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When it's not personal but positional: The upside of CEO power

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Abstract

We examine links between corporate cash holdings and types of CEO power, and how these affect firm performance, using agency and stewardship theories to distinguish two types of CEO power: one attributable to the CEO position, and one attributable to CEO personal characteristics. Measured as indices, we find positive associations with cash holdings for both types of power, individually and in combination, but only positional power with higher cash holdings is positively associated with firm performance. Our findings are shown to be robust and suggest that scrutiny of cash holdings by CEOs with high personal power may be prudent.

KEYWORDS

cash holdings, CEO power, firm performance

JEL CLASSIFICATION

M41, G34

1 | INTRODUCTION

The chief executive officer (CEO), the firm's ultimate decision-maker, uses his or her executive powers in ways that affect the firm's management and, consequently, performance. There are two contrasting perspectives on how that power is used. The agency theory perspective is that unconstrained powerful CEOs use their power to make wealth-destroying corporate investments and/or further their personal objectives. They are able to sway crucial decisions by refusing to compromise and resisting opposition from their executives, boards and stakeholders (Adams et al., 2005). By these means, according to agency theory, powerful CEOs use their prestige and expertise to exacerbate agency problems and frustrate good governance. The contrasting stewardship perspective is that powerful CEOs use their executive powers (and

sometimes their ownership voting power) to make decisions that create wealth and improve outcomes for all stakeholders. In driving an agenda of reform or change, their behaviour may exhibit the same executive actions and lack of compromise, without being motivated by acquiring personal wealth (Florackis & Sainani, 2018). Prior research largely supports the agency theory perspective, showing that some measures of CEO power have been negatively associated with firm performance (Veprauskaitė & Adams, 2013). In practice, the exercise of CEO power is limited by governance regulations and recommendations, in response to a common perception of its downside.

In this study, we draw on prior management literature to distinguish two types of CEO power: personal or informal power, which is agency oriented, and positional or formal power, which is stewardship oriented. We then extend the corporate governance literature by exploring whether these two types of CEO power are individually and jointly associated with high cash holdings, through which a firm would typically experience poor working capital management and reduced profitability. We then explore whether the relations between types of CEO power and cash holdings improve or undermine firm performance. Our results show that both types of CEO power are individually positively associated with cash holdings. However, in combination with higher cash holdings, only positional power is associated with better firm performance.

Personal power is the power held by a CEO because of his or her positive perception and reputation, education, affiliations, networks and prior success (Amedu & Dulewicz, 2018). Other researchers describe this as informal power (e.g., Walls & Berrone, 2017). Positional power is the power held by a CEO because of his or her position and voting power in the firm, which is also described as formal power. These categories of CEO power align with Finkelstein's (1992) four sources of power. Prestige power aligns to personal power, and structural, ownership and expert power align to positional power. The identification and measurement of personal and positional CEO power by the construction of two CEO power indices is a key feature of this study. A point of difference to prior studies is that our test variables are directly related to CEO power. Other corporate governance metrics are included as control variables.

Cash is a key resource to aid maintenance of CEO power. By holding more cash, CEOs can use their executive power to spend it on opportunistic investments that create shareholder wealth, or to undertake wasteful expenditures that destroy shareholder wealth, without scrutiny from external capital markets. However, it is generally accepted that holding too much cash is not desirable for efficient corporate management or for maximising firm performance. If too much cash is held, a firm's resources are wasted and its operating performance may be sub-optimal (Bates et al., 2009; Huang-Meier et al., 2016).

The setting for this study is Australia, a country which provides a robust environment to examine relations between cash holdings and CEO power. Compared to the United States, Australia is recognised as being a less litigious environment and has fewer regulations over internal controls. In addition, companies attract less external scrutiny over their financial choices in Australia because they are followed by fewer analysts (Hassan & Giorgioni, 2019) and are accountable to fewer institutional investors.[1] Khurana and Raman (2004) suggest that less regulated settings better reveal the consequences of voluntary choices in managerial decision-making. In these settings, significant liquidity outcomes are more likely to be based on the choices of relatively more powerful CEOs, and less likely to be affected by external pressures such as threats of litigation and the regulatory environment.

[1]Individual share ownership in Australia is about 31% (Deloitte Access Economics, 2017) which is higher than in many other countries, meaning that institutional ownership is lower.

It is also interesting to note that cash forms a more significant component of the balance sheets of Australian companies because in the dominant mining sector, average cash to total assets are higher than in other countries, whereas in the relatively smaller sectors of utilities and communications, cash holdings are generally lower.[2]

Using a sample of 9708 firm-year observations from 2001 to 2015, we find a significant positive association between both CEO power indices (separate and combined) and corporate cash holdings, indicating that more personally powerful CEOs and more positionally powerful CEOs hold more cash. This analysis controls for other determinants of cash and several methodological issues common to corporate governance research. In relation to the links between CEO power, cash holdings and firm performance, our findings support a stewardship perspective for CEO positional power. While we find no association between CEO personal power and firm performance either directly or in combination with higher cash holdings, we do find that a combination of CEO positional power and higher cash holdings contribute to better firm performance. When a CEO with power that emanates from his or her formal power and position in the firm chooses to hold more cash, shareholder wealth increases. This is the upside of CEO power.

Our paper makes several key contributions to the literature and to practice. We build on and contribute to research that examines the link between CEO power and firm performance. Prior research between measures or components of CEO power and performance outcomes has found both positive associations (e.g., Amedu & Dulewicz, 2018; Brookman & Thistle, 2009) and negative associations (e.g., Adams et al., 2005; Daily & Johnson, 1997; Gupta et al., 2018; Jiraporn et al., 2012; Veprauskaitė & Adams, 2013). We extend this literature first by adding cash holdings to the estimated relation between CEO power and firm performance, which confirms one channel through which CEO power can achieve better performance. We also extend the literature by employing Finkelstein's (1992) four sources of power and aligning them to two types of power (personal and positional power) that have been developed from other parts of the literature, measuring personal and positional power as indices using combinations of measures used in other studies. Our paper contributes to practice by showing that high cash holdings are associated with both types of CEO power, but the firm's performance is only improved by high cash holdings in the presence of strong CEO positional power. There is no association with performance when high cash holdings are combined with the CEO's strong personal power. These results provide support for a stakeholder view of management. Our results are also helpful for investors who wish to understand how power is wielded by the CEO, or who wish to understand why firms hold relatively high levels of cash. Importantly, our findings indicate to investors and regulators that not all types of CEO power are detrimental to performance. High cash holdings are indicative of CEO power, but this may not be a problem by itself. High cash holdings determined by a CEO with strong positional power can improve firm performance, for example, by providing for future strategic reform. Our findings therefore do not support the agency perspective regarding CEO motivations, nor do they indicate the need for a higher level of regulation over boards or CEOs in this particular area.

Section 2 describes the related literature and develops our hypotheses. Section 3 details the models, variable construction and sample collection. Section 4 reports the empirical results. Section 5 describes robustness checks that are applied, and Section 6 describes how we deal with endogeneity. Section 7 concludes.

[2]For example, large mining companies held an average of 10.4% cash to total assets between 2012 and 2019, compared to an average of 7.0% in the rest of the world. The equivalent figures for small mining companies are 15.1% and 10.2%. On the other hand, the utilities and communications sectors, which are a much smaller proportion of the Australian economy compared to other countries, generally hold less cash (Pinnuck et al., 2021).

2 | LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 | CEO power

The finance and management literatures confirm that a firm's decision-making power is concentrated in the CEO (Jiraporn et al., 2012). The concept of power has multiple dimensions, not all of which can be observed or operationalised. Finkelstein (1992) distinguishes four sources of power: ownership power, prestige power, structural power and expert power. The most commonly cited type in the literature, structural power, is based on organisational structure and hierarchical authority (Hambrick, 1981). Pfeffer (1992) explains that powerful CEOs are those who can persistently influence key decisions in their firms despite facing different opinions from other top executives.

Different disciplines take contrasting perspectives on CEO power. The strategic leadership literature highlights the benefits of CEO structural power in terms of getting things done (Gupta et al., 2018). In the finance literature, Brookman and Thistle (2009) show how longer tenure and knowledge of the firm is associated with firm performance. Used well, structural power allows a CEO to pursue his or her agenda, and not be blocked by other powerful groups in the firm (Amedu & Dulewicz, 2018). CEO power can help a firm respond quickly to a rapidly changing and competitive market for its products or services (Han et al., 2016). Decision-making can be expedited, resulting in a more timely response to problems or anticipated changes in market conditions (Boyd, 1995; Finkelstein & D'Aveni, 1994). This perspective aligns with stewardship theory, which posits that individuals with high positional power are likely to use their authority responsibly in ways that benefit the organisation as a whole, aligning their actions with the interests of the shareholders and the firm. Stewardship theory suggests that CEOs will act as stewards of the firm and will be motivated to act in its best interests. This perspective also aligns with Finkelstein's constructs of ownership, structural and expert power, and the construct of positional power that has been used in prior management literature.

Positional power, in our research, reflects the formal authority and influence that the CEO holds within the organisation, including his or her role in strategic decision-making and governance. It captures the power that emanates from externally observable, commonly understood characteristics that reflect the power of the position and role(s): the formal authority of the CEO's position which is enhanced by also serving as Chair, the CEO's tenure and experience, his/her status as founder and his/her ownership share. These characteristics enable the CEO to control, override or act without being questioned by subordinates, the board and the top management team.

In contrast, corporate governance studies take an agency theory perspective, focusing on the potential conflicts of interest between principals (shareholders) and agents (CEOs). These studies tend to find that CEO power aggravates agency costs and has a negative influence on corporate performance outcomes (e.g., Adams et al., 2005; Jiraporn et al., 2012). The agency theory perspective aligns with the construct of personal power from prior management literature, and with Finkelstein's construct of prestige power. Personal power, as defined in our study, reflects the CEO's legitimacy and reputation. Its exercise is linked to the CEO's personal incentives and objectives, which can lead to self-serving behaviour that may not align with the best interests of shareholders (Chao et al., 2017; Daily & Johnson, 1997; Lewellyn & Muller-Kahle, 2012; Liu & Jiraporn, 2010). Because CEO undermining shareholders' interests is an agency problem, agency theory provides a robust framework for understanding how personal power can influence a CEO's decisions that might prioritise their personal gains over shareholders' interests.

Personal power is challenging to measure because it is a perception of the CEO's power in the eyes of those that the CEO influences rather than an observable external reality. Reflecting the

legitimacy and reputation of the CEO, personal power allows him/her to appear to be in control of uncertainties in the environment. The CEO may use his or her power to increase agency costs and informational asymmetry, foster managerial entrenchment and reduce reporting transparency (Jiraporn et al., 2012). Such CEO's power restricts board involvement in strategic decision-making by concealing critical information and weakening board monitoring of decision-making (Kor, 2006). When powerful CEOs indulge in empire building and forgo shareholder interests (Bebchuk et al., 2011), agency conflicts increase and credit ratings decline, which restricts the firm's access to external sources of funds including the bond market. Bebchuk et al. (2011) relate strong CEO power to poorer accounting profitability, which eventually worsens firm value.

2.2 | CEO power and cash holdings

The optimum allocation of internal funds is an important corporate financing decision and also a frequent source of conflict between shareholders and top management (Jensen, 1986). Jiang and Lie (2016) explain that it is difficult and costly to run a business with too little cash, and it is better to have excess levels of cash. Managers become anxious if cash balances are low when their firm has a high leverage ratio or few/no rated borrowings. In this situation, managers would like to take swift remedial action to increase cash reserves. Alternatively, managers may be reluctant to reduce their firm's cash holdings if it holds higher levels of cash, because they prefer to retain the flexibility and reduced risk from being able to pursue their own interests (Opler et al., 1999). The ability to increase cash flows in times of economic prosperity leaves powerful CEOs with the choice to build up cash reserves, spend more or disburse cash to shareholders and debtholders (Harford et al., 2012).

An alternative perspective on cash holdings is that managers do not need to hold high cash balances because they have access to lines of credit which enables them to fund expenditures more cheaply and efficiently as opportunities and needs arise. In particular, more powerful CEOs will be able to use their reputation and strong personal and professional networks to obtain external finance, and thus do not need to maintain high cash holdings (Larcker & Tayan, 2012; Wade et al., 2008).

In either scenario, powerful CEOs are able to determine the level of cash held by the firm to manage uncertainty, according to their own perspective on the appropriate way to use their power. Whether their behaviour fits a stewardship perspective or an agency perspective, we argue that powerful CEOs may choose to build up cash reserves. When the CEO's power is positional or formal, this may be driven by CEOs wanting to be able to take advantage of opportunities in a timely manner or to increase their resilience to future adverse market conditions. When the CEO's power is personal or informal, this may be so CEOs can prioritise personal advantages of current spending.

Therefore, we expect positive associations between the two types of CEO power: personal and positional, and corporate cash holdings, consistent with both agency theory and stewardship theory. We investigate the various associations between types of CEO power and corporate cash holdings in the following four hypotheses:

H1a. Firms with positionally powerful CEOs have higher cash holdings.

H1b. Firms with personally powerful CEOs have higher cash holdings.

H1c. Positional power and personal power are jointly associated with higher cash holdings.

H1d. Positional power has more effect on cash holdings than personal power.

2.3 | CEO power, cash holdings and firm performance

Following the first hypothesis, higher cash holdings by powerful CEOs may have a positive or negative effect on firm performance. Agency theory predicts that personally powerful CEOs will use higher cash holdings to make wealth-destroying corporate investments and/or further their personal objectives. This is likely to lower firm performance. In contrast, stewardship theory predicts that positionally powerful CEOs will use higher cash holdings to create wealth and improve outcomes for all stakeholders, rather than for personal gain, which will result in higher firm performance.

We propose two hypotheses, one consistent with the prediction of agency theory that firm performance will be lower, and one consistent with the prediction of stakeholder theory that firm performance will be higher.

H2a. Firms with personally powerful CEOs and higher cash holdings have lower performance.

H2b. Firms with positionally powerful CEOs and higher cash holdings have higher performance.

3 | MODELS, CONSTRUCTION OF VARIABLES AND DATA SOURCES

3.1 | Models

To test Hypothesis 1, we use ordinary least squares (OLS) regressions with cluster-robust standard errors, clustering at the firm level, to examine the relation between cash holdings and types of CEO power.[3]

$$Cash\ Holding_{i,t} = \beta_0 + \beta_1\ PosPower_{i,t} + \left[Control\ Variables\right] + IND\_FE + YEAR\_FE + \varepsilon_i \quad (1a)$$

$$Cash\ Holding_{i,t} = \beta_0 + \beta_1\ PerPower_{i,t} + \left[Control\ Variables\right] + IND\_FE + YEAR\_FE + \varepsilon_i \quad (1b)$$

$$Cash\ Holding_{i,t} = \beta_0 + \beta_1\ PosPower_{i,t} + \beta_2\ PerPower_{i,t} + \left[Control\ Variables\right] + IND\_FE + YEAR\_FE + \varepsilon_i \quad (1c)$$

We use cluster-robust standard errors because they take into account any potential correlation between the magnitude of variation in cash holdings and CEO power, and consider heteroskedasticity across the cluster of observations.

To test Hypothesis 2, we also use ordinary least squares regressions with cluster-robust standard errors, clustered at the firm level, to examine the relation between types of CEO power, cash holdings and the impact of this association on firm performance.

$$Tobin's\ Q_{i,t} = \beta_0 + \beta_1\ PerPower_{i,t} + \beta_2\ Cash\ Holding_{i,t} + \beta_3\ PerPower_{i,t} \times Cash\ Holding_{i,t} + \left[Control\ Variables\right] + IND\_FE + YEAR\_FE + \varepsilon_{i,t} \quad (2a)$$

[3]See Appendix 1 for variable definitions.

$$Tobin's\ Q_{i,t} = \beta_0 + \beta_1\ PosPower_{i,t} + \beta_2\ Cash\ Holding_{i,t} + \beta_3\ PosPower_{i,t} \times Cash\ Holding_{i,t} + [Control\ Variables] + IND\_FE + YEAR\_FE + \varepsilon_{i,t} \quad (2b)$$

3.2 | Variables

3.2.1 | Construction of test variables (CEO power indices)

For CEO power, the key explanatory variable in this study, we use principal component analysis (PCA) to construct two CEO power indices.[4]

In the CEO power literature, researchers have proxied CEO power in a variety of ways. The most common approach is to base measures on one or more of the four sources of executive-level power identified by Finkelstein (1992), namely structural, ownership, expert and prestige. However, no prior single study captures all of Finkelstein's different dimensions of CEO power. Some use *CEO duality*, *CEO tenure*, *CEO ownership*, *CEO founder*, *CEO multiple ownership* and *CEO compensation* as individual proxies for CEO power (Adams et al., 2005; Bebchuk et al., 2011; Daily & Johnson, 1997; Han et al., 2016; Huang et al., 2019), or in different combinations to construct a CEO power index (Chao et al., 2017; Han et al., 2016; Huang et al., 2019; Liu & Jiraporn, 2010; Morse et al., 2011; Veprauskaitė & Adams, 2013).

Extending research on CEO power indices, we construct two distinct CEO power indices using eight CEO power proxies. We employ PCA to load these eight variables into two factors that capture most of the variance in the correlation matrix. We observe from practice and the literature that five variables: *CEO duality*, *CEO tenure*, *CEO ownership*, *CEO founder* and *CEO functional experience* capture the influence of the CEO in making strategic decisions as well as day-to-day operational decisions (Chao et al., 2017; Huang et al., 2019; Veprauskaitė & Adams, 2013). That power and influence emanate from the CEO's history with the firm, previous positions and ownership. Therefore, we label this first index of CEO power as '*CEO positional power*' (*PosPower* hereafter). The remaining three variables: *CEO compensation ratio*, *CEO remuneration* and *CEO bonus pay* reflect aspects of CEO pay which the prior literature suggests are also useful ways to capture CEO power (Chao et al., 2017; Daily & Johnson, 1997; Lewellyn & Muller-Kahle, 2012; Veprauskaitė & Adams, 2013). These variables provide a picture of the CEO's relative importance within top management, his or her ability to persuade the board of his or her value to the firm, and his or her influence over board members who determine CEO remuneration. That power and influence emanate from the CEO's connections with other key stakeholders. We label this second index of CEO power as '*CEO personal power*' (*PerPower* hereafter). We provide details of each of these CEO power proxies in Appendix 2.

Panel A (D) of Appendix 3 outlines PCA results for *PosPower (PerPower)*. They show an eigenvalue of 1.61 (1.62),[5] and percentage of variation of 32.27% (53.86%), indicating that PCA captures 32.27% (53.86%) of the total variance in the dataset. The results also indicate that all CEO power proxies used to construct the index contribute positively to *PosPower (PerPower)*, consistent with our expectations (Boyd, 1995; Chao et al., 2017; Hermalin & Weisbach, 1998; Veprauskaitė & Adams, 2013). A positive *PosPower (PerPower)* indicates higher positional

[4]We adopt PCA for two main reasons: the advantages that PCA offers over other commonly used index methods in relation to dimensionality reduction, variance maximisation and minimisation of information overlap and also the potential adverse effects that other index methods may have on empirical results such as unequal weighting of factors and multicollinearity issues.

[5]An eigenvalue of >1 indicates that the newly constructed variable has more explanatory power over the variance than any of the original variables individually (Florackis & Sainani, 2018).

(personal) power of the CEO, and a negative *PosPower (PerPower)* indicates lower CEO positional (personal) power.

The correlation matrices of the CEO power proxies used to construct *PosPower (PerPower)* in Panel B (E) of Appendix 3 indicate positive and highly significant ($p < 0.001$) correlations among each set of variables. In addition to this, Panel C (E) of Appendix 3 shows the Bartlett test of sphericity (Bartlett, 1954) and the Kaiser-Meyer-Olkin test of appropriateness to validate our data reduction (Kaiser, 1974), indicating no intercorrelation within the two sets of variables. We run Kaiser-Meyer-Olkin statistics for multicollinearity, which also justifies use of PCA.

3.2.2 | Measurement of dependent variables: Cash holdings and firm performance

Following the literature on cash holdings, we use three different proxies to measure the level of cash holdings. First, we measure cash holdings as the ratio of cash and marketable securities to total assets (Bates et al., 2009; Kusnadi, 2011; Opler et al., 1999). Second, following Bates et al. (2009) and Atif et al. (2019), we measure cash holdings as deflated cash and marketable securities to net assets. We use net assets because they are a function of a firm's future profitability. The third measure of cash holdings is the ratio of cash to net assets (Chung et al., 2015; Galpin, 2020).[6] We measure firm performance using Tobin's Q, defined as total assets minus book value of equity plus market value of equity, divided by total assets (Brockman et al., 2016).

3.2.3 | Control variables

We include control variables shown in the prior literature to be associated with CEO power and cash holdings to account for alternative explanations for the influence of CEO power on corporate cash holding decisions.

Corporate governance variables

We use six corporate governance variables as controls. Both *CEO gender* and *CEO Age* have been shown in prior studies to influence corporate financing decisions (Brookman & Thistle, 2009; Chintrakarn et al., 2014; Florackis & Sainani, 2018). *CEO gender* is measured as a dummy variable equal to 1 if the CEO is female and 0 otherwise, and *CEO Age* is measured as age of the CEO in years. We include *Board Size* (measured as the total number of members on the board of directors) and *Board Independence* (measured as the ratio of independent directors to total directors) following (Florackis & Sainani, 2018). *Board Meetings* (measured as the total number of board meetings held during the year) are also included as a control variable following Rutherford et al. (2007) and Veprauskaitė and Adams (2013). Rutherford et al. (2007) explain that frequent board meetings help board members gather more internal information about the firm, especially financial information, which can mitigate CEO actions by reducing their power. Finally, we control for interdependent directors appointed by the CEO or who join the firm after the CEO's date of appointment, following Daily and Johnson (1997) who suggest that a higher ratio of interdependent directors reflects greater CEO power and more CEO decision-making autonomy. We measure

[6]We also use an alternative measure of cash holdings, the log of the ratio of cash to net assets, in a robustness check and obtain quantitatively similar results.

Interdependent Directors as the number of interdependent directors divided by the total number of directors.

Firm characteristics

We control for ten firm-specific variables that have been found to affect corporate cash holdings, namely firm size, return on equity, debt to equity ratio, market-to-book ratio, dividend payout, research and development (R&D) expenses, capital expenditure, working capital, cash flow and cash flow volatility. *Firm Size* is measured as the natural logarithm of book value of total assets. It is associated with cash holdings in prior studies (e.g., Bigelli & Sánchez-Vidal, 2012; Colquitt et al., 1999; Orens & Reheul, 2013). Return on equity (*ROE*) is calculated as net income divided by total shareholders' equity. It is included to control for use of cash holdings to undertake profitable investment opportunities (Ferreira & Vilela, 2004). The *Debt to Equity* ratio, calculated as total debt divided by total shareholders' equity, is included to control for the preferences of entrenched managers not to become dependent on capital markets for funds (Jensen, 1986). The *Market-to-book* ratio is measured as the book value of assets minus the book value of equity plus the market value of equity, all divided by the book value of assets. Prior studies have shown that shareholders value cash holdings (Dittmar & Mahrt-Smith, 2007; Faulkender & Rong, 2006). Several firm-specific variables are included to control for expected or regular cash outflows that decrease the firm's relative cash holdings. *Dividend Payment* is measured as a dummy variable equal to 1 if the firm pays dividends and 0 otherwise (Koussis et al., 2017; Opler et al., 1999). *R&D* is measured as research and development expenses divided by total assets.[7] Capital expenditure (*CAPEX*) is measured as the natural logarithm of the ratio of capital expenditures to total assets and working capital (*WC*) is divided by total revenue (DeFond, 2002; DeFond & Park, 2001). Finally, we include *Cash Flow* (measured as operating cash flow divided by total assets) and *Cash Flow Volatility* (measured as the standard deviation of the firm's operating cash flows scaled by total assets over the prior three-year period) following Acharya et al. (2007), Harford et al. (2008) and Demerjian et al. (2013).

3.3 | Data sources

We collect data from two sources. Corporate governance data, including board and CEO characteristics and data required for the CEO power indices, are collected from Securities Industry Research Centre of Asia-Pacific (SIRCA). Data for the dependent variables and all other financial data required for control variables are obtained from MorningStar (DatAnalysis). Following La Porta et al. (2002) and Matsumoto (2002), we exclude financial institutions, banks and insurance companies due to their unique regulatory framework. We start the sample with all firms listed on the Australian Securities Exchange (ASX) for the period 2001–2015 that have data available from SIRCA.[8] This choice of period is guided by SIRCA starting its coverage in 2001. We include data for all CEOs who were appointed during the year regardless of whether or not they served a full financial year. After excluding duplicate observations and firms with missing values, our sample consists of 9708 firm-year observations. We then winsorise the data at 1% and 99% levels, consistent with prior studies (Rajgopal et al., 2006), to remove the effects of extreme outliers. Details for each variable are presented in Appendix 1 and industry and year distributions for the sample are provided in Table 1.

[7]Following Opler et al. (1999), we input the number zero if firms do not report any R&D expenses.

[8]We finish our dataset in 2015, because the data for many of the control variables are not available in the SIRCA database beyond this time.

TABLE 1 Distribution of sample – By industry and year.

Industry Year	Communication services	Consumer discretionary	Consumer staples	Energy	Health care	Industrials	Information technology	Materials	Utilities	Total
2001	30	65	16	83	56	105	56	125	5	541
2002	10	75	16	50	23	110	45	156	5	490
2003	13	79	19	60	23	116	51	165	5	531
2004	29	96	30	62	59	106	70	175	10	637
2005	29	95	31	75	59	110	66	197	8	670
2006	31	101	28	87	64	117	64	204	6	702
2007	30	99	29	94	63	123	63	208	7	716
2008	32	94	28	92	63	125	66	213	9	722
2009	32	93	27	93	63	127	63	224	8	730
2010	30	84	26	95	64	129	61	229	10	728
2011	31	78	25	91	57	119	59	229	8	697
2012	30	80	25	83	56	116	56	219	10	675
2013	31	72	26	82	46	111	49	196	10	623
2014	33	71	26	76	55	103	52	195	9	620
2015	32	81	26	71	57	100	55	192	12	626
Total	423	1263	378	1194	808	1717	876	2927	122	9708

Note: This table provides the sample used in this study, by industry sector and by year. After excluding duplicate observations and observations related to the financial industry, including firms with missing values, 9708 firm-years have complete information at the CEO level, board level and firm level.

4 | EMPIRICAL RESULTS

4.1 | Descriptive statistics

Table 2 reports descriptive statistics for the variables used in this study. It shows that Australian firms keep 22% of total assets as cash and marketable securities, and 30% of net assets as cash. Of the CEOs, 12% are also board chairpersons. The average (median) tenure of the CEO is 6.43 (6) years. Furthermore, 34% of CEOs are also founders and 92% have functional expertise. The mean ratio of CEOs' total annual compensation to top executives' compensation is 1.64. In Australia, 23% of CEOs receive bonuses in addition to their fixed compensation. The average ratio of CEO annual compensation to total annual board compensation is 0.44. Among CEOs in Australia, only 3% are female and CEO average age is 52 years. The average board in Australia has 6.38 members, of whom 35% are independent. The ratio of interdependent directors is 0.60 and suggests that Australian CEOs enjoy a high level of power, based on Daily and Johnson's (1997) argument that interdependent directors are sympathetic to the CEO's decision-making. Boards of directors in Australian listed firms meet 6.62 times a year on average. The mean log value of Australian listed firms' total assets is 18.10. The average ROE, debt to equity and market-to-book ratios are −0.17, 0.35 and 2.34, respectively. Dividends are paid by 39% of Australian listed firms. R&D expenditure to total assets is 23% on average. The average log of CAPEX, working capital to total sales/revenue and cash flow to total assets are 16.04, −0.69 and −0.05, respectively.

4.2 | Correlation matrix

Table 3 reports the correlations between the variables used in this study. Cash holdings (cash and marketable securities to total assets) are positively correlated with *PerPower*, *Market-to-book* and *Cash Flow Volatility*, but negatively correlated with *CEO Age*, *Board Size*, *Interdependent Directors*, *Board Independence*, *Firm Size*, *ROE*, *Dividend Payment* and *CAPEX*. The relations between cash holdings and both *CEO Gender* and *R&D* are not significant. *PosPower* is positively correlated with almost all the control variables except *Market-to-book* and *Cash Flow Volatility*, for which the relation is negative. A positive significant relation also exists between *PerPower* and variables such as *CEO Age*, *Interdependent Directors*, *Market-to-book* and *Cash Flow/Total Assets*, whereas it is negatively correlated with *CEO Gender*, *Board Size*, *Board Independence*, *Board Meetings*, *Firm Size*, *Debt to Equity* and *CAPEX*. Given the correlation of 0.84 between two control variables, namely *SIZE* and *CAPEX*, we substitute another measure for *SIZE* but this does not alter our main results. We are not surprised that correlations between both CEO power indices and cash holdings are not in the same direction due to our indices capturing different aspects of CEO power.

4.3 | Multivariate analyses

Tables 4–6 show the results of the pooled OLS regressions with cluster-robust standard errors in models (1a), (1b) and (1c) using *PerPower*, *PosPower* and both indices, respectively, as test variables, and using three alternative measures of cash holdings. We find significantly positive coefficients for the CEO power indices across all cash holdings measures.[9] For columns (1) and

[9]We also run alternative measures of cash holdings following Bates et al. (2009) for robustness purposes and find significant results.

TABLE 2 Descriptive statistics.

	Mean	Median	Std. dev.	25%	75%
Cash holdings variables					
Cash & Mkt Sec./Total Assets	0.22	0.12	0.24	0.05	0.31
Cash & Mkt Sec./Net Assets	0.83	0.14	2.31	0.05	0.45
Cash/Net Assets	0.30	0.18	0.36	0.06	0.43
Log (Cash/Net Assets)	−2.02	−2.06	1.94	−3.21	−0.85
CEO power variables					
PosPower	0.00	−0.11	1.00	−0.99	0.60
PerPower	0.00	−0.29	1.00	−1.32	0.70
CEO Duality	0.12	0.00	0.33	0.00	0.00
CEO Tenure	6.43	6.00	3.97	3.00	9.00
CEO Founder	0.34	0.00	0.48	0.00	1.00
CEO Ownership	0.08	0.02	0.15	0.00	0.08
CEO Functional Experience	0.92	1.00	0.27	1.00	1.00
CompRatio	1.64	1.28	1.58	1.00	1.86
CEO Remuneration	0.44	0.47	0.33	0.16	0.65
CEO Bonus Pay	0.23	0.00	0.42	0.00	0.00
Control variables					
CEO Gender	0.03	0.00	0.16	0.00	0.00
CEO Age	51.91	52.00	6.52	48.00	55.00
Board Size	6.38	6.00	2.64	5.00	8.00
Board Independence	0.35	0.38	0.26	0.07	0.57
Interdependent Directors	0.60	0.67	0.35	0.33	1.00
Board Meetings	6.62	6.00	6.14	2.00	9.00
Log(Firm Size)	18.10	17.97	2.28	16.54	19.53
ROE	−0.17	0.01	1.04	−0.20	0.14
Debt to Equity	0.35	0.11	0.77	0.00	0.49
Market-to-book	2.34	1.42	3.04	0.96	2.40
Dividend Payment	0.39	0.00	0.49	0.00	1.00
R&D/Total Assets	0.23	0.04	0.39	0.00	0.26
Log (CAPEX)	16.04	16.18	2.76	14.33	17.99
WC/Total Revenue	−0.69	0.00	2.80	−0.33	0.15
Cash Flow/Total Assets	−0.05	0.02	0.30	−0.10	0.10
Cash Flow Volatility	0.10	0.05	0.13	0.02	0.11

Note: This table provides the descriptive statistics of all the variables used in this study. After excluding duplicate observations and observations related to the financial industry, including firms with missing values, 9708 firm-years have complete information at the CEO level, board level and firm level. Details of each variable used in the study are presented in Appendix 1.

(3), we follow cash holdings measures suggested by Bates et al. (2009) and for column (2), we follow Opler et al. (1999). We include corporate governance and firm-level control variables following Opler et al. (1999), Veprauskaitė and Adams (2013) and Florackis and Sainani (2018). Definitions of all variables are given in Appendix 1.

4.3.1 | Cash holdings and CEO positional power

Table 4 presents regression results for the relations between cash holdings measures and positional power that support Hypothesis 1a. The results show positive relations which are strongly significant (at 1% level) in columns (1) and (3) and weakly significant (at 10% level) in column (2).[10] The economic magnitude of this relation is also significant. For example, a one standard deviation increase in the measure of CEO positional power is associated with a 4.23%, 5.15% and 5.33% increase in the level of cash holdings reserve (relative to the sample means) for *Cash & Mkt Sec./Total Assets* (0.22), *Cash & Mkt Sec./Net Assets* (0.83) and *Cash/Net Assets* (0.30), respectively.[11]

Although there are minor differences between the significance of the control variables using the different measures of cash holdings, the results presented in Table 4 strongly support a positive relation between *PosPower* and corporate cash holdings.

4.3.2 | Cash holdings and CEO personal power

Table 5 presents regression results for the relations between cash holdings measures and personal power that support Hypothesis 1b. There is a positive and significant relation between each of the three cash holdings measures and *PerPower*. The economic magnitude of this relation is also significant. For example, a one standard deviation increase in the measure of CEO personal power results in a 1.86%, 6.69% and 2.27% increase in firms' level of cash holding reserves (relative to the respective sample means) for *Cash & Mkt Sec./Total Assets* (0.22), *Cash & Mkt Sec./Net Assets* (0.83) and *Cash/Net Assets* (0.30), respectively.

Overall, the results presented in Table 5 support a positive relation between CEO personal power and corporate cash holdings, consistent with our argument that powerful CEOs are willing to keep more cash than their non-powerful counterparts.

4.3.3 | Cash holdings with both CEO positional and personal power

Table 6 presents regression results for the relations between cash holdings measures and both positional and personal power, supporting both Hypotheses 1c and 1d. The coefficients for *PosPower* are statistically significant at the 1% level in columns (1) and (3) (0.0093, 0.0159), and the 5% level in column (2) (0.0425). For *PerPower*, the coefficients are statistically significant at the 5% level in columns (1) and (3) (0.0041, 0.0067), and the 1% level in column (2) (0.0554). Note that these coefficients and significance levels are similar to those reported in Tables 4 and 5 when the two power indices are separately regressed on cash holdings. This shows that the two measures capture separate aspects of CEO power and have separate associations with cash holdings. Comparing the coefficients of the two indices, *PosPower* has a stronger association with two of the three measures of cash holdings, as shown in columns (1) and (3).

We undertake sensitivity tests to confirm our results. To address potential multicollinearity between our two measures of power, we deconstruct our indices, take the individual variables with collinearity levels below 80%, rebuild the CEO power indices and re-run the analyses with qualitatively similar results. We also regress *PerPower* directly against *PosPower*, calculate the residuals from this equation and then regress the residual against all three measures of cash holdings (keeping the control variables but excluding *PosPower*). We find significant and positive results across

[10]Additionally, we conduct subsample analyses by industry and find that the relation to the CEO decision-based power index is significant and positive in the Communication Services, Health Care, Industrials and Materials industries.

[11]Calculation for economic significance = (coefficient of independent variable × standard deviation of independent variable)/mean of dependent variable.

TABLE 3 Pearson's correlation analysis.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) *Cash & Mkt Sec./Total Assets*	1.00							
(2) *PosPower*	−0.06***	1.00						
(3) *PerPower*	0.05***	−0.02	1.00					
(4) *CEO Gender*	0.02	0.02*	−0.03**	1.00				
(5) *CEO Age (Log)*	−0.05***	0.05***	0.07***	−0.05***	1.00			
(6) *Board Size (Log)*	−0.17***	0.05***	−0.23***	0.03**	0.03**	1.00		
(7) *Interdependent Director*	−0.11***	0.07***	0.42***	−0.01	0.10***	0.33***	1.00	
(8) *Board Independence*	−0.07***	0.16***	−0.04***	0.02	0.10***	0.12***	0.12***	1.00
(9) *Board Meetings (Log)*	−0.20***	0.15***	−0.15***	0.01	0.07***	0.52***	0.24***	0.37***
(10) *Firm Size (Log)*	−0.41***	0.20***	−0.14***	−0.00	0.13***	0.57***	0.27***	0.38***
(11) *ROE*	−0.18***	0.07***	0.01	−0.01	0.01	0.09***	0.06***	0.09***
(12) *Debt to Equity*	−0.24***	0.01	−0.05***	−0.00	0.01	0.13***	0.05***	0.04***
(13) *Market-to-book*	0.34***	−0.06***	0.09***	0.00	−0.04***	−0.09***	−0.03***	−0.05***
(14) *Dividend Payment*	−0.32***	0.14***	0.00	0.02*	0.08***	0.31***	0.17***	0.25***
(15) *R&D/Total Assets*	0.01	−0.02	0.02	−0.02*	−0.04***	−0.08***	−0.05***	−0.04***
(16) *CAPEX (Log)*	−0.39***	0.16***	−0.10***	−0.03**	0.10***	0.47***	0.24***	0.32***
(17) *WC/Total Revenue*	−0.17***	0.06***	−0.03**	0.02	0.03*	0.09***	0.04***	0.08***
(18) *Cash Flow/Total Assets*	−0.38***	0.11***	0.03**	−0.01	0.03**	0.15***	0.12***	0.17***
(19) *Cash Flow Volatility*	0.33***	−0.08***	−0.01	−0.01	−0.07***	−0.12***	−0.10***	−0.15***
N	9708							

Note: This table summarises the results of the Pearson correlation matrices among the variables used in this study. Refer to Appendix 1 for the definition of the variables. The correlations are *statistically significant at the 10% level; **statistically significant at the 5% level; and ***statistically significant at the 1% level.

all three measures of cash holdings. This again suggests that *PerPower* and *PosPower* capture different aspects of CEO power, and that the positional power of CEOs is more influential than their personal power over cash holdings. We do not tabulate these results for the purpose of brevity.

4.3.4 | Cash holdings, CEO power index and firm performance

To assess whether the interaction of powerful CEOs and cash holdings has a positive or negative effect on firm performance, we (separately) interact both CEO power indices and cash holdings with firm performance as in models (2a) and (2b) in Section 3.1. Panels A and B of Table 7 presents the results, which support Hypothesis 2b but not Hypothesis 2a.

Columns (1), (2) and (3) of Panel A (B) show the interaction of the CEO's positional (personal) power index and cash holdings and their impact on firm performance. Panel A shows that firms with CEOs who have greater positional power and who maintain higher levels of cash holdings have better performance across all three measures of cash holdings. On the other hand, columns (1), (2) and (3) of Panel B show that there is no significant interaction between the CEO's personal power index and cash holdings and its joint impact on firm performance. Our results are consistent with CEOs behaving as predicted by stewardship theory: those with higher positional power act to increase shareholder wealth.

The literature provides some clues as to how this might happen. Deb et al. (2017) synthesise theoretical arguments in the literature to predict that cash is more beneficial in contexts

(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
1.00										
0.61***	1.00									
0.15***	0.27***	1.00								
0.13***	0.24***	−0.29***	1.00							
−0.12***	−0.30***	−0.11***	−0.15***	1.00						
0.41***	0.58***	0.26***	0.14***	−0.15***	1.00					
−0.05***	−0.08***	−0.03**	−0.01	0.00	−0.03**	1.00				
0.51***	0.84***	0.23***	0.19***	−0.22***	0.45***	−0.07***	1.00			
0.16***	0.19***	0.10***	0.08***	−0.14***	0.22***	0.01	0.13***	1.00		
0.26***	0.52***	0.40***	0.13***	−0.40***	0.43***	−0.04***	0.49***	0.20***	1.00	
−0.21***	−0.42***	−0.21***	−0.12***	0.33***	−0.29***	0.03**	−0.37***	−0.11***	−0.51***	1.00

requiring adaptation to changed circumstances, such as industries with high competition, high research intensity and high growth. Cash is potentially value-destroying in contexts of power imbalances that encourage value appropriation by other stakeholders, such as in situations of poor governance or lack of transparency.

5 | ROBUSTNESS CHECKS

We have undertaken a number of robustness and sensitivity tests to ensure that our findings are not the result of specific design or measurement choices in our analysis. We use alternative and lagged measures of cash holdings, we add controls for characteristics of the CEO and the chief financial officer (CFO), we consider whether the years of the Global Financial Crisis (GFC) impact on our results, we employ different measures for several control variables used in our main model, and we include controls for very high cash holdings.

5.1 | Alternative measures of cash holdings

The results of using alternative measures of cash holdings are presented in Table 8. We use the natural log of the ratio of cash to net assets (Bates et al., 2009), shown in columns (1) and (2),

TABLE 4 CEO positional power and cash holdings.

	Cash & Mkt Sec./Total Assets	*Cash & Mkt Sec./Net Assets*	*Cash/Net Assets*
Variables	**(1)**	**(2)**	**(3)**
PosPower	0.0093***	0.0427*	0.0160***
	(3.8410)	(1.8624)	(4.2305)
CEO Gender	0.0054	−0.1246	0.0370*
	(0.5035)	(−1.2343)	(1.9263)
CEO Age (Log)	−0.0302*	−0.0464	−0.0422*
	(−1.9530)	(−0.3314)	(−1.7149)
Board Size (Log)	0.0328***	0.1754**	0.0309***
	(4.4169)	(2.4055)	(2.5785)
Interdependent Director	−0.0160***	−0.0510*	−0.0209***
	(−4.8691)	(−1.6810)	(−4.0318)
Board Independence	0.0227**	0.1307	0.0312**
	(2.3670)	(1.4594)	(2.0250)
Board Meetings (Log)	0.0137***	0.0834**	0.0171***
	(3.8030)	(2.5455)	(2.8877)
Firm Size (Log)	−0.0098***	0.0564**	−0.0086**
	(−4.1305)	(2.5061)	(−2.2379)
ROE	−0.0168***	−0.0517	−0.1125***
	(−5.2338)	(−1.4935)	(−14.2930)
Debt to Equity	−0.0386***	−0.1098***	0.0523***
	(−13.8227)	(−4.4557)	(6.6560)
Market-to-book	0.0134***	0.0622***	0.0162***
	(10.1622)	(4.4910)	(8.3900)
Dividend Payment	−0.0201***	0.0096	−0.0067
	(−4.1771)	(0.2511)	(−0.7867)
R&D/Total Assets	−0.0231**	−0.2614***	0.0051
	(−1.9892)	(−2.8660)	(0.2323)
CAPEX (Log)	−0.0139***	−0.1641***	−0.0177***
	(−7.8556)	(−8.7220)	(−6.8966)
WC/Total Revenue	−0.0040***	−0.0331***	−0.0064***
	(−4.0584)	(−3.0737)	(−4.7219)
Cash Flow/Total Assets	−0.0259*	−1.0857***	0.1681***
	(−1.8209)	(−6.8378)	(7.0430)
Cash Flow Volatility	0.1921***	1.4632***	0.3482***
	(7.0805)	(4.8843)	(8.3770)
Year effects	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes
Constant	0.5880***	1.4582**	0.6791***
	(9.1390)	(2.5434)	(6.4511)
Observations	9708	9708	9707
R-squared	0.3280	0.2066	0.2568

Note: This table contains the results of the pooled OLS regressions with cluster-robust standard errors for Model 1, using the three cash holdings measures and the CEO decision-making power index (*PosPower*). We run OLS regressions by adding year and industry fixed effects in all regressions. This study includes all firms listed on the ASX for the period 2001–2015 except financial institutions, banks and insurance companies. The final sample consists of 9708 firm-year observations. Column (1) uses the ratio of cash and marketable securities to total assets, column (2) uses the ratio of cash and marketable securities to net assets and column (3) uses the ratio of cash to net assets. The *t*-statistics are in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. Details of each variable used in the study are presented in Appendix 1.

TABLE 5 CEO personal power and cash holdings.

	Cash & Mkt Sec./Total Assets	*Cash & Mkt Sec./Net Assets*	*Cash/Net Assets*
Variables	**(1)**	**(2)**	**(3)**
PerPower	0.0041**	0.0555***	0.0068**
	(2.0399)	(2.9800)	(2.0657)
CEO Gender	0.0046	−0.1301	0.0355*
	(0.4238)	(−1.2897)	(1.8543)
CEO Age (Log)	−0.0262*	−0.0267	−0.0354
	(−1.7014)	(−0.1921)	(−1.4397)
Board Size (Log)	0.0258***	0.1550**	0.0189
	(3.5390)	(2.1559)	(1.5878)
Interdependent Director	−0.0090***	−0.0214	−0.0089**
	(−3.2105)	(−0.8201)	(−1.9742)
Board Independence	0.0195**	0.1009	0.0258*
	(2.0302)	(1.1232)	(1.6681)
Board Meetings (Log)	0.0128***	0.0775**	0.0156***
	(3.5633)	(2.3948)	(2.6257)
Firm Size (Log)	−0.0108***	0.0495**	−0.0102***
	(−4.5390)	(2.2487)	(−2.6677)
ROE	−0.0168***	−0.0518	−0.1124***
	(−5.2403)	(−1.4975)	(−14.2992)
Debt to Equity	−0.0386***	−0.1088***	0.0523***
	(−13.8591)	(−4.4236)	(6.6623)
Market-to-book	0.0136***	0.0630***	0.0166***
	(10.3280)	(4.5622)	(8.5771)
Dividend Payment	−0.0187***	0.0136	−0.0043
	(−3.9078)	(0.3610)	(−0.5043)
R&D/Total Assets	−0.0221*	−0.2540***	0.0068
	(−1.9113)	(−2.7930)	(0.3123)
CAPEX (Log)	−0.0137***	−0.1636***	−0.0175***
	(−7.7752)	(−8.7204)	(−6.8059)
WC/Total Revenue	−0.0040***	−0.0331***	−0.0065***
	(−4.0773)	(−3.0776)	(−4.7519)
Cash Flow/Total Assets	−0.0234*	−1.0763***	0.1724***
	(−1.6456)	(−6.7871)	(7.2219)
Cash Flow Volatility	0.1890***	1.4416***	0.3429***
	(6.9468)	(4.8301)	(8.2330)
Year effects	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes
Constant	0.5792***	1.4387**	0.6635***
	(8.9809)	(2.5126)	(6.2911)
Observations	9708	9708	9707
R-squared	0.3272	0.2070	0.2557

Note: This table contains the results of the pooled OLS regressions with cluster-robust standard errors for Model 1, using the three cash holdings measures and the remuneration CEO power index (*PerPower*). We run OLS regressions by adding year and industry fixed effects in all regressions. This study includes all firms listed on the ASX for the period 2001–2015 except financial institutions, banks and insurance companies (for details, see Section 3.1). The final sample consists of 9708 firm-year observations. Column (1) uses the ratio of cash and marketable securities to total assets, column (2) uses the ratio of cash and marketable securities to net assets and column (3) uses the ratio of cash to net assets. The *t*-statistics are in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. Details of each variable used in the study are presented in Appendix 1.

TABLE 6 CEO positional and personal power and cash holdings.

	Cash & Mkt Sec./Total Assets	*Cash & Mkt Sec./Net Assets*	*Cash/Net Assets*
Variables	**(1)**	**(2)**	**(3)**
PosPower	0.0093***	0.0425**	0.0159***
	(3.9718)	(1.9706)	(4.1847)
PerPower	0.0041**	0.0554***	0.0067**
	(2.0051)	(2.9439)	(2.0266)
CEO Gender	0.0052	−0.1270	0.0367**
	(0.4596)	(−1.2056)	(1.9724)
CEO Age (Log)	−0.0300*	−0.0440	−0.0419*
	(−1.9403)	(−0.3074)	(−1.6608)
Board Size (Log)	0.0341***	0.1929***	0.0331***
	(4.7502)	(2.9055)	(2.8226)
Interdependent Director	−0.0162***	−0.0544*	−0.0213***
	(−4.8354)	(−1.7533)	(−3.8935)
Board Independence	0.0210**	0.1077	0.0283*
	(2.2280)	(1.2348)	(1.8431)
Board Meetings (Log)	0.0135***	0.0808**	0.0168***
	(3.7223)	(2.3957)	(2.8189)
Firm Size (Log)	−0.0101***	0.0525***	−0.0091***
	(−4.7962)	(2.6835)	(−2.6253)
ROE	−0.0168***	−0.0519**	−0.1125***
	(−7.2723)	(−2.4197)	(−29.7458)
Debt to Equity	−0.0385***	−0.1083***	0.0525***
	(−13.9200)	(−4.2254)	(11.6042)
Market-to-book	0.0133***	0.0619***	0.0161***
	(16.4146)	(8.2293)	(12.1638)
Dividend Payment	−0.0204***	0.0061	−0.0071
	(−3.9267)	(0.1268)	(−0.8373)
R&D/Total Assets	−0.0228**	−0.2573***	0.0056
	(−2.1726)	(−2.6454)	(0.3270)
CAPEX (Log)	−0.0139***	−0.1643***	−0.0178***
	(−10.3229)	(−13.1845)	(−8.0799)
WC/Total Revenue	−0.0040***	−0.0330***	−0.0064***
	(−5.5656)	(−5.0113)	(−5.5340)
Cash Flow/Total Assets	−0.0262***	−1.0887***	0.1677***
	(−2.6277)	(−11.8092)	(10.3107)
Cash Flow Volatility	0.1913***	1.4522***	0.3469***
	(10.3293)	(8.4677)	(11.4653)
Year effects	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes
Constant	0.5904***	1.4903**	0.6829***
	(9.1037)	(2.4813)	(6.4436)

TABLE 6 (Continued)

Variables	*Cash & Mkt Sec./Total Assets* (1)	*Cash & Mkt Sec./Net Assets* (2)	*Cash/Net Assets* (3)
Observations	9708	9708	9707
R-squared	0.3283	0.2073	0.2571

Note: This table contains the results of the pooled OLS regressions with cluster-robust standard errors, using the three cash holdings measures from Tables 4 and 5 and the CEO decision-making power index (*PosPower*) and the remuneration CEO power index (*PerPower*). Column (1) uses the ratio of cash and marketable securities to total assets, column (2) uses the ratio of cash and marketable securities to net assets and column (3) uses the ratio of cash to net assets. The *t*-statistics are in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. Details of each variable used in the study are presented in Appendix 1.

the ratio of cash and marketable securities to lagged net assets,[12] shown in columns (3) and (4), and the ratio of cash to lagged net assets, shown in columns (5) and (6).

Panel A presents the results for *PosPower*, and Panel B of Table 8 presents the results for *PerPower*. We only use firm characteristics as controls in columns (1), (3) and (5) in Panels A and B, and include both firm characteristics and corporate governance variables as controls in columns (2), (4) and (6) (Bates et al., 2009; Custódio & Metzger, 2014; Florackis & Sainani, 2018; Harford et al., 2008; Veprauskaitė & Adams, 2013). We find that all of the coefficients for the CEO power indices are significant and the associations are positive. Across the different results, for the mean firms in the sample, a one standard deviation increase in *PosPower* is associated with an increase in cash holdings of between 3.24% and 13.06%, and a one standard deviation increase in *PerPower* is associated with an increase in cash holdings of between 3.34% and 4.27%. Based on our results in Table 8, we conclude that the alternative measures of cash holdings validate the main results.

5.2 | Controlling for CFO characteristics and CEO fixed effects

The cash holdings literature includes the influence of CFOs on corporate cash holdings (Chava & Purnanandam, 2010; Florackis & Sainani, 2018). We add *CFO Age* and *CFO Gender* as control variables and re-run the regressions from the main model. The results are shown in Panels A and B of Table 9. The main results hold, and we find that the CFO controls are not significant predictors.

Panels C and D of Table 9 present regression results for the relation between CEO power indices (*PosPower* and *PerPower*) and cash holdings when clustering firm-year observations on the basis of CEO appointment (i.e., CEO effects). We continue to find a positive association between the CEO power indices (*PosPower* and *PerPower*) and cash holdings (with the exception of column (2) of Panel C).

5.3 | Interaction with the Global Financial Crisis

The GFC resulted in a shortage of cash globally and created a significant demand for liquidity and therefore cash levels. In order to assess whether the GFC is driving our results, we include the GFC as an interaction variable with *PosPower* and *PerPower* in our models. Following

[12]Faff et al. (2016) measure cash holdings as the ratio of cash and marketable securities to lagged total assets. We use lagged net assets instead of lagged total assets.

TABLE 7 Cash holdings, CEO power indices and firm performance.

Variables	Tobin's *Q* (1)	Tobin's *Q* (2)	Tobin's *Q* (3)
Panel A: *PosPower*			
PosPower	0.0262	0.1781***	0.0904**
	(0.7199)	(5.9885)	(2.2405)
Cash & Mkt Sec./Total Assets	2.0503***		
	(10.5829)		
PosPower × *Cash & Mkt Sec./Total Assets*	0.7561***		
	(4.2903)		
Cash & Mkt Sec./Net Assets		0.1128***	
		(4.4429)	
PosPower × *Cash & Mkt Sec./Net Assets*		0.0411*	
		(1.9052)	
Cash/Net Assets			0.9532***
			(9.0019)
PosPower × *Cash/Net Assets*			0.3532***
			(3.1454)
Control variables	YES	YES	YES
Year effects	YES	YES	YES
Industry effects	YES	YES	YES
Constant	4.4560***	5.6914***	5.1420***
	(5.6041)	(7.0565)	(6.3537)
Observations	9708	9708	9707
R-squared	0.2747	0.2563	0.2636
Panel B: *PerPower*			
PerPower	0.0501*	0.0396	0.0238
	(1.6932)	(1.6262)	(0.7466)
Cash & Mkt Sec./Total Assets	2.0689***		
	(10.6163)		
PerPower × *Cash & Mkt Sec./Total Assets*	−0.1124		
	(−0.6506)		
Cash & Mkt Sec./Net Assets		0.1145***	
		(4.4992)	
PerPower × *Cash & Mkt Sec./Net Assets*		−0.0142	
		(−0.5958)	
Cash/Net Assets			0.9610***
			(9.1423)
PerPower × *Cash/Net Assets*			0.0224
			(0.2046)
Control variables	YES	YES	YES
Year effects	YES	YES	YES

TABLE 7 (Continued)

Variables	Tobin's *Q* (1)	Tobin's *Q* (2)	Tobin's *Q* (3)
Industry effects	YES	YES	YES
Constant	4.3954***	5.5415***	5.0022***
	(5.5534)	(6.8987)	(6.2429)
Observations	9708	9708	9707
R-squared	0.2673	0.2515	0.2579

Note: This table contains the results of the interaction between two CEO power indices and cash holdings and its impact on firm performance (Tobin's *Q*). The *t*-statistics are in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. Details of each variable used in the study are presented in Appendix 1.

Degl'Innocenti et al. (2018), we assign 2007 and 2008 as the years of the GFC, and construct a dummy variable *GFC* coded 1 if the year falls in the GFC period and 0 otherwise.[13] Panel A of Table 10 presents results for *PosPower* and Panel B presents results for *PerPower*. The results suggest that the GFC did influence the relation between CEOs with greater decision-making power (*PosPower*) and cash holdings but not the relation between CEOs with renumeration-based power (*PerPower*) and cash holdings. Specifically, with regard to *PosPower*, results that were significant and positive prior to the GFC continue to be so after. However, we do not observe this for *PerPower*.

5.4 | Very high cash holdings and CEO power

To assess whether powerful CEOs are associated with very high levels of cash holdings, we create three new dummy variables that capture the top quartile for our three measures of cash holdings. These newly constructed variables are coded 1 if cash holdings of that firm fall in the top quartile in that particular year and 0 otherwise. We include them in the main models and report results in Table 11.

Columns (1), (2) and (3) in both Panels A and B report the regression results for corporate cash holdings in the top quartile and CEO power indices *PosPower* and *PerPower*, respectively. The results continue to support a significant and positive relation between both CEO power indices and higher levels of corporate cash holdings across all three measures of very high cash holdings.

5.5 | Lagged CEO power indices

It is possible that it may take time for powerful CEOs to influence the level of cash holdings. To allow for this, we re-run our analyses by lagging the CEO power indices (*PosPower* and *PerPower*) in regressions estimating the three proxies of cash holdings. We find no statistically significant associations between either of our lagged CEO power indices and the three proxies of cash holdings. Given this result and our main results reported in Tables 4–6, we conclude that the impact of powerful CEOs on cash holdings is contemporaneous rather than lagged. This suggests that CEO power is more immediately influential in influencing cash holdings.

[13]There are definitions of the GFC that range from July 2008 to March 2009. We include the years 2007 and 2008 in recognition of the fact that the GFC unfolded over more than 1 year and that the GFC was a prolonged period of financial turmoil that started in 2007. In this way, we are able to capture its full impact.

TABLE 8 Alternative measures of cash holdings.

Variables	*Log (Cash/Net Assets)* (1)	*Log (Cash/Net Assets)* (2)	*Cash & Mkt Sec./ Lagged Net Assets* (3)	*Cash & Mkt Sec./ Lagged Net Assets* (4)	*Cash/Lagged Net Assets* (5)	*Cash/Lagged Net Assets* (6)
Panel A: *PosPower*						
PosPower	0.0324*	0.0799***	0.0920***	0.1306***	0.0859***	0.1181***
	(1.9409)	(4.0281)	(3.7499)	(4.4275)	(3.6363)	(4.2179)
Corporate governance variables	NO	YES	NO	YES	NO	YES
Firm characteristics	YES	YES	YES	YES	YES	YES
Year effects	YES	YES	YES	YES	YES	YES
Industry effects	NO	YES	NO	YES	NO	YES
Constant	−0.4043*	0.9421*	−0.4874*	0.3489	−0.4890*	1.3148*
	(−1.8502)	(1.7080)	(−1.7624)	(0.4547)	(−1.8189)	(1.7831)
Observations	9654	9654	9128	9128	9128	9128
R-squared	0.2481	0.2861	0.1783	0.1795	0.1771	0.1965
Panel B: *PerPower*						
PerPower	0.0345**	0.0334*	0.0401*	0.0416*	0.0427*	0.0389*
	(1.9678)	(1.9300)	(1.6738)	(1.7447)	(1.8374)	(1.7098)
Corporate governance variables	NO	YES	NO	YES	NO	YES
Firm characteristics	YES	YES	YES	YES	YES	YES
Year effects	YES	YES	YES	YES	YES	YES
Industry effects	NO	YES	NO	YES	NO	YES
Constant	−0.3272	0.8614	−0.2502	0.3140	−0.2622	1.2462*
	(−1.4990)	(1.5619)	(−0.9433)	(0.4079)	(−1.0312)	(1.6858)
Observations	9654	9654	9128	9128	9128	9128
R-squared	0.2481	0.2852	0.1771	0.1777	0.1760	0.1950

Note: This table contains the results of the pooled OLS regressions with cluster-robust standard errors for Model 1. Panel A reports the regression results for Model 1 using *PosPower*. Panel B reports the regression results for Model 1 using *PerPower*. We only use firm characteristics in columns (1), (3) and (5) in both Panels A and B. We include corporate governance variables and firm characteristics in columns (2), (4) and (6) in both Panels A and B. The *t*-statistics are in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. Details of each variable used in the study are presented in Appendix 1.

TABLE 9 Controlling for CFO characteristics and CEO fixed effects.

Variables	*Cash & Mkt Sec./Total Assets* (1)	*Cash & Mkt Sec./Net Assets* (2)	*Cash/Net Assets* (3)
Panel A: *PosPower* (controlling for CFO age and gender)			
PosPower	0.0060**	0.0557**	0.0153***
	(2.0320)	(2.0520)	(3.0890)
CFO_Age (log)	0.0000	−0.0000	0.0003
	(0.2086)	(−0.0375)	(1.2400)
CFO Gender	0.0097	0.0029	−0.0028
	(1.1896)	(0.0478)	(−0.2026)
All other control variables	YES	YES	YES
Year effects	YES	YES	YES
Industry effects	YES	YES	YES
Constant	0.6110***	1.9704***	0.7345***
	(7.4117)	(3.2055)	(4.9393)
Observations	5214	5214	5213
R-squared	0.3790	0.2771	0.2481
Panel B: *PerPower* (controlling for CFO age and gender)			
PerPower	0.0062**	0.0688***	0.0085**
	(2.5606)	(3.4159)	(1.9628)
CFO_Age (log)	0.0000	0.0001	0.0003
	(0.2950)	(0.0495)	(1.3457)
CFO Gender	0.0097	0.0039	−0.0032
	(1.1935)	(0.0639)	(−0.2278)
All other control variables	YES	YES	YES
Year effects	YES	YES	YES
Industry effects	YES	YES	YES
Constant	0.5987***	1.8619***	0.6999***
	(7.2955)	(3.0851)	(4.7051)
Observations	5214	5214	5213
R-squared	0.3792	0.2779	0.2474
Panel C: *PosPower* (CEO fixed effects)			
PosPower	0.0093**	0.0428	0.0160**
	(2.2644)	(1.1902)	(2.4854)
All other control variables	YES	YES	YES
Year effects	YES	YES	YES
Industry effects	YES	YES	YES
Constant	0.5880***	1.4579*	0.6782***
	(5.5432)	(1.7475)	(3.5820)
Observations	9705	9705	9704
R-squared	0.3280	0.2066	0.2572

(Continues)

TABLE 9 (Continued)

Variables	*Cash & Mkt Sec./Total Assets* (1)	*Cash & Mkt Sec./Net Assets* (2)	*Cash/Net Assets* (3)
Panel D: *PerPower* (CEO fixed effects)			
PerPower	0.0051*	0.0554**	0.0076*
	(1.8417)	(2.4967)	(1.6934)
All other control variables	YES	YES	YES
Year effects	YES	YES	YES
Industry effects	YES	YES	YES
Constant	0.7019***	1.4384*	0.8174***
	(6.2089)	(1.7212)	(3.9868)
Observations	9705	9705	9215
R-squared	0.2937	0.2070	0.2529

Note: This table presents the regression results of the relation between CEO power indices (*PosPower* and *PerPower*) and cash holdings when controlling for CFO characteristics in addition to the existing control variables. This table also presents the results from the relation between CEO power indices (*PosPower* and *PerPower*) and cash holdings when adopting CEO fixed effects. The *t*-statistics are in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. Details of each variable used in the study are presented in Appendix 1.

5.6 | Alternative scaling

We use alternative scaling to address the possibility of a common denominator affecting the regression coefficients. We test two different scaling patterns. We deflate the dependent variable in our original analysis by total assets while deflating other variables by total sales, and we also do the opposite, deflating the dependent variable by total sales and other variables by total assets. The main results hold for these different measures.

5.7 | Alternative control variables

We replicate the main analyses (as reported in Tables 4 and 5) using four alternative firm-level control variables to substantiate the relation between CEO power and corporate cash holdings. We use the natural log of total sales (as a replacement for total assets) and return on assets (instead of return on equity) (Custódio & Metzger, 2014; Florackis & Sainani, 2018). We also use total current assets minus total current liabilities divided by net assets instead of working capital over total revenue (Liu et al., 2014) and the standard deviation of the firm's cash flow scaled by total sales over the prior three-year period instead of existing cash flow volatility. The untabulated results remain significant and show a positive association between both CEO power indices (*PosPower* and *PerPower*) and corporate cash holdings, further supporting the main findings.

6 | DEALING WITH ENDOGENEITY

Endogeneity may arise in our models for several reasons, one of which is the CEO firm matching issue, where CEOs who are appointed to best fit the firm's financial strategy (including cash holdings policy) also have characteristics that make them powerful. We address this and

TABLE 10 Interaction with the GFC.

Variables	*Cash & Mkt Sec./Total Assets* (1)	*Cash & Mkt Sec./ Net Assets* (2)	*Cash/Net Assets* (3)
Panel A: Interaction of *PosPower* with the GFC			
PosPower	0.0347	0.0088***	0.0136***
	(1.4938)	(3.4246)	(3.3498)
GFC Period	0.1738***	0.0234***	0.0175**
	(3.5950)	(4.8008)	(2.3252)
PosPower × *GFC Period*	0.0851*	0.0139***	0.0254***
	(1.7139)	(2.8541)	(3.5044)
Corporate governance variables	YES	YES	YES
Firm characteristics	YES	YES	YES
Year effects	NO	NO	NO
Industry effects	YES	YES	YES
Constant	1.6162***	0.6362***	0.7461***
	(2.9784)	(10.1283)	(7.2210)
Observations	9708	9708	9707
R-squared	0.1988	0.3043	0.2432
Panel B: Interaction of *PerPower* with the GFC			
PerPower	0.0443**	0.0038*	0.0053
	(2.4055)	(1.7742)	(1.5052)
GFC Period	0.1878***	0.0253***	0.0205***
	(3.8818)	(5.1943)	(2.7153)
PerPower × *GFC Period*	0.0439	0.0003	−0.0001
	(0.9482)	(0.0586)	(−0.0139)
Corporate governance variables	YES	YES	YES
Firm characteristics	YES	YES	YES
Year effects	NO	NO	NO
Industry effects	YES	YES	YES
Constant	1.6992***	0.6418***	0.7537***
	(3.1261)	(10.1425)	(7.2769)
Observations	9708	9708	9707
R-squared	0.1989	0.3020	0.2405

Note: This table represents the interaction results of three measures of cash holdings and two CEO power indices, i.e., *PosPower* and *PerPower* at the time of the GFC. We run pooled OLS regressions with cluster-robust standard errors by adding industry fixed effects in all regressions. We consider 2007 and 2008 as the GFC. To interact GFC with *PosPower* and *PerPower*, we construct a dummy variable named *GFC*, coded 1 in the year falls in GFC period, otherwise 0. In this table, we incorporate *GFC* as interaction variables with *PosPower* and *PerPower*. Panel A reports the regression results of the relations between all measures of cash holdings used in the main analysis and CEO power index (*PosPower*) with interaction effects of GFC period. Similarly, Panel B reports the regression results of the relations between all measures of cash holdings used in the main analysis and CEO power index (*PerPower*) with interaction effects of GFC period. The *t*-statistics are in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. Details of each variable used in the study are presented in Appendix 1.

other sources of potential endogeneity in our models by re-estimating them using propensity score matching, difference in differences, and the two-step generalised method of moments estimators. In each case, the results confirm the original findings.

TABLE 11 Corporate cash holdings at the top 25 percentile and CEO power indices.

Variables	*Cash & Mkt Sec./Total Assets* (1)	*Cash & Mkt Sec./ Net Assets* (2)	*Cash/Net Assets* (3)
Panel A: *PosPower*			
PosPower	0.1183***	0.1151***	0.1388***
	(3.3271)	(3.2428)	(4.3353)
Corporate governance variables	YES	YES	YES
Firm characteristics	YES	YES	YES
Year effects	YES	YES	YES
Industry effects	YES	YES	YES
Constant	5.3270***	5.3301***	4.3896***
	(5.2462)	(5.2607)	(4.7488)
Observations	9708	9708	9708
Pseudo *R*-squared	0.2349	0.2343	0.1412
Panel B: *PerPower*			
PerPower	0.0624**	0.0594**	0.0466*
	(2.0947)	(1.9979)	(1.7130)
Corporate governance variables	YES	YES	YES
Firm characteristics	YES	YES	YES
Year effects	YES	YES	YES
Industry effects	YES	YES	YES
Constant	4.0819***	4.0946***	3.3401***
	(4.3043)	(4.3235)	(3.8490)
Observations	9708	9708	9708
Pseudo *R*-squared	0.2103	0.2101	0.1222

Note: This table represents the regression results of three measures of cash holdings and two CEO power indices, i.e., *PosPower* and *PerPower* at the top quartile of cash holdings. We run logit regressions with cluster-robust standard errors by adding year and industry effects in all regressions. Panel A reports the regression results of the relation between all three measures of cash holdings used in the main analysis and the CEO decision-making power index (*PosPower*). Similarly, Panel B reports the regression results of the relation between all three measures of cash holdings used in the main analysis and CEO remuneration power index (*PerPower*). The *t*-statistics are in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. Details of each variable used in the study are presented in Appendix 1.

6.1 | Propensity score matching

Improper specification of the relation between CEO power and cash holdings can generate a problem known as 'functional form misspecification' (FFM) and can produce biased estimates. If treatment groups are more heterogeneous, the probability of a biased estimation from FFM increases. We adopt the propensity score matching (PSM) technique suggested by Rosenbaum and Rubin (1983) to deal with this concern because PSM reduces the dependency on the specification of the relation between variables.

We first create a treatment group with a high concentration of CEO power from the independent variables. We create two dummy variables for *PosPower* and *PerPower*, which are equal to 1 for CEOs who fall above or equal to the 80th percentile of the respective power indices of CEOs, and 0 otherwise based on year and industry (Florackis & Sainani, 2018).[14] The PSM procedure is implemented in two stages. In the first stage, we run a logistic regression by pooling

[14]We also select the 80th percentile as it provides us with data on CEOs who are disproportionately powerful and closer to 100% thus allowing us to better identify the differences in CEO power.

the treatment and control groups and calculate propensity scores for each firm-year observation. This model includes board size, ratio of interdependent directors to board size, firm size, market-to-book ratio, cash flow to total assets, and industry and year effects. As shown in Panel A of Table 12A, the control variables are significantly associated with our newly constructed dummy variable, i.e., CEOs with high power. In the matching technique, we use covariate balance tests (Hardies et al., 2015). As shown in Panel B of Table 12A, none of the included covariates are significantly different between control versus treatment sub-samples (Habib et al., 2018). In addition, we also observe that the mean differences of all the covariates are statistically insignificant, thus providing strong support for this estimation. In the second stage, we use the calculated propensity score to match each CEO with a high concentration of power to a CEO with a low concentration of power, using nearest-neighbour matching technique without replacement, as suggested by Leuven and Sianesi (2003),[15] and we find 2787 matches for CEOs with high concentration of power for *PosPower* and 2419 for *PerPower*. The final panel observation for PSM includes 4424 and 4338 matches for *PosPower* and *PerPower*, respectively.

Panels A and B of Table 12B report the PSM results. The relation between CEOs with a high concentration of power and corporate cash holdings is positive and statistically significant for five of the six results for *PosPower* and *PerPower*. These results confirm that CEOs with a high concentration of power hold more cash than CEOs with a low concentration of power, alleviating concerns of self-selection bias and CEO firm-matching, and further confirming the findings from the main analysis.

6.2 | Difference-in-differences

It is possible that a change in an externality, such as government policy, can affect CEO power. Amendments to ASX CGC introduced in 2010 to strengthen corporate governance structures (Harford et al., 2008; Nelson, 2005) are such a change, which may have impacted the personal and positional power of CEOs in our sample. The amendments include an emphasis on having a majority of independent directors, maintaining the decision-making autonomy of board members and the independent nature of the Chair, establishing a nomination committee, promoting ethical and responsible decision-making practices, and establishing audit and remuneration committees (Australian Securities Exchange Corporate Governance Council (ASX CGC), 2010). To deal with the treatment effects derived from these ASX CGC changes, difference-in-differences (DID) estimators are used (Roberts & Whited, 2013). We create a dummy variable for the treatment and control groups. The dummy variable (*Δ CG Principles*) for post-shock is equal to 1 if the date is after the shock, and 0 if the date is equal to or before the shock. For balance, we take 5 years after the shock and 5 years before the shock, including the year of the shock. We estimate the following DID model[16]:

$$\begin{aligned} Cash\ Holding_{i,t} = {} & \beta_0 + \beta_1\ PosPower_{i,t} \text{ or } PerPower_{i,t} + \beta_2\ \left(\Delta \text{CG } Principles_{i,t}\right) \\ & + \beta_3\ \left(PosPower_{i,t}\ or\ PerPower_{i,t} \times \Delta\ CG\ Principles_{i,t}\right) \\ & + \left[Control\ Variables\right] + IND\_FE + YEAR\_FE + \varepsilon_{i,t} \end{aligned} \tag{3}$$

The coefficients β_0, β_1, β_2 and β_3 are the DID estimators. These capture changes in firm cash holdings between the treatment and the control groups before and after the corporate governance policy changes. To ensure consistency with the main models, we also use cluster-robust standard errors.

[15]To ensure accurate matching, we set the maximum difference between the propensity scores of the two groups to not exceed more than 0.05. In addition, we match the control group and treatment group based on industry and year.

[16]See Appendix 1 for variable definitions.

TABLE 12A Propensity score matching (PSM) – Stage one.

Variables	First stage (*PosPower*) (1)	First stage (*PerPower*) (2)
Panel A		
Board Size (log)	−3.006***	−0.326***
	(−28.7872)	(−3.8774)
Interdependent Director	0.470***	0.720***
	(31.8724)	(5.9500)
Firm Size (log)	−0.139***	0.212***
	(−8.0347)	(11.8975)
Market-to-book	0.045***	0.049***
	(5.3509)	(5.2563)
Cash Flow/Total Assets	0.760 ***	0.352***
	(7.1573)	(2.8909)
Year effects	YES	YES
Industry effects	YES	YES
Constant	0.2147***	−6.859***
	(83.2214)	(−17.9698)
Observations	11,674	11,674
R-squared	0.112	0.1158

Variable	Mean		%Bias	*t*-test	
	Treated	Control		*t*	$p>\|t\|$
Panel B: Covariate balance test					
PosPower					
Board Size (log)	1.653	1.6512	0.50	0.18	0.856
Interdependent Director	4.445	4.4539	−0.50	−0.14	0.890
Firm Size (log)	17.67	17.61	2.80	1.05	0.294
Market-to-book	2.441	2.5231	−2.50	−0.95	0.344
Cash Flow/Total Assets	−0.0584	−0.0601	0.60	0.2	0.839
PerPower					
Board Size (log)	1.832	1.833	−0.20	−0.08	0.938
Interdependent Director	0.466	0.460	2.20	0.81	0.419
Firm Size (log)	18.985	19.002	−0.80	−0.26	0.793
Market-to-book	2.264	2.329	−2.20	−0.79	0.428
Cash Flow/Total Assets	0.008	0.007	0.40	0.16	0.871

Note: This table reports the first stage regression results from the PSM analysis for treatment (high concentration of CEO power) and control (non-high concentration of CEO power) groups. The treatment group includes those firms whose CEO power indices fall above or equal to the 80th percentile across all firms in year *t*. The control group includes those firms whose CEO power indices fall below the 80th percentile across all firms in year *t*. The propensity score in this table is predicated as a logit function of board size, ratio of interdependent director to board size, firm size, market-to-book ratio, cash flow to total assets, industry and year effect. The *t*-statistics are in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. Details of each variable used in the study are presented in Appendix 1.

Panels A and B of Table 13 report results of the DID analysis. Panel A shows that, before the changes in policy, the relations between *PosPower* and all three cash holdings measures are positive and statistically significant (at the 1% level) but after the changes, when *PosPower*

TABLE 12B Propensity score matching (PSM) – Stage two.

Variables	*Cash & Mkt Sec./Total Assets* (1)	*Cash & Mkt Sec./ Net Assets* (2)	*Cash/Net Assets* (3)
Panel A: *PosPower*			
PosPower	0.0134***	0.0681**	0.0161***
	(3.8808)	(2.0587)	(2.9419)
Corporate governance variables	YES	YES	YES
Firm characteristics	YES	YES	YES
Year effects	YES	YES	YES
Industry effects	YES	YES	YES
Constant	0.7600***	3.1255***	0.8516***
	(7.8939)	(3.8023)	(5.5516)
Observations	4424	4424	4410
R-squared	0.3003	0.2008	0.2351
Panel B: *PerPower*			
PerPower	0.0035	0.0428**	0.0084**
	(1.4429)	(2.0106)	(2.0325)
Corporate governance variables	YES	YES	YES
Firm characteristics	YES	YES	YES
Year effects	YES	YES	YES
Industry effects	YES	YES	YES
Constant	0.5426***	1.2699	0.6307***
	(6.3650)	(1.6349)	(4.2391)
Observations	4338	4338	4349
R-squared	0.3774	0.2508	0.2562

Note: This table reports the results from the PSM analysis for treatment (high concentration of CEO power) and control (non-high concentration of CEO power) groups. The treatment group includes those firms whose CEO power indices fall above or equal to the 80th percentile across all firms in year *t*. The control group includes those firms whose CEO power indices fall below the 80th percentile across all firms in year *t*. The propensity score in this table is predicated as a logit function of board size, ratio of interdependent director to board size, firm size, market-to-book ratio, cash flow to total assets, industry and year effect. Subsequently, we match each CEO with high concentration of power with that of a CEO with low concentration of power using the nearest neighbour matching technique without replacement as suggested by Leuven and Sianesi (2003). We also use industry and year to do the matching. We run pooled OLS regressions with cluster-robust standard errors by adding year and industry fixed effects in all regressions. Panel A presents the regression results of the relations between all three measures of cash holdings and equal size of treatment group and control group of *PosPower*. Panel B presents the regression results of the relations between all three measures of cash holdings and equal size of treatment group and control group of *PerPower*. The *t*-statistics are in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. Details of each variable used in the study are presented in Appendix 1.

interacts with *Δ CG Principles*, the coefficients become negative but remain statistically significant at the 10%, 5% and 10% levels, respectively. This result suggests that the changes in corporate governance structures affected the decision-making autonomy of CEOs. The relation between *PosPower* and all three cash holdings measures is negative, indicating that CEOs hold less cash after the corporate governance policy changes.

Similarly, Panel B of Table 13 indicates that before the changes in the policy, the coefficients of *PerPower* are positive for all three cash holdings measures and statistically significant at the 10% and 5% levels, respectively, except in column (3). After the change, the coefficients are not significant across all our three measures of cash holdings. While the

TABLE 13 Difference-in-differences (DID).

Variables	*Cash & Mkt Sec./ Total Assets* (1)	*Cash & Mkt Sec./ Net Assets* (2)	*Cash/Net Assets* (3)
Panel A: (*PosPower*) evidence from *Δ CG Principles* in 2010			
PosPower	0.0166***	0.1171***	0.0286***
	(4.3359)	(2.9500)	(5.2184)
Δ CG Principles	−0.0083	−0.0126	−0.0054
	(−0.8279)	(−0.1317)	(−1.3492)
PosPower × *Δ CG Principles*	−0.0085*	−0.0866**	−0.0138*
	(−1.8703)	(−1.9637)	(−1.8330)
Corporate governance variables	YES	YES	YES
Firm characteristics	YES	YES	YES
Year effects	YES	YES	YES
Industry effects	YES	YES	YES
Constant	0.6995***	2.1262***	0.7441***
	(9.0679)	(2.9039)	(9.1335)
Observations	6735	6735	6734
R-squared	0.3419	0.2191	0.2587
Panel B: (*PerPower*) evidence from *Δ CG Principles* in 2010			
PerPower	0.0051*	0.0693**	0.0063
	(1.6840)	(2.2195)	(1.1973)
Δ CG Principles	−0.0100*	−0.1023**	−0.0052
	(−1.7296)	(−2.1542)	(−0.2970)
PerPower × *Δ CG Principles*	0.0035	0.0334	0.0084
	(0.8942)	(0.8022)	(1.1088)
Corporate governance variables	YES	YES	YES
Firm characteristics	YES	YES	YES
Year effects	YES	YES	YES
Industry effects	YES	YES	YES
Constant	0.6962***	2.2024***	0.7174***
	(9.8251)	(3.0846)	(5.5663)
Observations	6735	6735	6734
R-squared	0.3394	0.2180	0.2390

Note: This table reports the results from the DID analysis. The amendments recommended by the ASX Corporate Governance Council in 2010 are used as an exogenous shock to the explanatory variables of this study, i.e., CEO power. To implement DID, we create a dummy variable for the treatment group and control group. The dummy variable (*Δ CG Principles*) of Post-Shock is equal to 1 if the date is after the shock and 0 if the date is equal to or before the shock of 2010. We run pooled OLS regressions with cluster-robust standard errors by adding year and industry fixed effects in all regressions. Panel A presents the regression results of the relation between all three measures of cash holdings and *PosPower* with an interaction effect of *Δ CG Principles*. Panel B presents the regression results of the relation between all three measures of cash holdings and *PerPower* with an interaction effect of *Δ CG Principles*. The *t*-statistics are in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. Details of each variable used in the study are presented in Appendix 1.

interaction terms do not show statistically significant relations, it is worth noting that the coefficients of *PerPower* show a positive and statistically significant effect on cash holdings before the policy changes, which becomes statistically insignificant after the changes. This

pattern suggests that the policy changes might have influenced the remuneration-based power of the CEO, which, in turn, contributed to changes in cash holdings. While the interaction analysis did not demonstrate a significant interaction effect, the observed change in the significance of *PerPower* coefficients before and after the policy changes indicates a potential influence of the changes on CEO personal power dynamics. Additionally, the impact of policy changes is greater on *PosPower* than on *PerPower* because the policy changes placed more emphasis on the decision-making autonomy of the executive and board members than on the remuneration of executives.

6.3 | Two-step system generalised method of moments estimator

Arellano and Bover (1995) and Blundell and Bond (1998) report that the system generalised method of moments (GMM) estimator is able to correct unobserved panel heterogeneity, omitted variable bias and measurement error, and is more robust than other GMM estimators. Omitted variable bias may arise due to omitting variables that may affect corporate cash holdings but cannot be directly observed from the vector of the independent variable. Additionally, it is arguable whether CEO power determines cash holdings or corporate cash holdings influence CEO power. An organisation may choose a certain CEO, for example, based on their characteristics aligning with the organisation's financial policy. Alternatively, certain CEOs may self-select into certain types of organisations. Measurement error may arise through improper measurement of the variables which are not observable and can therefore be difficult to quantify (e.g., the construction of CEO power indices). Furthermore, in this study, we use panel data containing cross-sectional observations on firms over time (Coakley et al., 2006), which may create a variety of unobserved heterogeneity in regression models.

We use the two-step system GMM, because it is more robust than the one-step system GMM as well as being more efficient and robust to heteroskedasticity and autocorrelation (Roodman, 2009). Panels A and B of Table 14 report the results of the two-step system GMM. To test the presence of serial correlation, we run the Arellano-Bond test because, if error terms are correlated over time, the GMM estimator will be inconsistent in the dynamic panel model.

The results in both Panels A and B show that the null hypothesis is rejected in the first test (AR(1)) but not in the second test (AR(2)), showing no evidence that errors are correlated over time. We also run the Hansen *J*-test to determine the validity of the instrumental variables. The Hansen *J*-statistic yields *p*-values for Panel A (0.801, 0.735 and 0.802 for columns (1), (2) and (3), respectively) and Panel B (0.861, 0.818 and 0.685 for columns (1), (2) and (3), respectively). The *p*-values across all results are more than 5%, which means that we cannot reject the null hypothesis that our instruments are valid (Hansen, 1982). Additionally, we run the Diff-Hansen test to confirm the validity of the additional instruments utilised by the system GMM estimator. Diff-Hansen yields *p*-values for Panel A (0.463, 0.390 and 0.725 in columns (1), (2) and (3), respectively) and Panel B (0.514, 0.694 and 0.575 in columns (1), (2) and (3), respectively). Again, the *p*-values indicate that we cannot reject the null hypothesis and therefore confirm the validity of the additional instruments.

To test the dynamic nature of the CEO power indices and cash holdings relations, the lagged dependent variable is used in the system GMM estimator. Panels A and B of Table 14 report that the lagged dependent variables (columns (1), (2) and (3)) are statistically significant for all three measures of cash holdings at the 1% level. Thus, they do not reject the dynamic nature of the relations. Panel A of Table 14 also reports that the relations between the CEO power indices (*PosPower* and *PerPower*) and all three cash holdings measures (columns (1), (2) and (3)) are still positive and statistically significant (5%, 5% and 1%, and 1%, 1% and 1%, respectively).

TABLE 14 Two-step system generalised method of moments (GMM) estimators.

Variables	*Cash & Mkt Sec./Total Assets* (1)	*Cash & Mkt Sec./Net Assets* (2)	*Cash/Net Assets* (3)
Panel A: *PosPower*			
L. Cash & Mkt Sec./Total Assets ($t-1$)	0.4665***		
	(4.8770)		
L. Cash & Mkt Sec./Net Assets ($t-1$)		0.3190***	
		(3.7803)	
L. Cash/Net Assets ($t-1$)			0.6144***
			(6.1233)
PosPower	0.0207**	0.2111**	0.0522***
	(2.0810)	(2.3903)	(2.9385)
Corporate governance variables	Yes	Yes	Yes
Firm characteristics	Yes	Yes	Yes
Year effects	Yes	Yes	Yes
Observations	9131	9131	9131
Number of instruments	82	82	82
Hansen (*p*-value)	38.67 (0.801)	40.55 (0.735)	31.37 (0.802)
Diff-Hansen (*p*-value)	31.06 (0.463)	32.56 (0.390)	18.59 (0.725)
AR(1) (*p*-value)	−6.98 (0.000)	−4.86 (0.000)	−7.14 (0.000)
AR(2) (*p*-value)	−0.35 (0.725)	0.30 (0.767)	0.96 (0.338)
Panel B: *PerPower*			
L. Cash & Mkt Sec./Total Assets ($t-1$)	0.6979***		
	(9.9266)		
L. Cash & Mkt Sec./Net Assets ($t-1$)		0.6263***	
		(6.6791)	
L. Cash/Net Assets ($t-1$)			0.3631***
			(5.2234)
PerPower	0.0181*	0.1936*	0.0275*
	(1.6737)	(1.7317)	(1.6747)
Corporate governance variables	Yes	Yes	Yes
Firm characteristics	Yes	Yes	Yes
Year effects	Yes	Yes	Yes
Observations	9131	9131	9131
Number of instruments	90	89	90
Hansen (*p*-value)	43.80 (0.861)	44.52 (0.818)	73.43 (0.685)
Diff-Hansen (*p*-value)	38.04 (0.514)	39.74 (0.694)	65.16 (0.575)
AR(1) (*p*-value)	−9.11 (0.000)	−5.64 (0.000)	−7.48 (0.000)
AR(2) (*p*-value)	−0.02 (0.986)	0.92 (0.355)	0.09 (0.930)

Note: This table presents the results of the system GMM estimators of the three cash holdings measures and the two CEO power indices (*PosPower* and *PerPower*). We run the two-step system GMM estimators by using xtabond2, a STATA function written by Roodman (2009). Two-step system GMM estimators use lagged values as regressors. These lagged levels of the dependent variables in Arellano and Bond's (1991) estimator are used as instruments in two-step system GMM estimators to deal with endogeneity. Due to the process of internal transformation, the two-step system GMM reduces the number of firm-year observations. The dynamic panel data system GMM model extends the fixed-effects model further by including the lagged value of dependent variables in the regression as instruments, thereby controlling the dynamic nature of endogeneity (Ullah et al., 2018). Panel A presents the two-step system GMM estimators between all three measures of cash holdings and *PosPower*. Panel B presents the two-step system GMM estimators between all three measures of cash holdings and *PerPower*. Although the Hansen test is high, it is one available test and our other test, consistent with comments made by Roodman (2009) and used by Arellano and Bond (1991) and Arellano and Bover (1995), has greater power than the Sargan and Hansen tests to detect lagged instruments being made invalid through autocorrelation. Furthermore, in our study, AR(1) < 0.05 and AR(2) > 0.05 point to the fact that the null hypothesis is rejected in the first test (AR(1)) but not in the second test (AR(2)), therefore showing no evidence that our errors are correlated over time. The *t*-statistics are in parentheses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. Details of each variable used in the study are presented in Appendix 1.

Consequently, the two-step system GMM estimator further confirms the result of the main model after mitigating unobserved panel heterogeneity, omitted variable bias and measurement error.

7 | CONCLUSION

In this study, we examine whether higher cash holdings is one channel by which powerful CEOs exercise and maintain their power, and whether the exercise of this power is beneficial or detrimental for firm performance. We find a positive association between corporate cash holdings and indices of two distinct types of CEO power which represent positional power and personal power. In further analyses, we find a positive outcome in terms of firm performance when higher cash holdings are combined with CEO positional power, but no association with firm performance when CEO personal power is high. The results for CEO positional power align more with stewardship theory than agency theory in terms of how powerful CEOs make decisions about cash holdings.

Our empirical results have implications for future research on CEO power, and practical implications for investors and regulators. They indicate to researchers that the nuances of CEO power should be investigated further given their differing impact. For example, our indices of CEO positional power and personal power may help to explain other actions taken by CEOs. For investors, our results indicate that not all types of CEO power are detrimental to performance. A high level of cash in the hands of a powerful CEO is not a problem by itself, because its impact depends on the type of power that the CEO wields. Positional power can have beneficial consequences for firm performance, whereas personal power does not. For regulators, our results do not indicate that all firms need greater regulation, such as the requirements of the Sarbanes-Oxley Act 2002 in the US for reporting internal control weaknesses. Greater scrutiny should be concentrated on those firms whose CEOs have high levels of personal power, and on the sources of that power.

DATA AVAILABILITY STATEMENT

Data derived from public domain resources.

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APPENDIX 1

VARIABLE DEFINITIONS

Variables	Definition
Dependent variables	
Cash & Mkt Sec./Total Assets	Ratio of cash and marketable securities to total assets
Cash & Mkt Sec./Net Assets	Ratio of cash and marketable securities to net assets, where net assets = total assets – cash and marketable securities
Cash/Net Assets	Ratio of cash to net assets
Log (Cash/Net Assets)	Natural log of the ratio of cash to net assets
Cash & Mkt Sec./Lagged Net Assets	Ratio of cash and marketable securities to lagged net assets
Cash/Lagged Net Assets	Ratio of cash to lagged net assets
Independent variables	
CEO Duality	Dummy variable equal to 1 if the CEO is also the chair of the board and 0 otherwise
CEO Tenure	Number of years the CEO has spent as the CEO in the firm
CEO Founder	Dummy variable equal to 1 if the CEO is a founder and 0 otherwise. The CEO is considered as a founder if he/she is in the role of CEO at the time of incorporation or joins within 1 year of the firm's date of incorporation
CEO Ownership	Percentage of CEO shares in the total outstanding shares of the firm
CEO Functional Experience	Dummy variable equal to 1 if the CEO has prior experience in the following six functions (i.e., accounting, finance, legal, human resources, mining and engineering) in an organisation before acting as CEO and 0 otherwise. This data is downloaded from SIRCA
Compensation Ratio (CompRatio)	Ratio of the CEO's total compensation to the total compensation of the top executive of the firm who receives the highest compensation after the CEO
CEO Remuneration	Ratio of the CEO's annual total compensation (including salary, bonus and other benefits) to the total annual compensation received by all the directors on the board other than the CEO
CEO Bonus Pay	Dummy variable equal to 1 if the CEO receives a performance-related bonus and 0 otherwise
Power	Index of CEO characteristics
PosPower	Principal component from a PCA based on the following variables: *CEO Duality*, *CEO Tenure*, *CEO Founder*, *CEO Ownership* and *CEO Functional Experience*
PerPower	Principal component from a PCA based on the following variables: *Compensation Ratio (CompRatio)*, *CEO Remuneration* and *CEO Bonus Pay*
Corporate governance variables	
CEO Gender	Dummy variable equal to 1 if the CEO is female and 0 otherwise
CEO Age	Natural log of the CEO age, where CEO age is the age of the CEO in years
Board Size	Number of members sitting on the board of directors
Interdependent Director	Ratio of interdependent directors to the total number of directors of the firm. Interdependent directors are those who are appointed by the CEO

(Continues)

APPENDIX 1 (Continued)

Variables	Definition
Board Independence	Ratio of independent directors to total directors of the firm
Board Meetings	Total number of board meetings held during the year
Firm variables	
Firm Size	Natural log of the book value of total assets
ROE	Net income divided by total shareholders' equity
Debt to Equity	Total debt divided by total shareholders' equity
Market-to-book	The book value of assets minus the book value of equity plus the market value of equity, divided by the book value of assets
Dividend Payment	Dummy variable equal to 1 if the firm pays dividends and 0 otherwise
R&D/Total Assets	Research and development expenses divided by total assets. Firms that do not report R&D expenses are considered to be firms with no R&D expenses
CAPEX	Natural log of the ratio of capital expenditures to total assets
WC/Total Revenue	Working capital divided by total revenue
Cash Flow/Total Assets	Cash flow divided by total assets
Cash Flow Volatility	Standard deviation of the firm's cash flow from operations scaled by total assets over the prior three-year period
Industry_Dummy	Industry dummy according to the global industry classification standard
Year_Dummy	Year dummy according to the financial year end
ε	Error term

APPENDIX 2

DETAILS OF PROXIES USED IN THE CONSTRUCTION OF CEO POWER INDICES

CEO POSITIONAL POWER

CEO duality

A common practice in some organisations is for the CEO to serve jointly as a chairperson of the board of directors. This dual service of the CEO is widely referred to as CEO duality. CEO duality may have a positive or negative effect on the firm. Proponents of CEO duality explain that this joint service of the CEO indicates that CEOs have the authority to act on the final resolution of any decision made by the board (Chang & Sun, 2009), which eventually can enhance firm performance. On the other hand, CEO duality enables CEOs to weaken the role of the board of directors in corporate decision-making by effectively controlling judgements, thereby negatively affecting firm activities like financing decisions (Dayton, 1984). In this study, *CEO duality* is a dummy variable equal to 1 if the CEO is also the chairman of board and 0 otherwise.

CEO tenure

CEOs' decision-making power largely rests on their length of tenure in firms. Chava et al. (2010) argue that a longer-tenured CEO can influence the corporate management and board structure to escalate his or her power. Hermalin and Weisbach (1998) also explain that longer CEO tenure escalates CEO power, which subsequently influences the board structure of a firm by making recommendations on the selection of board members. CEOs can positively affect

board decision-making by increasing the firm-related knowledge resulting from their tenure, consequently making better financing decisions (Brookman & Thistle, 2009). In this study, we measure *CEO tenure* as the total number of years for which a person has served as a CEO in a firm (Lewellyn & Muller-Kahle, 2012).

CEO ownership

CEO equity ownership motivates CEOs to make decisions that maximise firm performance and therefore increase their economic benefit due to having equity ownership in the firm. Denis et al. (1997) argue that CEOs' ownership increases their decision-making power in the board and acts as a safeguard against dismissal. This equity ownership also protects CEOs from excessive monitoring mechanisms deployed by board members (Lewellyn & Muller-Kahle, 2012). Pathan (2009) suggests that CEOs with greater equity ownership are more powerful. Therefore, CEOs with large proportions of shareholdings can play a significant role in determining a firm's direction by being the most powerful decision-maker in the firm. To measure CEO ownership power, we divide the total number of shares owned by the CEO by the firm's total number of outstanding shares.

CEO founder

To construct the CEO power indices, we also use CEO founder status, because Lilienfeld-Toal and Ruenzi (2014) suggest that founder CEOs are more powerful in the organisation and hold greater discretionary power within it. Chao et al. (2017) also find that founder CEOs play an important role in financial decision-making processes. Consistent with the prior literature (Daily & Johnson, 1997; Finkelstein, 1992; Lilienfeld-Toal & Ruenzi, 2014), we include CEO founder status because a founder CEO influences firm decision-making and has control over the board of directors as a result of having long-term relationships with its members. *CEO founder* is a dummy variable equal to 1 if the CEO is the founder and 0 otherwise. Following Lilienfeld-Toal and Ruenzi (2014), we consider the CEO as a founder if he/she was in the role of CEO at the time of incorporation or joined within 1 year of the firm's date of incorporation.

CEO functional experience

Functional experience is an important component of an individual's knowledge base. This cognitive trait provides CEOs with realistic knowledge of different functions within the organisation, fostering their decision-making accuracy and therefore making them powerful. Daily and Johnson (1997) argue that, if a CEO has been exposed to different functional areas, he/she may develop relationships with people from different functional areas within and outside the organisation. Subsequently, this relationship helps him/her to understand organisational problems better and thereby improve the efficiency of the organisation (Finkelstein & Hambrick, 1996). Furthermore, CEOs can use their own network established through their functional experience to solve organisational problems without asking for help from the board of directors within the same functional experience (Daily & Johnson, 1997). Due to the CEOs' own functional experience, their reliance on the board of directors decreases, eventually making them more powerful. In this study, we measure CEO functional experience using a dummy variable. If the CEO has any prior experience in any industry or function in an organisation before acting as the CEO, a value equal to 1 is allocated and 0 otherwise.

CEO PERSONAL POWER

Compensation ratio

CEO power is also measured in the form of CEO compensation (Chao et al., 2017; Daily & Johnson, 1997; Lewellyn & Muller-Kahle, 2012; Veprauskaitė & Adams, 2013). When a CEO

receives a higher salary than the other executives of the firm, it suggests that he/she has a greater influence on the decision-making process of the organisation. Bebchuk et al. (2011) argue that the compensation ratio demonstrates the CEO's relative position in the firm based on compensation. Therefore, compensation is a useful proxy to measure CEO power, as it provides a picture of the CEO's relative importance in the top management. Following Daily and Johnson (1997) and slightly modifying Bebchuk et al. (2011), we measure the compensation ratio by the ratio of the CEO's total compensation to the total compensation of the top executive of the firm who receives the highest compensation after the CEO.[17] A higher compensation ratio indicates that the CEO holds relatively more power than other top executives in the firm.

CEO remuneration

In corporate governance, the annual remuneration received by the board of directors is also an important factor and has a direct connection with the firm's structural power (Florackis & Ozkan, 2009; Grosse et al., 2019). Comparing the board of directors' annual remuneration with the CEOs' annual compensation provides a relative picture of the incumbent CEO's power compared with the board based on compensation. Agency theory assumes that a powerful CEO may influence the remuneration committee to approve liberal compensation packages that have little relation to the firm's performance (Boyd, 1995). In this study, we include another compensation proxy, namely the ratio of CEO annual total compensation (including salary, bonus and other benefits) to the total annual compensation received by all directors other than the CEO (Veprauskaitė & Adams, 2013).

CEO bonus pay

For the third CEO compensation proxy, we include CEO bonus pay. In the compensation package of executives, there are variable parts other than the base salary. The most common of these is a bonus (an incremental payment based on individual performance) (Holthausen et al., 1995). As bonuses depend largely on individual performance and firm performance, it is obvious that performing CEOs – and therefore more powerful CEOs – receive comparatively higher bonuses than their non-performing counterparts (Grinstein & Hribar, 2004). Following Veprauskaitė and Adams (2013), we measure CEO bonus pay using a dummy variable coded 1 if the CEO receives a performance-related bonus and 0 otherwise.

APPENDIX 3

CONSTRUCTION OF THE CEO POWER INDICES

Principal component	Components	Component loadings
Panel A: Principal component analysis (*PosPower*)		
PosPower	*CEO Duality*	0.48
	CEO Tenure	0.53
	CEO Founder	0.54
	CEO Ownership	0.71
	CEO Functional Experience	0.55
Eigenvalue	1.61	
Proportion explained	32.27%	

[17]Bebchuk et al. (2011) measure CEO compensation as the ratio of CEO compensation to the total compensation of the top five executives of the organisation. In this study, we use the top executive to measure the compensation ratio, because we already include two other CEO compensation proxies to construct the second CEO power index (*PerPower*).

APPENDIX 3 (Continued)

	(1)	(2)	(3)	(4)	(5)
Panel B: Correlation among CEO power proxies					
(1) *CEO Duality*	1.00				
(2) *CEO Tenure*	0.10***	1.00			
(3) *CEO Founder*	0.05***	0.13***	1.00		
(4) *CEO Ownership*	0.21***	0.18***	0.24***	1.00	
(5) *CEO Functional Experience*	0.11***	0.15***	0.12***	0.20***	1.00
Panel C: Appropriateness of *PosPower*					
Bartlett test of sphericity	H_0: CEO power proxies are not intercorrelated				
KMO	0.64				

Principal component	Components	Component loadings
Panel D: Principal component analysis (*PerPower*)		
PerPower	*CEO Remuneration*	0.82
	CompRatio	0.80
	CEO Bonus Pay	0.55
Eigenvalue	1.62	
Proportion explained	53.86%	

	(1)	(2)	(3)
Panel E: Correlation among CEO compensation proxies			
(1) *CEO Remuneration*	1.00		
(2) *CompRatio*	0.47***	1.00	
(3) *CEO Bonus Pay*	0.23***	0.19***	1.00
Panel F: Appropriateness of *PerPower*			
Bartlett test of sphericity	H_0: CEO compensation proxies are not intercorrelated		
KMO	0.62		

Note: Panel A presents the results from a PCA based on the following CEO power proxies which are related to CEOs' decision-making autonomy: *CEO duality*, *CEO tenure*, *CEO ownership*, *CEO founder* and *CEO functional experience*. Panel A represents the component loading, eigenvalue and proportion of variance, which are explained by the first components. Panel B presents the coefficients of correlation among the five CEO power proxies related to their decision-making autonomy. Panel C reports the results of the Bartlett test and the Kaiser–Meyer–Olkin test of appropriateness. Panel D presents the results from a PCA based on the following CEO power proxies, which are related to CEOs' remuneration: *CEO remuneration*, *Compensation ratio* and *CEO bonus pay*. Panel D represents the component loading, eigenvalue and proportion of variance, which are explained by the first components. Panel E presents the coefficients of correlation among the three different measures of CEO compensation. These three measures are all related to CEOs' power and influence their ability to exercise decision-making power. Panel F reports the results of the Bartlett test and the Kaiser–Meyer–Olkin test of appropriateness. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively. Details of each variable used in the study are presented in Appendix 1.