growth firms. Nevertheless, the effect is weakened for high-growth firms, i.e., with lower economic significance. In other words, CEOs exercise their power to increase firm risk more strongly if the firms possess low growth opportunity. This may be because higher risk is often associated with higher returns so CEOs with power are more optimistic and confident that they can increase the growth rate of their low-growth firms by taking on higher risk.

In terms of R&D expense, the positive association between CEO power and firm risk is mainly driven by firms with low R&D expenses. The reason lies in the risk-taking capacity of firms, which is linked to their R&D expenditure (Yung and Chen 2018). Firms having low R&D expenditure signifies a lower risk level (higher risk-taking capacity) in comparison to high R&D spending firms. Therefore, with a greater risk capacity, powerful CEOs can be more confident in employing their power to increase firm risk for higher firm performance.

1. **DISCUSSION AND CONCLUSIONS**

This paper investigates the influence of CEO power on firm risk in an international context during the 2007 global financial crisis and COVID-19 crisis. The study combined agency theory with the behavioural agency model and inhibition/approach theory to explain the relationship between CEO power and firm risk using G7-listed firms. Cross-country panel data of 12,836 firm-year observations covering the period from 2006 to 2021 are employed. The study provides empirical evidence of a significant positive relationship between CEO power and three types of firm risk: total risk, idiosyncratic risk, and systematic risk. The economic significance is more pronounced for total risk and idiosyncratic risk, indicating a positive influence of CEO power on firm risk being mainly driven by firm-specific risk. The data were obtained from multiple sources, namely DataStream, BoardEx, the World Bank, and International Monetary Fund. Lewellyn and Muller‐Kahle (2012) recommended further research into the power of CEOs, through developing a measure of possible sources of their compensation and power. Accordingly, this study adopts CEO compensation (CPS) and confirms the results of Lewellyn and Muller‐Kahle (2012) and Sheikh (2019).

Our findings confirm these two studies conducted on firm samples, concluding that CEO power is significantly positively correlated with firm risk. Extending their findings, this study also finds that the association between CEO power and risk is stronger in non-crisis periods. This suggests that power may allow and incline CEOs to take more risk in times of financial stability and discourage them (or at least encourage caution) in taking risk during crises. This argument complements the premise of the behavioural agency model together with inhibition/approach theory, that CEOs’ risk-taking behaviour increases with power due to their propensity to be optimistic in their perceptions of risk (Anderson and Galinsky, 2006). A distinction is made between the 2007 global financial crisis and 2020 COVID crisis. Particularly, the increased risk with CEO power remains relatively unchanged across financial crises and non-financial crises. However, such an effect only remains during non-COVID crises and disappears during COVID crises. This may be because the optimism and confidence of powerful CEOs is reduced during turbulence that they are unfamiliar with and have no reference to or experience of, which was the COVID case. Conceivably, CEOs with power are more reluctant to increase firm risk during new or ‘strange’ occurrences like a pandemic. It is possible that, if there is a similar public health crisis in the future, the association between CEO power and firm risk will be detected since the health crisis will then have become a familiar phenomenon that they have experience of.

The findings of this study offer international empirical evidence for the relationship between CEO power and firms’ risk-taking, which has several implications in practice, particularly for firms, current and potential investors, and regulators or policymakers. For example, policymakers can use our evidence as a proactive tool to anticipate the impact of crises on investors and markets by analysing how CEO power affects corporate risk. Regulators may also establish improved rules and regulations to minimize risk and prevent future turbulence. Firms and investors can enjoy deeper insights into how to manage risks associated with powerful CEOs, based on the mentioned recommendations. Hence, this study is helpful for enhancing senior managers’ hiring criteria, and understanding the risks associated with powerful CEOs during crises. Furthermore, as shown in this study, power helps to reduce extremely conservative attitudes in the risk-taking of CEOs. Such risk-aversion appears to be detrimental to shareholder’s wealth accumulation. As the key findings of this study demonstrate, CEO power is more likely to cause firm risk to increase, in line with those of Finkelstein and Hambrick (1996) and Lewellyn and Kahle (2012). In this respect, the board of directors and top management are encouraged to delegate more power to CEOs to achieve positive outcomes and meet firms’ objectives. This is because CEO power is expected to work effectively and achieve a reasonable return on investment. However, they should reduce authoritarian CEOs’ power and adopt strict corporate governance as appropriate to obtain firms’ potential and restrict CEOs’ risk-based compensation. At the same time, the demonstrated positive relationship between CEO power and risk acts as a wake-up call for any management layers in a corporation, though especially the board of directors, to pay more attention to the risk-taking by powerful CEOs and assure value-enhancing risk-taking strategies, because higher risk can eventually lead to excessive risk, which is detrimental to firms if not under cautious surveillance.

Similar signals and alerts are sent to other stakeholders, including shareholders and regulators, that put upward pressure on firms led by powerful CEOs. This is because the evidence provided serves as a stable governance tool that enables: firms’ top management teams to impose vigilant monitoring to maximize corporate profit and reduce costs related to risk-taking; investors to employ more rigid analyses of firms’ risk-taking behaviours; and policymakers to apply relevant and prudential governance regulations related to risk, enhancing the health and sustainability of corporate environments and financial markets (Lewellyn and Muller-Kahle, 2012).

Furthermore, the empirical evidence offered in this study enhances international boards and other senior decision-makers’ awareness and consideration of the relationship between CEO power and firm risk under the influence of worldwide health and financial crises (Sheikh, 2019). Policymakers constantly attempt to influence legislation to impose monitoring policies on firm activities, including risk-taking (Sheikh, 2019), specifically during or after times of crisis. The 2007 financial crisis and 2020 COVID pandemic are among the riskiest events since the Great Depression of 1929-1932 (Moschonas, 2020) and these two reveal the sheer vulnerability of the global economy and its impact on corporate risk-taking. Therefore, it is more critical to evaluate and critically examine the determinants of firm risk today than ever before.

**References**

Abadie, A., Athey, S., Imbens, G.W. and Wooldridge, J.M. (2022) “When should you adjust standard errors for clustering?”, *The Quarterly Journal of Economics*, 138(1), pp. 1–35. Available at: <https://doi.org/10.1093/qje/qjac038>.

Adams, R.B., Almeida, H. and Ferreira, D. (2005) “Powerful CEOS and their impact on corporate performance,” *Review of Financial Studies*, 18(4), pp. 1403–1432. Available at: <https://doi.org/10.1093/rfs/hhi030>.

Altman, E.I. (1983) “Why businesses fail,” *Journal of Business Strategy*, 3(4), pp. 15–21. Available at: <https://doi.org/10.1108/eb038985>.

Altman, E.I., Iwanicz‐Drozdowska, M., Laitinen, E.K. and Suvas, A. (2016) “Financial distress prediction in an international context: A review and empirical analysis of Altman's *z-*score model,” *Journal of International Financial Management & Accounting*, 28(2), pp. 131–171. Available at: <https://doi.org/10.1111/jifm.12053>.

Amihud, Y. and Lev, B. (1981) “Risk reduction as a managerial motive for conglomerate mergers,” *The Bell Journal of Economics*, 12(2), p. 605. Available at: <https://doi.org/10.2307/3003575>.

Anderson, C. and Berdahl, J.L. (2002) “The experience of power: Examining the effects of power on approach and inhibition tendencies,” *Journal of Personality and Social Psychology*, 83(6), pp. 1362–1377. Available at: <https://doi.org/10.1037/0022-3514.83.6.1362>.

Anderson, C. and Galinsky, A.D. (2006) “Power, optimism, and risk-taking,” *European Journal of Social Psychology*, 36(4), pp. 511–536. Available at: <https://doi.org/10.1002/ejsp.324>.

Anderson, R.C. and Fraser, D.R. (2000) “Corporate Control, bank risk taking, and the health of the Banking Industry,” *Journal of Banking & Finance*, 24(8), pp. 1383–1398. Available at: [https://doi.org/10.1016/s0378-4266(99)00088-6](https://doi.org/10.1016/s0378-4266%2899%2900088-6).

Bebchuk, L., Cohen, A. and Ferrell, A. (2008) “What matters in corporate governance?,” *Review of Financial Studies*, 22(2), pp. 783–827. Available at: <https://doi.org/10.1093/rfs/hhn099>.

Bernile, G., Bhagwat, V. and Yonker, S. (2018) “Board diversity, firm risk, and corporate policies,” *Journal of Financial Economics*, 127(3), pp. 588–612. Available at: <https://doi.org/10.1016/j.jfineco.2017.12.009>.

Bosse, D.A. and Phillips, R.A. (2016) “Agency theory and bounded self-interest,” *Academy of Management Review*, 41(2), pp. 276–297. Available at: <https://doi.org/10.5465/amr.2013.0420>.

Brisley, N., Cai, J. and Nguyen, T. (2021) “Required CEO stock ownership: Consequences for risk-taking and compensation,” *Journal of Corporate Finance*, 66, p. 101850. Available at: <https://doi.org/10.1016/j.jcorpfin.2020.101850>.

Carline, N.F., Pryshchepa, O. and Wang, B. (2023) “CEO compensation incentives and playing it safe: Evidence from FAS 123R,” *Journal of Financial and Quantitative Analysis*, pp. 1–82. Available at: <https://doi.org/10.1017/s0022109023000017>.

Carpenter, M.A., Pollock, T.G. and Leary, M.M. (2003) “Testing a model of reasoned risk-taking: Governance, the experience of principals and agents, and global strategy in high-technology IPO firms,” *Strategic Management Journal*, 24(9), pp. 803–820. Available at: <https://doi.org/10.1002/smj.338>.

Chen, H.-L. (2014) “Board capital, CEO power and R&D investment in electronics firms”, *Corporate Governance: An International Review*, 22(5), pp. 422–436. Available at: <https://onlinelibrary.wiley.com/doi/abs/10.1111/corg.12076>.

Chen, J., Leung, W.S., Song, W. and Goergen, M. (2019) “Why Female Board Representation Matters: The role of female directors in reducing male CEO overconfidence,” *Journal of Empirical Finance*, 53, pp. 70–90. Available at: <https://doi.org/10.1016/j.jempfin.2019.06.002>.

Chintrakarn, P., Jiraporn, P. and Tong, S. (2014) “How do powerful CEOS view corporate risk-taking? evidence from the CEO pay slice (CPS)”, *Applied Economics Letters*, 22(2), pp. 104–109. <https://doi:10.1080/13504851.2014.927565>.

Climate Transparency (2018) “G7 countries' transition towards a low-carbon economy, Climate Transparency,” *Climate Transparency*. Available at: <https://www.climate-transparency.org/g7-countries-performance-in-the-transition-towards-a-low-carbon-economy> (Accessed: February 29, 2022).

Çolak, G. and Korkeamäki, T. (2021) “CEO mobility and corporate policy risk,” *Journal of Corporate Finance*, 69, p. 102037. Available at: <https://doi.org/10.1016/j.jcorpfin.2021.102037>.

Coles, J. L., Daniel, N. D., and Naveen, L. (2006) “Managerial incentives and risk-taking,” *Journal of Financial Economics*, 79(2), pp. 431–468. Available at: <https://doi.org/10.1016/j.jfineco.2004.09.004>.

Contessi, S., De Pace, P. and Guidolin, M. (2014) “How did the financial crisis alter the correlations of U.S. yield spreads?,” *Journal of Empirical Finance*, 28, pp. 362–385. Available at: <https://doi.org/10.1016/j.jempfin.2014.04.005>.

Daily, C.M. and Johnson, J.L. (1997) “Sources of CEO power and firm Financial Performance: A longitudinal assessment,” *Journal of Management*, 23(2), pp. 97–117. Available at: <https://doi.org/10.1177/014920639702300201>.

Dalton, D.R., Daily, C.M., Johnson, J.L. and Ellstrand, A.E. (1999) “Number of directors and Financial Performance: A meta-analysis,” *Academy of Management Journal*, 42(6), pp. 674–686. Available at: <https://doi.org/10.5465/256988>.

Demirguc‐Kunt, A., Detragiache, E. and Merrouche, O. (2013) “Bank Capital: Lessons from the financial crisis,” *Journal of Money, Credit and Banking*, 45(6), pp. 1147–1164. Available at: <https://doi.org/10.1111/jmcb.12047>.

Eisenhardt, K.M. (1989) “Agency theory: An assessment and review,” *Academy of Management Review*, 14(1), pp. 57–74. Available at: <https://doi.org/10.5465/amr.1989.4279003>.

Fan, Y., Boateng, A., Ly, K.C. and Jiang, Y. (2021) “Are bonds blind? Board-CEO social networks and firm risk,” *Journal of Corporate Finance*, 68, p. 101922. Available at: <https://doi.org/10.1016/j.jcorpfin.2021.101922>.

Fernandes, C., Farinha, J., Martins, F.V. and Mateus, C. (2021) “The impact of board characteristics and CEO Power on Banks’ risk-taking: Stable versus crisis periods,” *Journal of Banking Regulation*, 22(4), pp. 319–341. Available at: <https://doi.org/10.1057/s41261-021-00146-4>.

Finkelstein, S. (1992) “Power in top management teams: Dimensions, measurement, and validation,” *Academy of Management Journal*, 35(3), pp. 505–538. Available at: <https://doi.org/10.5465/256485>.

Finkelstein, S., and Hambrick, D.C. (1996) *Strategic leadership: Top executives and their effects on organizations*. Minneapolis, St. Paul: West Publishing Company. Available at: <https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=ced267755e751bdcde737ce6d26ee2c32053ca6f>.

Flannery, M.J. and Rangan, K.P. (2007) “What caused the bank capital build-up of the 1990s?,” *Review of Finance*, 12(2), pp. 391–429. Available at: <https://doi.org/10.1093/rof/rfm007>.

Garel, A. and Petit-Romec, A. (2021) “Investor rewards to environmental responsibility: Evidence from the COVID-19 crisis,” *Journal of Corporate Finance*, 68, p. 101948. Available at: <https://doi.org/10.1016/j.jcorpfin.2021.101948>.

Gretz, R.T. and Malshe, A. (2019) ‘Rejoinder to “endogeneity bias in marketing research: Problem, causes and remedies”’, Industrial Marketing Management, 77, pp. 57–62. <https://doi:10.1016/j.indmarman.2019.02.008>.

Grinstein, Y. and Hribar, P. (2004) “CEO compensation and incentives: Evidence from M&A bonuses,” *Journal of Financial Economics*, 73(1), pp. 119–143. Available at: <https://doi.org/10.1016/j.jfineco.2003.06.002>.

Guggenberger, P. (2010) “The impact of a Hausman pretest on the size of a hypothesis test: The Panel Data Case,” *Journal of Econometrics*, 156(2), pp. 337–343. Available at: <https://doi.org/10.1016/j.jeconom.2009.11.003>.

Haynes, K.T. and Hillman, A. (2010) “The effect of board capital and CEO power on strategic change,” *Strategic Management Journal*, 31(11), pp. 1145–1163. Available at: <https://doi.org/10.1002/smj.859>.

Hirshleifer, D., Low, A. and Teoh, S.H. (2012) “Are overconfident CEOS better innovators?,” *The Journal of Finance*, 67(4), pp. 1457–1498. Available at: <https://doi.org/10.1111/j.1540-6261.2012.01753.x>.

<https://discoversocialsciences.com/wp-content/uploads/2018/03/knight-uncertainty-and-profit.pdf>.

Huber, C. and Scheytt, T. (2013) “The dispositif of risk management: Reconstructing risk management after the financial crisis,” *Management Accounting Research*, 24(2), pp. 88–99. Available at: <https://doi.org/10.1016/j.mar.2013.04.006>.

Johnson, R.A., Hoskisson, R.E. and Hitt, M.A. (1993) “Board of director involvement in restructuring: The effects of board versus managerial controls and characteristics,” *Strategic Management Journal*, 14(S1), pp. 33–50. Available at: <https://doi.org/10.1002/smj.4250140905>.

Kahneman, D. and Tversky, A. (1979) “Prospect theory: An analysis of decision under risk,” *Econometrica*, 47(2), p. 263. Available at: <https://doi.org/10.2307/1914185>.

Karniol, R. and Ross, M. (1996) “The motivational impact of temporal focus: Thinking about the future and the past,” *Annual Review of Psychology*, 47(1), pp. 593–620. Available at: <https://doi.org/10.1146/annurev.psych.47.1.593>.

Keltner, D., Gruenfeld, D.H. and Anderson, C. (2003) “Power, approach, and inhibition,” *Psychological Review*, 110(2), pp. 265–284. Available at: <https://doi.org/10.1037/0033-295x.110.2.265>.

Kim, E.H. and Lu, Y. (2011) “CEO ownership, external governance, and risk-taking,” *Journal of Financial Economics*, 102(2), pp. 272–292. Available at: <https://doi.org/10.1016/j.jfineco.2011.07.002>.

Knight, F.H. (1921) *Risk, uncertainty and profit* (Vol. 31). Houghton Mifflin*.* Available at:

KOF Swiss Economic Institute (2021)“Comparing the coronavirus crisis and the financial crisis: Eight differences and similarities,” Available at: <https://kof.ethz.ch/en/news-and-events/kof-bulletin/kof-bulletin/2021/10/Comparing-the-coronavirus-crisis-and-the-financial-crisis-eight-differences-and-similarities.html>. (Accessed: February 29, 2022).

Lewellyn, K.B. and Muller-Kahle, M.I. (2012) “CEO power and risk taking: Evidence from the subprime lending industry,” *Corporate Governance: An International Review*, 20(3), pp. 289–307. Available at: <https://doi.org/10.1111/j.1467-8683.2011.00903.x>.

Li, J. and Tang, Y. (2010) “CEO hubris and firm risk taking in China: The moderating role of managerial discretion,” *Academy of Management Journal*, 53(1), pp. 45–68. Available at: <https://doi.org/10.5465/amj.2010.48036912>.

Li, Y., Gong, M., Zhang, X.Y. and Koh, L. (2018) “The impact of environmental, social, and governance disclosure on firm value: The role of CEO power,” *The British Accounting Review*, 50(1), pp. 60–75. Available at: <https://doi.org/10.1016/j.bar.2017.09.007>.

Liu, M.-H., Tian, S. and Zhang, Y. (2023) “CEO marital status and Corporate Tax Planning Behavior”, *Review of Quantitative Finance and Accounting*, pp.1-36. Available at: <https://link.springer.com/article/10.1007/s11156-023-01178-9>.

Liu, Y. and Jiraporn, P. (2010) “The effect of CEO power on bond ratings and yields,” *Journal of Empirical Finance*, 17(4), pp. 744–762. Available at: <https://doi.org/10.1016/j.jempfin.2010.03.003>.

Lo, H.-C. and Shiah-Hou, S.-R. (2022) “The effect of CEO power on overinvestment”, *Review of Quantitative Finance and Accounting*, 59(1), pp. 23–63. Available at: <https://link.springer.com/article/10.1007/s11156-022-01060-0>

Magee, J.C. and Galinsky, A.D. (2008) “8 social hierarchy: The Self‐reinforcing nature of power and status,” *Academy of Management Annals*, 2(1), pp. 351–398. Available at: <https://doi.org/10.5465/19416520802211628>.

Markowitz, H. (1952) “The utility of wealth,” *Journal of Political Economy*, 60(2), pp. 151–158. Available at: <https://doi.org/10.1086/257177>.

Moschonas, G. (2020) “Paradigm shifts in the light of the past: The 1929 crash, the Great Recession of 2008 and the COVID-19 crisis,” *openDemocracy*. Available at: <https://www.opendemocracy.net/en/can-europe-make-it/paradigm-shifts-light-past-1929-crash-great-recession-2008-and-covid-19-crisis/>. (Accessed: March 6, 2022).

Neyland, J. (2020) “Love or money: The effect of CEO divorce on firm risk and compensation,” *Journal of Corporate Finance*, 60, p. 101507. Available at: <https://doi.org/10.1016/j.jcorpfin.2019.101507>.

Onali, E., Galiakhmetova, R., Molyneux, P. and Torluccio, G. (2016) “CEO power, government monitoring, and bank dividends,” *Journal of Financial Intermediation*, 27, pp. 89–117. Available at: <https://doi.org/10.1016/j.jfi.2015.08.001>.

Parrino, R., Poteshman, A.M. and Weisbach, M.S. (2005) “Measuring investment distortions when risk-averse managers decide whether to undertake risky projects,” *Financial Management*, 34(1), pp. 21–60. Available at: <https://doi.org/10.1111/j.1755-053x.2005.tb00091.x>.

Pathan, S. (2009) “Strong Boards, CEO power and bank risk-taking,” *Journal of Banking & Finance*, 33(7), pp. 1340–1350. Available at: <https://doi.org/10.1016/j.jbankfin.2009.02.001>.

Pfeffer, J. (1981) “Understanding the role of power in decision making,” *Power in Organizations,* pp.404–423.

Provan, K.G. (1980) “Board power and organizational effectiveness among human service agencies,” *Academy of Management Journal*, 23(2), pp. 221–236. Available at: <https://doi.org/10.5465/255428>.

Roberts, M.R. and Whited, T.M. (2013) “Endogeneity in empirical corporate finance,” *Handbook of the Economics of Finance*, pp. 493–572. Available at: <https://doi.org/10.1016/b978-0-44-453594-8.00007-0>.

Rosenbaum, P.R. and Rubin, D.B. (1985) “Constructing a control group using multivariate matched sampling methods that incorporate the propensity score,” *The American Statistician*, 39(1), p. 33–38. Available at: <https://doi.org/10.2307/2683903>.

Rubin, D.B. (2001) “Using propensity scores to help design observational studies: application to the tobacco litigation”, *Health Services and Outcomes Research Methodology*, 2(3/4), pp. 169–188. Available at: [https://doi.org/10.1023/a:1020363010465](https://doi.org/10.1023/a%3A1020363010465).

 Sah, R.K. and Stiglitz, J.E. (1991) “The quality of managers in centralized versus decentralized organizations,” *The Quarterly Journal of Economics*, 106(1), pp. 289–295. Available at: <https://doi.org/10.2307/2937917>.

Salancik, G.R. and Pfeffer, J. (1974) “The bases and use of power in organizational decision making: The case of a university,” *Administrative Science Quarterly*, 19(4), p. 453–473. Available at: <https://doi.org/10.2307/2391803>.

Sawers, K., Wright, A. and Zamora, V. (2011) “Does greater risk-bearing in stock option compensation reduce the influence of problem framing on managerial risk-taking behavior?,” *Behavioral Research in Accounting*, 23(1), pp. 185–201. Available at: <https://doi.org/10.2308/bria.2011.23.1.185>.

 Serfling, M.A. (2014) “CEO age and the riskiness of corporate policies,” *Journal of Corporate Finance*, 25, pp. 251–273. Available at: <https://doi.org/10.1016/j.jcorpfin.2013.12.013>.

Sharma, A.K. (2005) *Text book of correlations and regression*. New Delhi: Discovery Publishing House*.*

Sheikh, S. (2019) “CEO power and corporate risk: The impact of Market Competition and corporate governance,” *Corporate Governance: An International Review*, 27(5), pp. 358–377. Available at: <https://doi.org/10.1111/corg.12285>.

Shipman, J.E., Swanquist, Q.T. and Whited, R.L. (2016) “Propensity score matching in accounting research,” *The Accounting Review*, 92(1), pp. 213–244. Available at: <https://doi.org/10.2308/accr-51449>.

Smith, C.W. and Stulz, R.M. (1985) “The determinants of firms' hedging policies,” *The Journal of Financial and Quantitative Analysis*, 20(4), p. 391. Available at: <https://doi.org/10.2307/2330757>.

 Strauss-Kahn, M.O. (2020) “Can we compare the COVID 19 and 2008 crises,” *Atlantic Council, 5.* Available at: <https://www.suerf.org/docx/f_dfdfab9941ac833a0c364aa2e608185e_13389_suerf.pdf>. (Accessed: February 20, 2022).

Ullah, S., Akhtar, P. and Zaefarian, G. (2018) “Dealing with endogeneity bias: The generalized method of moments (GMM) for panel data,” *Industrial Marketing Management*, 71, pp. 69–78. Available at: <https://doi.org/10.1016/j.indmarman.2017.11.010>.

Vo, T.T. and Canil, J.M. (2019) “CEO pay disparity: Efficient Contracting or managerial power?,” *Journal of Corporate Finance*, 54, pp. 168–190. Available at: <https://doi.org/10.1016/j.jcorpfin.2016.10.002>.

White, H. (1980) “A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity,” *Econometrica*, 48(4), p. 817–838. Available at: <https://doi.org/10.2307/1912934>.

Wiseman, R.M. and Gomez-Mejia, L.R. (1998) “A behavioral agency model of managerial risk taking,” *Academy of Management Review*, 23(1), pp. 133–153. Available at: <https://doi.org/10.5465/amr.1998.192967>.

Yung, K. and Chen, C. (2017) “Managerial ability and firm risk-taking behavior,” *Review of Quantitative Finance and Accounting*, 51(4), pp. 1005–1032. Available at: <https://doi.org/10.1007/s11156-017-0695-0>.

1. Note that to perform this estimation approach, the main independent variable (CPS), which is denoted as a percentage, will be converted to a dummy variable. This dummy will take a value of 1 if the firm’s CPS is higher than the industry median (i.e., firms run by powerful CEOs), and 0 otherwise (i.e., firms run by non-powerful CEOs). [↑](#footnote-ref-2)
2. We performed an additional analysis considering two years before COVID-19 pandemic started (2018 and 2019) and during the pandemic (2020 and 2021). We obtained consistent results that further support our main findings that CEOs seem to only exercise their power to increase firm risk during pre-COVID times. This suggests that CEOs may practice with more caution during a novel crisis such as COVID-19, compared to normal times. All these results are not presented here to save space, but they are available from the authors. [↑](#footnote-ref-3)