

WHO WINS THE TUG OF WAR? A COMPARATIVE STUDY OF THE INFLUENCE OF BOARD POWER AND CEO POWER ON CEO-TMT PAY GAP

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Abstract

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Extant studies theoretically debate and empirically present inconsistent findings of the factors that influence the CEO-TMT pay gap. In this study, we extend the research of the antecedents of the CEO-TMT pay gap by directly comparing different theoretical predictions regarding the impacts of board power and CEO power on the CEO-TMT pay gap. Conducting dynamic panel analyses with GMM estimator on a sample of 2,117 firm-year observations in the S&P 500 between 2006 and 2013, we empirically test the contrasting predictions regarding the relationships among board power, CEO power, board-CEO power imbalance, and the CEO-TMT pay gap. In turn, we find that board power is negatively associated with the CEO-TMT pay gap and CEO power has the opposite effect. Moreover, the stronger board power against CEO power, the smaller the CEO-TMT pay gap becomes. Our theoretical analyses and empirical investigations contribute to the existing theoretical debate among agency theory, tournament theory, and managerial power theory regarding the determinants of the CEO-TMT pay gap. Consistent with agency theory predictions rather than tournament theory ones, our empirical results suggest that boards are conscientious about the potential negative effects of a larger CEO-TMT pay gap and therefore stronger boards usually do not rely on larger CEO-TMT pay gap to incentivize CEOs. This study also contributes to corporate governance literature by offering new aggregated proxies for board power and CEO power which reflect the multidimensional features of board-CEO relationships.

Keywords: Board Power, CEO Power, CEO-TMT Pay Gap, Agency Theory, Tournament Theory, Comparative Study, Dynamic Panel Analyses

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1. INTRODUCTION

Management and finance scholars have shown increasing interest in the phenomenon of pay differentials between a CEO and other top executives of the firm, i.e., CEO-TMT pay gap (Henderson & Fredrickson, 2001; Bebchuk, Cremers, & Peyer, 2011; Vo & Canil, 2019). However, extant studies theoretically debate the main factors that influence the CEO-TMT pay gap (Henderson & Fredrickson, 2001; Vo & Canil, 2019; Lin, Yeh, & Shih, 2013; Lambert, Larcker, & Weigelt, 1993) and empirically present inconsistent findings (Bebchuk et al., 2011; Henderson & Fredrickson, 2001; Zorn, Shropshire, Martin, Combs, & Ketchen, 2017; Carpenter & Sanders, 2002; Conyon, Peck, & Sadler, 2001; Mueller, Ouimet, Simintzi, 2017). For example, consistent with agency theory which assumes that managers tend to pursue their self-interest (Bebchuk, Fried, & Walker, 2002; Bebchuk et al., 2011), Vo and Canil (2019) show evidence that supports a positive relationship between managerial power and the CEO-TMT pay gap. In comparison, Conyon et al. (2001), Lin et al. (2013), and Lambert et al. (1993) find support for tournament theory predictions by showing that the CEO-executive pay gap reflects hierarchical levels and competition among executives.

Meanwhile, prior corporate governance studies have extensively analyzed the impacts of the board of directors and CEO on CEO compensation which influences the CEO-TMT pay gap. Particularly, one stream of research focuses on the effects of the board of directors and documents a negative relationship between board control and CEO compensation in general (Boyd, 1994; Chhaochharia & Grinstein, 2009); and another stream of research emphasizes the impacts of CEO power and mainly reports a positive relationship between CEO power and CEO compensation (van Essen, Otten, & Carberry, 2015; Song & Wan, 2019).

If stronger board control results in stronger board power which negatively influences CEO compensation (Boyd, 1994; Chhaochharia & Grinstein, 2009), how does stronger board power influence the CEO-TMT pay gap? Incumbent theoretical debate still does not reach a consensus. On the one hand, tournament theory suggests that a stronger board should not suppress larger CEO-TMT pay gap which motivates a CEO to do a better job (Lambert et al., 1993) and consequently benefits the firm (Burns, Minnick, & Starks, 2017); on the other hand, agency theory proposes that stronger board should discourage larger CEO-TMT pay gap which can be considered as a result of CEO rent-seeking (Bebchuk et al., 2011). Consequently, we are uncertain about the relationship between board power and the CEO-TMT pay gap.

Moreover, if stronger CEO power facilitates higher CEO compensation, does a powerful CEO capitalize his or her power to increase the CEO-TMT pay gap? In this case, agency theory predicts that a larger CEO-TMT pay gap serves the self-interest of the CEO and therefore stronger CEO power should lead to a larger pay gap; tournament theory suggests that a larger CEO-TMT pay gap is beneficial because of its motivational effect (Lambert et al., 1993). Thus, both agency theory and tournament theory lead to the same prediction that stronger CEO power

should have a positive relationship with the CEO-TMT pay gap.

In sum, although these research questions regarding the antecedents of the CEO-TMT pay gap are important, prior studies voice seemingly contradicted theoretical arguments and provide inconsistent findings (Carpenter & Sanders, 2004; Eriksson, 1999; Henderson & Fredrickson, 2001). Our understanding of the antecedents of the CEO-TMT pay gap remains still limited.

In this study, we attempt to advance the research of the antecedents of the CEO-TMT pay gap by directly comparing different theoretical predictions regarding the impacts of board power and CEO power on the CEO-TMT pay gap. We seek to answer the following research question: *How do board power, CEO power, and board-CEO power imbalance influence CEO-TMT pay gap?* In turn, we empirically test the contrasting predictions regarding the relationships among board power, CEO power, board-CEO power imbalance, and the CEO-TMT pay gap. Particularly, we conduct dynamic panel analyses with a GMM estimator (Roodman, 2009) on a sample of 2,117 firm-year observations in the S&P 500 between 2006 and 2013. Our theoretical analyses and empirical investigation contribute to the existing theoretical debate among agency theory, tournament theory, and managerial power theory regarding the determinants of the CEO-TMT pay gap (Bebchuk et al., 2002; Henderson & Fredrickson, 2001; Vo & Canil, 2019; Lin et al., 2013; Lambert et al., 1993). Theoretically, our findings suggest that agency theory provides better predictions for the general relationships among board power, CEO power, and the CEO-TMT pay gap. Empirically, we contribute to corporate governance literature by exploring new aggregated proxies for board power and CEO power which reflect the multidimensional features of board-CEO relationships.

The rest of the paper is organized in the following way. In Section 2, we review relevant literature and develop hypotheses. In Section 3, we discuss the source of data, the sample of the study, definitions of the variables, and the regression model used in data analyses. Section 4 presents the results of the empirical analyses. Section 5 provides discussions of the findings. We summarize the findings, discuss the limitation and future research directions, and highlight the contributions in Section 6.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1. Board power, CEO power, and CEO compensation

Boards of directors of public firms, who represent the interest of shareholders (Black, 2001), have the legal rights to hire and fire CEOs, to determine CEO and executive compensations, and to evaluate and approve major corporate decisions (Adams, Hermalin, & Weisbach, 2010; Cannella, Finkelstein, & Hambrick, 2009; Lorsch & MacIver, 1989; Hermanson, Tompkins, Veliyath, & Ye, 2012). In other words, the legal rights of directors generate the structural power of directors over the CEO and other executives. Prior studies have extensively investigated the factors that strengthen board power that impacts CEO compensation. For example,

analyzing the structural relationships among board members and the CEO which influence board power, agency theorists identify power-strengthening factors as the independence of board chair (Boyd, 1994), the number of inside directors (Zorn et al., 2017), the presence of lead independent director (Krause, Withers, & Semadeni, 2017), board independence (Chhaochharia & Grinstein, 2009; Cannella et al., 2009), and board size (Haynes, Zattoni, Boyd, & Minichilli, 2019). Taking the resource-dependence theory and social network perspectives, a different group of researchers argue and demonstrate that board interlock influences board power (Zajac & Westphal, 1996) and impacts CEO compensation (Hallock, 1997; Wong, Gyga, & Wang, 2015; Zhang, 2021). Meanwhile, corporate governance scholars find that anti-takeover-related provisions such as the classified board influence directors and CEO compensation (Bereskin & Cicero, 2013; Faleye, 2007). In summary, to examine the potential determinants of CEO compensation, prior research mainly focuses on how the structural relationship between a board and the CEO influences board power which determines CEO compensation. Further, agency theorists highlight the monitoring effects of the board of directors and document a negative relationship between board power and CEO compensation in general (Boyd, 1994; Chhaochharia & Grinstein, 2009).

Although it is the prerogative of boards of directors to set CEO compensation, a CEO can rely on his or her ownership power and expert power (Finkelstein, 1992; Adams, Almeida, & Ferreira, 2005) to strengthen his or her structural power and bargain with the board for higher compensation. Prior research investigates a variety of factors that strengthen CEO power. Particularly, a CEO who is the founder possesses ownership power (Finkelstein, 1992); and a CEO with longer tenure accrues expert power (DeBoskey, Luo, & Zhou, 2019). Meanwhile, board structure related to CEO duality, CEO lone inside director, and lead independent director also influences CEO structural power (Song & Wan, 2019; Adams et al., 2005; Krause et al., 2017). Moreover, anti-takeover provisions, especially, the golden parachutes, weaken a board's power to fire the protected CEO (Singh & Harianto, 1989). In general, prior studies mainly report a positive relationship between CEO power and CEO compensation (van Essen et al., 2015; Song & Wan, 2019; Grabke-Rundell & Gomez-Mejia, 2002).

2.2. Board power and CEO pay gap

If stronger board control strengthens the power of the board of directors against a CEO and is negatively associated with CEO compensation (Boyd, 1994), do powerful directors further influence the pay gap between the CEO and other TMT members? If so, does strong board power makes the CEO-TMT pay gap narrowed or enlarged? Because boards of directors bear the fiduciary duty to serve the interest of shareholders (Black, 2001) and set the compensation of CEO and other TMT members (Lorsch & MacIver, 1989; Hermanson et al., 2012), whether directors facilitate or discourage larger CEO-TMT pay gap should be influenced by the evaluation of whether CEO-TMT pay gap serves the interest of the firm or the self-interest of the CEO. Consequently, before investigating the impact of

board power on the CEO-TMT pay gap, it is important to establish a premise about the implication of the CEO-TMT pay gap. In other words, we would need to know whether a larger CEO-TMT pay gap benefits the firm before we logically predict directors' impact on the phenomenon.

However, the implication of the CEO-TMT pay gap is subjected to theoretical debates. On the one hand, tournament theory argues that the CEO-TMT pay gap can act as an incentive impetus to elicit efforts from the top executives (Fisher, Sprinkle, & Walker, 2008; Henderson & Fredrickson, 2001; Lazear & Rosen, 1981). Firms pay managers differently based on their hierarchical positions and distinctive responsibilities (Lambert et al., 1993). A large CEO-TMT pay differential can act as a prize fixed in advance and a motivation impetus for other TMT members, discouraging CEO shirking (Ehrenberg & Bognanno, 1990; Henderson & Fredrickson, 2001; Lazear & Rosen, 1981). In turn, a larger CEO-TMT pay gap helps improve firm performance especially when the costs of monitoring managerial efforts are high (Fisher et al., 2008; Burns et al., 2017). On the other hand, agency theorists perceive excessive CEO compensation as an agency problem (Bebchuk & Fried, 2003) and therefore consider a larger CEO-TMT pay gap as a sign of CEO rent-seeking (Bebchuk et al., 2011). Thus, a CEO may not only pursue higher compensation (van Essen et al., 2015) but also try to keep the compensation of other TMT members relatively low because the CEO's self-interest does not necessarily converge with the interest of the firm and other top managers (Vo & Canil, 2019).

Moreover, the empirical evidence of the relationship between the CEO-TMT pay gap and firm performance is inconsistent. For example, Fredrickson, Davis-Blake, and Sanders (2010) as well as Carpenter and Sanders (2004) document a negative relationship between CEO-TMT pay gap and firm performance, respectively. But tournament-theory-based studies have found an increasing tendency toward the executive compensation design of large CEO-TMT pay differential (Canyon et al., 2001; Chhaochharia & Grinstein, 2009; Guthrie, Sokolowsky, & Wan, 2012; Sahib, Van der Laan, & Van Ees, 2018) and have shown a positive effect of CEO-TMT pay differential on firm performance (Eriksson, 1999; Lin & Lu, 2009; Main, O'Reilly, & Wade, 1993). The theoretical and empirical divergences drive us to make contrasting predictions of the relationship between board power and the CEO pay gap.

Among the four potential scenarios that influence the CEO-TMT pay gap which we summarize in Table 1, high CEO compensation and low TMT pay would result in a larger CEO-TMT pay gap; and either low CEO compensation or high TMT pay would reduce the CEO-TMT pay gap. Because boards of directors directly set CEO compensation and influence TMT pay (Hermanson et al., 2012), a larger CEO-TMT pay gap would exist when stronger board power increases CEO compensation and facilitates low TMT compensation. Alternatively, directors facilitate a smaller CEO-TMT pay gap when stronger board power either negatively influences CEO compensation or positively impacts TMT compensation.

Table 1. CEO and TMT compensation as determinants of CEO-TMT pay gap

		<i>TMT compensation</i>	
		<i>High</i>	<i>Low</i>
<i>CEO compensation</i>	<i>High</i>	small CEO-TMT pay gap	large CEO-TMT pay gap
	<i>Low</i>	small CEO-TMT pay gap	small CEO-TMT pay gap

Taking the agency theory perspective which suggests a negative effect of a larger CEO-TMT pay gap (Bebchuk et al., 2011), we expect that directors with stronger power against the CEO are more likely to serve the interest of shareholders and negatively impact the CEO-TMT pay gap. Consistent with the agency theory arguments that excessive CEO compensation is a sign of CEO rent-seeking (Bebchuk et al., 2011), prior research documents a negative relationship between board control and CEO compensation in general (Boyd, 1994; Chhaochharia & Grinstein, 2009). Accordingly, stronger board power may be associated with a smaller CEO-TMT pay gap when a board either directly reduces CEO compensation or increases TMT pay.

H1a: Board power is negatively associated with the CEO-TMT pay gap.

From the tournament theory's perspective which argues for a positive impact of the larger CEO-TMT pay gap on firm performance, we would expect that directors may facilitate a larger CEO-TMT pay gap as an incentive mechanism to motivate a CEO. Because CEO-TMT pay gap influences the behavior of a CEO (Lee, Cho, Arthurs, & Lee, 2019; Kini & Williams, 2012) and larger CEO-TMT pay gap may motivate a CEO to do a better job (Henderson & Fredrickson, 2001), especially when monitoring is costly (Connelly, Tihanyi, Crook, & Ganloff, 2014), larger CEO-TMT pay gap may benefit the firm. Consistent with this logic, Uygur (2019) shows that the CEO-to-worker pay inequality has a positive connection with firm performance, especially for a more capable CEO. Therefore, it is possible that directors with stronger power may incentivize a CEO with higher compensation and facilitate lower TMT compensation.

H1b: Board power is positively associated with the CEO-TMT pay gap.

2.3. CEO power and CEO-TMT pay gap

If CEOs can capitalize on their stronger power to obtain higher levels of compensation (Grabke-Rundell & Gomez-Mejia, 2002; Song & Wan, 2019), do they tend to suppress the compensation of other TMT members and correspondingly enjoy a larger CEO-TMT pay gap? With respect to the compensation negotiations between CEOs and boards of directors, extant literature generally suggests that CEOs with more power over boards of directors are in a better position to negotiate for their compensation arrangements than CEOs with less power (Bebchuk et al., 2002; Lambert et al., 1993; Abernethy, Kuang, & Qin, 2015; Morse, Nanda, & Seru, 2011). Furthermore, CEOs can influence compensation arrangements for other TMT members (Hermanson et al., 2012), and CEO characteristics tend to influence such decision processes (Malmendier & Tate, 2009; O'Reilly, Doerr, Caldwell, & Chatman, 2014). Thus, exploring various related theoretical analyses, we expect that CEOs with strong power

tend to negotiate with boards of directors for their better compensation but do not share these benefits with other TMT members, leading to an augmented CEO-TMT pay gap.

Unlike the diverging predictions regarding the connection between board power and the CEO-TMT pay gap, different theoretical perspectives lead to similar conclusions regarding the impact of CEO power on the CEO-TMT pay gap. Specifically, managerial power theory and agency theory suggest that a CEO capitalizes on his or her strong power to bargain with the board for higher compensation (Lambert et al., 1993). According to the agency theory premise that a CEO pursues self-interest, it is also logical to argue that the CEO usually lacks the motivation to raise the compensation for other TMT members out of self-interest. Indeed, prior agency theory research provides evidence that CEOs tend to increase their own compensations, but this increase is not observed for the next highest-paid executive (Malmendier & Tate, 2009). In sum, managerial power theory and agency theory both suggest that stronger CEO power tends to be associated with an enlarged pay gap between a CEO and other TMT members.

Moreover, tournament-theory-based research also supports the positive relationship between CEO power and the CEO-TMT pay gap. Theoretically, the larger CEO-TMT pay gap is consistent with the logic of tournament theory which proposes incentive structure based on organizational hierarchies (Lambert et al., 2001). When a CEO possesses stronger power over other TMT members, tournament theory predicts a larger CEO-TMT pay gap (Henderson & Fredrickson, 2001). Empirically, prior studies provide evidence that the CEO-TMT pay gap is positively related to the number of TMT members (Conyon et al., 2001; Lin et al., 2013). This phenomenon suggests that a powerful CEO who controls more subordinates receives higher pay than his or her TMT peers. Therefore, we posit

H2: CEO power is positively associated with the CEO-TMT pay gap.

2.4. Board-CEO power imbalance and the CEO pay gap

We further explore the impact of the power imbalance between a board of directors and a CEO because the CEO and the board influence each other with power (Westphal & Zajac, 1995). Since power is a relative concept that reflects one actor's influence over another in a social relation (Emerson, 1962), board power and CEO power become interdependent in the negotiation process of executive compensation. In turn, we examine the differential impact of board power and CEO power on the CEO-TMT pay gap in different scenarios¹.

¹ Board power and CEO power, although relating to each other, are two different concepts reflecting unique roles and functions of the board and the CEO, respectively. Even though prior research finds that board power and CEO power exerts the opposite impact on CEO compensation (Chhaochharia & Grinstein, 2009; van Essen et al., 2015), board power and CEO power may not always be inversely related because board power and CEO power has both common and disparate bases and dimensions (French & Raven, 1959; Finkelstein, 1992). In the context of CEO compensation and CEO-TMT pay gap, factors unique to either board or CEO make different dimensions of board power and CEO power (Westphal & Zajac, 1995; Adams et al., 2005; Finkelstein, 1992) salient. For example, while strong board power due to board structure logically result in weak structural power of CEO over the board, a CEO may resort to ownership power and expert power (Finkelstein, 1992) to compensate for his or her weak structural power over the board. Meanwhile, in the context of determining CEO-TMT pay gap, we argue that the structural power of board exerts a much stronger impact on the CEO than the potential ownership and expert power of directors.

The scenario of strong CEO power and weak board power should be related to the larger CEO-TMT pay gap. In other words, a CEO can rely on his or her strong power to bargain with the board which has weak power and obtain higher compensation. Meanwhile, the CEO does not have the incentive to raise the compensation of his or her TMT peers. As a result, a larger CEO-Board power imbalance should be related to the larger CEO-TMT pay gap.

However, when a board has stronger power and the CEO has weaker power at the same time, it is less clear whether the CEO-TMT pay gap will be larger. From the agency theory's perspective, as *H1a* predicts, stronger board power would be related to a smaller CEO-TMT pay gap. Meanwhile, a CEO with a weaker power is unlikely able to overcome the stronger power of the board to pursue a larger CEO-TMT pay gap. From the tournament theory's perspective, as *H1b* posits, stronger board power should be positively related to the CEO-TMT pay gap. In this case, because the CEO would nevertheless welcome a larger CEO-TMT pay gap, the weak CEO power over the board becomes moot. As a result, a larger board-CEO power imbalance should be related to the larger CEO-TMT pay gap.

H3a: Board-CEO power imbalance is negatively associated with the CEO-TMT pay gap.

H3b: Board-CEO power imbalance is positively associated with the CEO-TMT pay gap.

3. RESEARCH METHODOLOGY

3.1. Data and sample

The sample for our study included all publicly traded firms listed in the S&P 500 composite index in the year 2009. These firms were tracked for the study period, regardless of whether they stayed on the S&P 500 list. To identify changes over time, we collected data covering an eight-year window from 2006 and 2013. This period allowed us to track a firm's executive compensation pattern over years. To accurately reflect pay differentials between a CEO and the TMT, we excluded observations where CEO tenure is less than one year. This helped us avoid artificial low CEO-TMT pay gap ratios caused by the fact that CEOs receive lower compensations when they work only for part of the year (Bebchuk et al., 2011)². We used Execucomp to gather individual executive information for the five highest-paid executives (including the CEO), which was widely used in prior studies (Bloom & Michel, 2004; Bebchuk et al., 2011). We analyzed firm 10-K filings to supplement missing executive information in Execucomp. Compustat provides firm-level financial data. In our main analyses, we eliminated financial and utility firms to follow a common practice in prior research of firm governance choices and executive compensation designs (Ridge, Aime, & White, 2015)³.

As a result, it's possible that CEO power and board power reaches a balanced status, rendering the offset of both power when the board and CEO have different attitudes towards CEO-TMT pay gap. In turn, it is important to simultaneously examine the differential impact of board power and CEO power on CEO-TMT pay gap.

² Bebchuk et al. (2011) point out that a CEO receives a smaller amount of compensation if the CEO does not hold the position for the entire year. As a result, if we were to include observations where CEO tenure is less than one year, we would derive at a CEO-TMT pay gap ratio that is downward biased.

³ Ridge et al. (2015) argue that financial and utility firms are highly regulated by governmental agencies. Consequently, these firms need to satisfy unique

3.2. Dependent variables

The CEO-TMT pay gap is a ratio variable, calculated as the ratio of CEO compensation over the average compensation of the four highest highest-paid non-CEO managers (Lee et al., 2019; Ridge et al., 2015). These non-CEO managers, striving to work their way up to the highest managerial positions next to the CEO, oversee various aspects of the organization and hold positions such as Chief Operational Officer (COO), Chief Marketing Officer (CMO), Chief Financial Officer (CFO) (Cannella et al., 2009; Fredrickson et al., 2010), and Senior Vice President⁴. We calculated the total compensation of a CEO and the four highest highest-paid top managers by including salary, bonuses, other annual compensation, restricted stock grants, LTIP payouts, the total value of options granted (using the Black-Scholes valuation model), long-term incentive payouts, and all other compensation (i.e., TDC1 in Execucomp). This measure was widely used in prior literature (Conyon et al., 2001; Fredrickson et al., 2010).

3.3. Independent variables

We employ a composite measure of *board power* to represent a board's capability of controlling the CEO. Specifically, we take the standardized value of *board power* in the main tests, where:

$$\begin{aligned} \text{Board power} = & \\ & \text{Board size} \times (\text{Independent board chair} + \\ & \text{Multiple insider directors} + \\ & \text{Lead independent director} + \\ & \text{Super board independence} + \text{Board interlock} + \\ & \text{Classified board}) \end{aligned} \quad (1)$$

Following Zajac and Westphal (1996), we encode an *independent board chair* as one if the chairperson is not the CEO, and zero otherwise. In other words, the *independent board chair* is a reverse coding of CEO duality which represents the case that the CEO is also the chairperson. CEO duality gives the CEO increased power over the board to exert his or her own will and pursue his or her own interests (Daily & Johnson, 1997). In turn, the separation of the board chair and CEO weakens the power of the CEO and strengthens board control (Boyd, 1994; Zajac & Westphal, 1996).

The variable of *multiple insider directors* takes the value of one if the CEO is not the only inside director on the board, and zero otherwise. Traditional agency theory studies argue that CEO power increases when more insiders, who are employees or managers of the firm, serve as directors (Boyd, 1994; Morse et al., 2011). In other words, more inside directors should be negatively related to board power (Boyd, 1994). However, current research finds that recent regulatory changes appear to boost an unexpected effect that CEOs appear to be more powerful when no other firm employees serve on the board (Zorn et al.,

data-reporting requirements which make them less comparable to firms less regulated.

⁴ The Execucomp database records the five highest paid executives including the CEO. The exact titles of the recorded non-CEO executives may vary from firm to firm. A cursory search of the ExecuComp database shows that the typical titles of the highest paid non-CEO executives also include Executive Vice President, Chief Audit Executive, Chief Legal Officer, etc.

2017). We agree with the assessment that non-CEO insider directors not only may share the decision-making process with the CEO (Adams et al., 2005) but also can strengthen the monitoring capability of independent directors by mitigating the information asymmetry between the board and the CEO (Zorn et al., 2017).

Lead independent director takes the value of one if a board designates a lead independent director (Krause et al., 2017), and zero otherwise. A lead independent director helps balance the strong power of a CEO who is also the chairperson (Krause et al., 2017) and may facilitate the removal of a poorly performed CEO (Lamoreaux, Litov, & Mauler, 2019). Accordingly, a board strengthens its power over the CEO with a lead independent director.

Super board independence is one when a board is consisted of at least 50% of independent directors; otherwise, super board independence is zero. Chhaochharia and Grinstein (2009) show that stronger board independence is negatively associated with CEO compensation. This evidence supports the argument that a board enhances its power over the CEO with more independent directors (Cannella et al., 2009).

Board interlock takes the value of one if a member of the compensation committee also serves as a director of at least one of other companies, and zero otherwise. Zajac and Westphal (1996) suggest that the board interlocks influence board power. Regarding the effect of board power on CEO compensation, we expect that the interlocking status of a director who is a member of the compensation committee allows the interlocked director to relate CEO compensation to those of peer firms (Hallock, 1997; Wong et al., 2015; Zhang, 2021). As a result, board interlocking weakens the potential influence of the CEO on executive compensation.

Classified board is equal to one if directors are divided into separate classes with each class being elected to overlapping terms (Gompers, Iishi, & Metrick, 2003); otherwise, a *classified board* takes the value of zero. Besides providing the debatable anti-takeover effect (Bates, Becher, & Lemmon, 2008), the *classified board* directly protects directors from the threat of yearly re-election. Faleye (2007) finds that *classified board* is negatively associated with CEO compensation incentives. This result suggests that classified board strengthens the power of those protected directors to exert a stronger influence on executive compensation⁵.

Board size represents the number of directors. While prior research provides equivocal findings of the impacts of board size on firm performance (Coles, Daniel, & Naveen, 2008; Wintoki, Linck, & Netter, 2012; Dalton, Daily, Johnson, & Ellstrand, 1999), we agree with the assessment that a larger board of directors allows more monitoring of the CEO and strengthens board power over the CEO (Haynes et al., 2019). In other words, board power is strengthened when the board is larger and consisted of more directors who are independent of the CEO.

In sum, we expect that *board power* should be influenced by the combined effects of *board size*, *board composition* (i.e., *independent board chair*, *multiple insider directors*, *lead independent director*, *super board independence*), *board interlock*, and *classified board*.

Consistent with the research of Song and Wan (2019) as well as Adams et al. (2005), we operationalized CEO power as an aggregate index of six binary indicators of CEO characteristics and his or her relationship with the board. Specifically,

$$\begin{aligned} \text{CEO power} = & \\ & \text{CEO duality} + \text{CEO lone inside director} + \\ & \text{No lead independent director} + \text{Founder} + \\ & \text{CEO tenure} + \text{Golden parachutes} \end{aligned} \quad (2)$$

Effectively a reverse coding of *independent board chair*, *CEO duality* equals one if a CEO also serves as the chairperson, and zero otherwise. When a CEO serves as the chairperson of the board (CEO duality), the power of the CEO over the board is enhanced (Daily & Johnson, 1997). Meanwhile, a CEO/chairperson usually exerts more influence on the nomination process of new directors (Westphal & Zajac, 1995) and the composition of sub-committees of the board (e.g., compensation committee). When a CEO/chairperson exercises the power to influence director selection and reward the directors through director compensation or other business opportunities, the CEO/chairperson controls a better position over the board to negotiate for his or her own compensation (Bebchuk et al., 2002; O'Reilly, Main, & Crystal, 1988).

CEO lone inside director takes the value of one if a CEO is the only inside director, and zero otherwise. *CEO lone inside director* is a reverse coding of *multiple insider directors*. The practice of a CEO serving as the lone inside director on the board puts the CEO in a more powerful position (Adams et al., 2005) when the CEO negotiates compensation with the board. The CEO/lone inside director takes substantial control of firm-specific information over the board of directors, faces no contestants of other inside directors (Zorn et al., 2017), exerts increased influence on director nominations and elections (Joseph, Ocasio, & McDonnell, 2014), and impacts the board's decision-making on CEO compensation (Lambert et al., 1993).

No lead independent director takes the value of one if a board does not designate a lead independent director (Krause et al., 2017), and zero otherwise. A CEO would obtain stronger power against the board if there is no lead independent director who helps offset the strong power of a CEO (Krause et al., 2017) and facilitates the removal of an underperforming CEO (Lamoreaux et al., 2019).

Founder is a dummy variable that takes the value of one if a CEO is also the founder of the firm, and zero otherwise. Prior research argues and provides evidence that the founder status strengthens the power of a CEO over directors with respect to decision-making and influences CEO compensation (Adams et al., 2005; Song & Wan, 2019; Conyon & He, 2014). As the founder, a CEO also possesses ownership power (Daily & Johnson, 1997; Finkelstein, 1992).

CEO tenure takes the value of one if a CEO's tenure with his or her company exceeds the median

⁵ Bereskin and Cicero (2013) find that classified board is positively associated with CEO compensation in Delaware-incorporated firms without outside blockholders. This result is consistent with the argument that protected directors can influence CEO compensation at a stronger degree.

of the tenure of peer CEOs in the same industry based on two-digit SEC code, and zero otherwise. Prior studies have argued that CEO tenure has an impact on CEO compensation (Conyon & He, 2014) as CEO tenure is related to expert power (DeBoskey et al., 2019). In other words, CEOs may develop stronger expert power over longer tenure (DeBoskey et al., 2019). CEOs with more expert power due to long tenure can exert stronger influences on directors (Zajac & Westphal, 1996; Abernethy et al., 2015). Moreover, CEOs with longer tenure may possess stronger power when they have more opportunities to influence director nomination and selection of directors (Fahlenbrach, 2009; Lorsch & MacIver, 1989).

$$\text{Board} - \text{CEO power imbalance} = \text{Board power} - \text{CEO power} \quad (3)$$

3.4. Control variables

We first included individual-level variables that may influence the CEO-TMT pay gap as controls. Specifically, we included *CEO pay* and *TMT pay dispersion*. *CEO pay* was measured as the logarithm of the total compensation received by the CEO. We used the Gini coefficient to calculate *TMT pay*

$$\text{Gini coefficient} = 1 + 1/n - 2 \times (y_1 + 2y_2 + \dots + ny_n)/(n^2\bar{y}) \quad (4)$$

where, $y_1 \dots y_n$ is individual executive pay on the executive team j in decreasing order of size, \bar{y} is the mean pay on team j , and n is the number of executives on team j .

We next controlled several firm-level variables that may influence the CEO-TMT pay gap. We considered the governance environment of a firm by incorporating the *E-index*, an indicator of managerial entrenchment and an aggregate measure of firms' status related to a poison pill, classified board, golden parachutes, supermajority requirement, limit to amend a bylaw, and limit to amend corporate charter (Bebchuk, Cohen, & Ferrell, 2009). Specifically, we control for *E-index no classified board* (i.e., the *E-index* value minus the value of *classified board*), *E-index no golden parachutes* (i.e., the *E-index* value minus the value of *golden parachutes*), and *E-index no classified board and golden parachutes* (i.e., the *E-index* value minus the values of *classified board* and *golden parachutes*) in our main tests of *H1*, *H2*, and *H3*, respectively. Following prior studies (Fredrickson et al., 2010; Hansen & Wernerfelt, 1989; Henderson & Fredrickson, 2001; Ridge et al., 2015), we controlled *firm size* (i.e., the natural logarithm of a firm's sales), *leverage* (i.e., the ratio of debt to total assets), *current ratio* (i.e., the ratio of current assets divided by current liabilities), *R&D intensity* (i.e., the ratio of annual R&D expenditures over sales), and *capital investment* (i.e., the ratio of annual capital equipment expenditures over sales). We also control unrelated product *diversification* entropy, which was measured as $\sum P_i \ln(1/P_i)$, where P_i was the percentage of total sales a firm received from its i th two-digit SIC segment (Fredrickson et al., 2010; Ridge et al., 2015). We further control for *market-to-book ratio (MTB)* which is measured as the ratio of the firm's market value over equity book value divided by 1,000.

Golden parachutes are a dichotomous variable which that takes the value of one if a firm grants golden parachutes to the CEO, and zero otherwise. Although considered as a sign of managerial entrenchment, golden parachutes' the influences on the acquisition and firm value are controversial (Fich, Tran, & Walkling, 2013; Bebchuk, Cohen, & Wang, 2014). We argue that the practice of golden parachutes makes it more costly for a board to remove the CEO and is associated with stronger CEO power against the board (Singh & Harianto, 1989; Wade, O'Reilly, & Chandratat, 1990).

We define *board-CEO power imbalance* as the difference between the standardized value of *board power* and *CEO power*:

dispersion (Bloom & Michel, 2002; Messersmith, Patel, Lepak, & Gould-Williams, 2011). The Gini coefficient ranges from 0 to 1, where 1 indicates higher levels of dispersion and less equality in compensation among executive members. The Gini coefficient was calculated for each executive team for each year by using the following formula:

Moreover, we controlled for three industry industry-level factors that may influence the CEO-TMT pay gap: *complexity*, *munificence*, and *dynamism*. To account for the inequalities among competitors, we measured *complexity* as the sum of squares of market shares of all firms in each industry (Connelly, Haynes, Tihanyi, Gamache, & Devers, 2016). *Munificence* refers to the capacity of an industry to support sustained growth and is the regression of industry sales over time divided by the mean of industry sales (using a 5-year window with the focal year as the last year in the series) (Bergh, 1998). *Dynamism* captures the level of instability or turbulence present in an industry (Lepak, Takeuchi, & Snell, 2003). We define *dynamism* as the standard error of the prior regression divided by mean industry sales. We calculated these factors at the two-digit SIC code level.

Lastly, we employed a set of year dummy variables to control year year-fixed effects in all models. All dependent variables were one year forwarded ($t+1$). The focal year's data (t) were used for all other variables in the regression models.

3.5. Estimation strategies

We conducted panel data analyses with the system generalized method of moments (GMM) procedure (Arellano & Bover, 1995; Blundell & Bond, 1998) to test our hypotheses while resolving the potential problems of endogeneity, heteroskedasticity, and autocorrelation. Studying the determinants of top executive pay disparity encounters many empirical challenges. For example, firms and top executives are heterogeneous in nature and have many unique features difficult to measure (Sanchez-Marin & Baixauli-Soler, 2015). Unobserved factors that affect the dependent variable are potentially endogenous to the independent variable. Thus, the independent

variables, perhaps correlated with the past or current error terms, are not strictly exogenous (Patel, Li, del Carmen Triana, & Park, 2018). More specifically, the data used in this study contain observations of cross-sectional units (i.e., firms) over multiple time periods. The error items are often correlated across years within firm i (rather than randomly distributed), giving rise to the concern of heteroskedasticity and autocorrelation.

The GMM approach has been increasingly used to explore top executive pay disparity (Connelly et al., 2016; Li, 2016; Patel et al., 2018; Ridge et al., 2015; Sanchez-Martin & Baixauli-Soler, 2015). The system GMM model was designed especially for situations with a large number of cross-sectional observations and few time periods (small T and large N panels: Roodman, 2009) and has been widely used by empirical researchers due to its efficiency of estimation in the presence of heteroskedasticity and endogeneity (Baum, Schaffer, & Stillman, 2003; Roodman, 2009).

In general, we tested the hypotheses by estimating the GMM estimators in the following functional form of our models:

$$Y_{it} = \alpha + X_{it}\beta + \mu_i + \varepsilon_{it} \quad (5)$$

where, Y represents the dependent variable, i denotes the firm, and t denotes the year. X is the vector of variables including key independent variables and control variables, and β represents estimated parameters. The model includes an individual effect, μ_i , to control for unobservable heterogeneity, so that the error term is $\mu_i + \varepsilon_{it}$, where ε_{it} is a random error.

Specifically, we employed the *xtabond2* command in Stata with the two-step estimation option and the robust standard error option for the system GMM estimators. The two-step GMM approach allows us to estimate the error terms by regressing the dependent variable against the independent variable and the endogenous control variables as well as all exogenous instrumental variables as the first step. We treated *CEO pay*, *TMT pay dispersion*, and *E-index* related controls (i.e., *E-index no classified board*, *E-index no golden parachutes*, *E-index no classified board and golden parachutes*, and *E-index*) as the endogenous control variables that may have an impact on the endogenous independent variables (i.e., *board power*, *CEO power*, and *board-CEO power imbalance*) and used all other control variables as exogenous variables. Then, at the second step, the residuals generated from the first step were used to calculate the error terms and derive at the GMM estimators (Baum et al., 2003; Connelly et al., 2016; Roodman, 2009). In addition to the two-step system GMM approach, we followed prior studies of top executive pay disparity (Ridge et al., 2015) by adopting the robust standard error option, so that we provided more efficiency and robust estimates than other methods such as the generalized least square

equation with the fixed effect and first difference GMM (Baum et al., 2003). We also included a lagged dependent variable in the regression equation to address the dynamic nature of the dependent variable and mitigate the concerns caused by autocorrelation.

4. RESULTS

4.1. Main results

Table 2 shows descriptive statistics and pairwise correlations of the variables that we employ in testing our hypotheses. *CEO-TMT pay gap* does not have a statistically strong correlation with *board power*, offering no support for *H1*. Consistent with *H2*, *CEO-TMT pay gap* is positively correlated with *CEO power*. Meanwhile, *board-CEO power imbalance* is negatively correlated with *CEO-TMT pay gap*, a result consistent with *H3a*.

Table 3 shows the main test results of *Hypotheses 1-3*. The dependent variable for Models 1-3 is the *CEO-TMT pay gap*. Model 1 supplies evidence that supports *H1a* because the coefficient of *board power* is negative and significant ($\beta = -0.214$, $p < 0.05$). Shown in Model 2, *CEO power* has a marginal positive effect ($\beta = 0.141$, $p < 0.10$) on *CEO-TMT pay gap*. We thus find evidence consistent with *H2*. In Model 3, *board-CEO power imbalance* has a significant negative relationship with the *CEO-TMT pay gap* ($\beta = -0.114$, $p < 0.05$), providing support for *H3a*.

In all models, we performed the Arellano-Bond test for autocorrelation. Because we used a one-year lagged dependent variable in Models 1-3, we adopted the Arellano-Bond test for second-order autocorrelation to evaluate whether the lags of the dependent variable used as the instruments are endogenous (Ridge et al., 2015; Roodman, 2009). The Arellano-Bond test statistics for second-order autocorrelation in first differences — AR(2) — failed to reject the null hypothesis that no second-order autocorrelation exists in Models 1-3, respectively.

We also performed Hansen tests for the validity of the instruments. The Hansen test evaluates the validity of model specification and the exogeneity of instrumental variables (Baum et al., 2003). In Models 1-3, Hansen test statistics — reported as Hansen p-value for all GMM models — showed that we failed to reject the null hypothesis, indicating that the moment restrictions in our models are valid and that the instruments are exogenous.

In sum, the combined results of the tests showed that we do not have autocorrelation in the first-differenced errors and that our instruments satisfy the standard validity criterion. Our model specification enhances the validity of the results by sufficiently addressing the potential problems of autocorrelation and endogeneity.

Table 2. Descriptive statistics and pairwise correlations

No.	Variables	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	CEO-TMT pay gap	3,09	3,12	1																				
2	CEO slice	0,41	0,12	0,58*	1																			
3	Board power	0,00	1,00	-0,02	-0,10*	1																		
4	CEO power	2,88	1,12	0,10*	0,24*	-0,51*	1																	
5	Board-CEO power imbalance	-2,85	1,85	-0,07*	-0,20*	0,85*	-0,89*	1																
6	E-index no classified board	2,73	1,12	0,08*	0,11*	-0,05*	0,22*	-0,16*	1															
7	E-index no golden parachutes	2,25	1,24	0,05*	0,05*	0,12*	0,05*	0,02	0,85*	1														
8	E-index no classified board and golden parachutes	2,02	1,07	0,05*	0,04*	-0,05*	0,05*	-0,06*	0,92*	0,92*	1													
9	E-index	2,97	1,30	0,07*	0,12*	0,11*	0,20*	-0,07*	0,93*	0,94*	0,85*	1												
10	CEO pay	8,91	1,15	0,24*	0,50*	-0,17*	0,11*	-0,16*	0,06*	0,01	0,02	0,04*	1											
11	TMT pay dispersion	0,17	0,11	-0,02	-0,14*	0,14*	-0,12*	0,15*	0,02	0,02	0,04*	0,01	-0,01	1										
12	Firm size	9,02	1,23	-0,03	-0,02	-0,35*	0,00	-0,19*	-0,08*	-0,09*	-0,01	-0,14*	0,25*	-0,07*	1									
13	MTB	2,35	18,04	-0,01	-0,03*	-0,02	-0,04*	0,01	-0,03	-0,02	0,00	-0,05*	0,04*	-0,03	0,11*	1								
14	Leverage	1,00	13,30	0,00	0,00	-0,04*	0,00	-0,02	-0,01	-0,01	0,00	-0,01	0,01	0,00	0,01	0,37*	1							
15	Current ratio	1,84	1,25	-0,01	-0,09*	0,22*	-0,07*	0,16*	-0,01	0,01	0,00	0,01	-0,15*	0,04*	-0,34*	-0,02	-0,03	1						
16	Diversification	0,79	0,59	0,03*	0,02	-0,08*	-0,02	-0,03	0,00	0,01	0,02	-0,01	0,10*	0,00	0,27*	0,02	0,03	-0,14*	1					
17	R&D intensity	3,30	7,29	0,01	0,00	0,10*	-0,01	0,06*	0,03	0,00	0,03	0,01	0,00	-0,03*	-0,17*	0,03*	-0,02	0,40*	-0,09*	1				
18	Capital investment	4,16	4,62	0,04*	0,06*	0,03	0,09*	-0,04*	0,03	0,03	0,03	0,03	0,01	0,05*	0,00	-0,01	-0,01	-0,14*	-0,12*	-0,10*	1			
19	Complexity	0,07	0,07	0,00	-0,01	0,00	-0,02	0,01	-0,06*	0,00	-0,01	-0,04*	0,02	0,01	0,19*	0,03*	0,00	-0,08*	-0,17*	-0,17*	0,09*	1		
20	Dynamism	1,80	2,13	0,01	0,04*	-0,15*	0,06*	-0,11*	0,23*	0,13*	0,24*	0,13*	0,10*	-0,02	0,19*	0,00	0,01	-0,07*	0,09*	-0,05*	0,06*	-0,22*	1	
21	Munificence	1,35	6,14	-0,01	0,00	0,03	0,04*	0,00	-0,12*	-0,05*	-0,09*	-0,07*	-0,06*	0,02	-0,05*	0,00	0,00	0,02	-0,01	0,06*	-0,07*	-0,06*	-0,17*	1
22	CEO tenure	5,93	6,09	-0,02	-0,04*	-0,01	0,38*	-0,23*	-0,01	-0,01	0,01	-0,03	0,03*	0,05*	-0,06*	0,04*	0,03	0,08*	-0,05*	0,02	0,09*	0,00	-0,01	0,00

Notes: The table reports pairwise correlation coefficients of the variables. * indicates a p-value of 0.05 or better.

Table 3. Main test results of Hypothese 1-3

Dependent variable	CEO-TMT pay gap		
	Model 1	Model 2	Model 3
Lagged dependent variable	0.303 (0.291)	0.244 (0.384)	0.353 (0.251)
Board power	-0.214* (0.096)		
CEO power		0.141† (0.078)	
Board-CEO power imbalance			-0.114** (0.045)
CEO pay	1.846* (0.827)	1.769* (0.876)	1.864† (0.977)
TMT pay dispersion	-1.383 (1.125)	-0.909 (1.018)	-1.121 (1.107)
E-index no classified board	0.324* (0.183)		
E-index no golden parachutes		0.091 (0.067)	
E-index no classified board and golden parachutes			0.306* (0.151)
Firm size	-0.477* (0.215)	-0.470* (0.231)	-0.502* (0.241)
MTB	-0.002* (0.001)	-0.002 (0.001)	-0.002* (0.001)
Leverage	0.005* (0.002)	0.005* (0.002)	0.004 (0.003)
Quick ratio	0.104 (0.086)	0.072 (0.088)	0.112 (0.093)
Diversification	0.141 (0.175)	0.188 (0.156)	0.119 (0.142)
R&D intensity	-0.032** (0.012)	-0.020 (0.013)	-0.019† (0.010)
Capital investment	0.007 (0.011)	0.001 (0.010)	0.007 (0.015)
Industry complexity	0.877 (1.161)	0.993 (0.944)	0.814 (1.093)
Industry dynamism	-0.018 (0.031)	-0.031 (0.048)	-0.019 (0.031)
Industry munificence	0.004 (0.005)	0.001 (0.008)	0.005 (0.008)
Constant	-10.918 (7.010)	-9.962 (6.972)	11.226 (7.767)
Year dummies	Yes	Yes	Yes
Arrelano-Bond test for AR(2)	0.272	0.472	0.179
Hansen X ² of overid	0.996	0.852	0.916
Difference in Hansen (X ²)	0.831	0.375	0.774
F-test	199.12***	206.23***	173.62***
Number of observations	1,914	2,117	1,914

Notes: Robust standard errors are in parentheses. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; † $p < 0.10$.

4.2. Robustness tests

In unreported analyses, we reran Model 1 without standardizing the value of *board power* and found result consistent with what is reported in Model 1. When we include both the one-year and two-year lagged dependent variables in Model 2, we find stronger support for H2 ($\beta = 0.152$, $p < 0.05$) than what is reported in Model 2.

We further carefully exam whether our main results are robust to different constructs of key independent variables.

$$\text{Board power} = (\text{Independent board chair} + \text{Multiple insider directors} + \text{Lead independent director} + \text{Super board independence} + \text{Board interlock} + \text{Classified board}) / \text{Board size} \quad (6)$$

where, all the components of *board power* are defined in the same way as in equation (1).

We reran Model 1 with the modified construct of board power. In undocumented analysis, we again found evidence that supported H1a which predicts the negative relationship between *board power* and CEO-TMT pay gap ($\beta = -0.247$, $p < 0.05$).

We further reran Model 3 with a revised construct of *board-CEO power imbalance* which is

derived by substituting the revised construct of *board power* in equation (6) for the construct of *board power* in equation (1). In unreported analysis, we found support for H3a because the coefficient of *board-CEO power imbalance* is negative and significant ($\beta = -0.114$, $p < 0.05$).

Second, we focus on the structural power of directors and redefine *board power* as the following:

$$\text{Board power} = \text{Independent board chair} + \text{Multiple insider directors} + \text{Lead independent director} + \text{Super board independence} \quad (7)$$

where, *independent board chair*, *multiple insider directors*, *lead independent director*, and *super board independence* are defined in the same way as in

$$CEO\ power = CEO\ duality + CEO\ lone\ inside\ director + No\ lead\ independent\ director + Founder \quad (8)$$

where, *CEO duality*, *CEO lone inside director*, *no lead independent director*, and *Founder* have the same definitions as in equation (2).

$$Board\ CEO\ power\ imbalance = \ln(Board\ power / CEO\ power + 1) \quad (9)$$

Table 4 documents the robustness test results of *Hypotheses 1-3*. In Model 4, the coefficient of redefined *board power* is negative and significant ($\beta = -0.354$, $p < 0.05$), supporting *H1a*. Consistent with Model 2, the redefined *CEO power* has a marginally positive effect ($\beta = 0.480$, $p < 0.10$) on the *CEO-TMT pay gap* in Model 5 (Model 5 controls for a revised variable of *CEO tenure* which is measured by the number of years an individual had

equation (1). In the meantime, we redefine *CEO power* as:

Lastly, we redefine *board-CEO power imbalance* as the logarithmic transformation of the sum of one and the ratio of the redefined *board power* over the redefined *CEO power*.

been the CEO of a given firm). We find evidence consistent with *H2* again. Model 6 provides support for *H3a* because the redefined *board-CEO power imbalance* has a significant and negative coefficient ($\beta = -0.561$, $p < 0.05$). As a result, we show that our main results are robust to different definitions of *board power*, *CEO power*, and *board-CEO power imbalance*.

Table 4. Robustness test results of *Hypotheses 1-3*

Dependent variable	CEO-TMT pay gap		
	Model 4	Model 5	Model 6
Lagged dependent variable	0.381 (0.416)	0.288 (0.386)	0.528 (0.551)
Board power	-0.354* (0.143)		
CEO power		0.480† (0.269)	
Board-CEO power imbalance			-0.651* (0.327)
CEO tenure	-0.076 (0.059)	-0.060 (0.054)	-0.092 (0.078)
CEO pay	1.789* (0.894)	1.889* (0.863)	1.717* (0.814)
TMT pay dispersion	-0.578 (1.260)	0.234 (1.200)	-0.395 (1.102)
E-index	0.041 (0.089)	0.112 (0.072)	0.059 (0.094)
Firm size	-0.462 (0.291)	-0.471 (0.290)	-0.417† (0.246)
MTB	-0.000† (0.000)	-0.000* (0.001)	-0.000* (0.000)
Leverage	0.005** (0.002)	0.005* (0.003)	0.006* (0.003)
Quick ratio	0.127 (0.128)	0.118 (0.107)	0.117 (0.110)
Diversification	0.123 (0.189)	0.154 (0.175)	0.085 (0.222)
R&D intensity	-0.018 (0.017)	-0.017 (0.018)	-0.016 (0.014)
Capital investment	0.019† (0.012)	0.011 (0.011)	0.023 (0.026)
Industry complexity	1.065 (1.437)	1.076 (1.175)	0.040 (1.722)
Industry dynamism	-0.047 (0.032)	-0.056† (0.033)	-0.066* (0.028)
Industry munificence	0.007 (0.005)	0.005 (0.006)	0.004 (0.005)
Constant	-9.171 (6.125)	-11.686† (6.214)	-9.397 (6.258)
Year dummies	Yes	Yes	Yes
Arrelano-Bond test for AR(2)	0.264	0.421	0.153
Hansen X ² of overid	0.869	0.844	0.675
Difference in Hansen (X ²)	0.801	0.844	0.442
F-test	204.37***	190.81***	190.50***
Number of observations	1,905	2,107	1,754

Notes: Robust standard errors are in parentheses. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; † $p < 0.10$.

4.3. Supplemental analyses

We conduct supplemental tests to verify that our main results are consistent when we adopt a different construct of the CEO-TMT pay gap. Specifically, we substitute *CEO pay slice* for the *CEO-*

TMT pay gap and rerun Models 1-6. Following Bebchuk et al. (2011), *CEO pay slice* is calculated as the ratio of CEO compensation over the aggregate compensation of the five highest-paid managers. In Table 5 which documents the abridged results of our retesting of Models 1-3, Model 7 supports *H1a*

as *board power* has a negative and significant relationship with *CEO pay slice* ($\beta = -0.011$, $p < 0.01$). Model 8 shows that the coefficient of *CEO power* is positive and significant ($\beta = 0.011$, $p < 0.01$), offering support for *H2*. In Model 9, *board-CEO power imbalance* has a significant negative relationship

with *CEO pay slice* ($\beta = -0.007$, $p < 0.01$). We thus find support for *H3a* again.

In Table 6, we provide abridged results of the retest of Models 4–6 in which we substitute the *CEO pay slice* for the *CEO-TMT pay gap*. The results offer strong support for *H1a*, *H2*, and *H3a*.

Table 5. Abridged results of supplemental tests for GMM regressions on CEO pay slice

Dependent variable	CEO pay slice		
	Model 7	Model 8	Model 9
Board power	-0.011* (0.005)		
CEO power		0.011** (0.004)	
Board-CEO power imbalance			-0.007** (0.002)
Control variables	Included	Included	Included
Arrelano-Bond test for AR(2)	0.506	0.660	0.541
Hansen X^2 of overid	0.369	0.485	0.417
Difference in Hansen (X^2)	0.056†	0.386	0.109
F-test	910.42***	876.51***	838.75***
Number of observations	1,914	2,117	1,914

Notes: Robust standard errors are in parentheses. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; † $p < 0.10$.

Table 6. Abridged results of supplemental tests for GMM regressions on CEO pay slice

Dependent variable	CEO pay slice		
	Model 10	Model 11	Model 12
Board power	-0.015** (0.005)		
CEO power		0.016** (0.006)	
Board-CEO power imbalance			-0.027** (0.010)
Control variables	Included	Included	Included
Arrelano-Bond test for AR(2)	0.534	0.623	0.482
Hansen X^2 of overid	0.402	0.552	0.221
Difference in Hansen (X^2)	0.551	0.811	0.550
F-test	753.81***	2,030.11***	658.73***
Number of observations	1,905	2,017	1,754

Notes: Robust standard errors are in parentheses. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

5. DISCUSSION

5.1. CEO-TMT pay gap as a prize of tournament or result of rent-seeking

Firms pay managers differently based on their hierarchical positions. Pay differentials between a CEO and other TMT members reflect their distinctive responsibilities within the firm (Lambert et al., 1993). Thus, the CEO-TMT pay gap can act as an incentive impetus to elicit efforts from these top executives (Fisher et al., 2008; Henderson & Fredrickson, 2001; Lazear & Rosen, 1981). However, bigger CEO-TMT pay differentials, as the consequence of compensation negotiation process between a board and the CEO (Hermanson et al., 2012), also can lead to perceived inequity by the other TMT members (Carpenter & Sanders, 2004; Fredrickson et al., 2010; Siegel & Hambrick, 2005) and can be considered as a result of CEO rent-seeking (Bebchuk et al., 2011).

By showing that board power negatively influences the CEO-TMT pay gap but CEO power exerts the opposite effect, we provide evidence consistent with the agency theory argument that associates larger CEO-TMT pay gap with CEO rent-seeking (Bebchuk et al., 2011). In other words, CEOs tend to use their power over the boards to improve

their own compensation but not the pay of their subordinate TMT members.

We also find that the power imbalance between a board and the CEO is negatively associated with the CEO-TMT pay gap. We interpret this result as an indication that directors are sensitive to a CEO's strong power which may lead to potential rent-seeking behavior exemplified by a larger CEO-TMT pay gap. Consequently, a strong board prioritizes limiting the rent-seeking opportunity of the CEO over providing tournament incentives to the CEO and his or her executive peers.

5.2. The connection between board power and CEO power

While extant research presents different theoretical analyses and empirical operationalizations of board power and CEO power (Finkelstein, 1992; Cannella et al., 2009), we explore beyond the structural relationship between directors and CEO to construct our proxy for board power and CEO power. To gauge the power of directors over the CEO in the context of CEO and TMT compensations, we rely on the governance mechanisms such as board composition, board interlock, and board election. Particularly, we argue that board power is positively associated with the independence of the board chair (Boyd, 1994), the number of inside directors (Adams

et al., 2005; Zorn et al., 2017), the availability of lead independent director (Lamoreaux et al., 2019), the extent of board independence (Cannella et al., 2009), the existence of board interlocks (Zajac & Westphal, 1996), the classification of board election terms (Faleye, 2007), and board size (Haynes et al., 2019).

Building upon extant theoretical interpretations and empirical constructs of CEO power (Daily & Johnson, 1997; Finkelstein, 1992), we operationalize CEO power as the combination of structural power, ownership power, expert power, and the status of CEO entrenchment. Structural power is associated with a CEO's formal organizational position (Finkelstein, 1992). Ownership power may come from a CEO's founder status (Finkelstein, 1992). Expert power is related to CEO tenure (DeBoskey et al., 2019). CEO entrenchment exists with the presence of golden parachutes (Bebchuk et al., 2014). Prior research identifies various indicators of CEO power without distinguishing the sources from the manifestations of that power. For instance, prior literature identifies CEO duality, board independence, and CEO-TMT pays differential as indicators of CEO managerial power (Choe, Tian, & Yin, 2014; Finkelstein, 1992; Li, Li, & Minor, 2016). However, while CEO duality and low levels of board independence tend to enhance CEO power, CEO compensation is a manifestation of CEO power rather than one of the sources. Thus, we submit that stronger CEO power over the board is associated with CEO duality, the status of a CEO as the lone inside director, the absence of a lead independent director, the founder status of a CEO (Song & Wan, 2019; Adams et al., 2005), the tenure of a CEO (Abernethy et al., 2015), and the entrenchment of a CEO (Bebchuk et al., 2014).

In sum, this study extends corporate governance literature by constructing new aggregated measures of board power and CEO power which reflect the multidimensional characteristics of board-CEO relationships.

6. CONCLUSION

Aiming at expanding extant literature that examines the effect of the board of directors and CEO on executive pay levels (Bebchuk et al., 2002; van Essen et al., 2015), we comparatively explore how board power and CEO power impacts CEO-TMT pay gap. We discover that board power has a negative relationship with the CEO-TMT pay gap and that CEO power is positively associated CEO-TMT pay gap.

Meanwhile, the power imbalance between board and CEO negatively connects with the CEO-TMT pay gap. These findings yield new insights that help advance the research of the antecedents of the CEO-TMT pay gap.

Although this study offers notable insights into CEO-TMT pay gap literature, there are several limitations that may limit the interpretation of the findings and offer opportunities for future research. First, the firms examined in this study are relatively large, publicly-traded firms. This sampling design is widely used in studies exploring CEO-TMT pay differential (Henderson & Fredrickson, 2001; Ridge et al., 2015); however, the results found in this study should be interpreted within the boundary conditions of the firms studied. Research using other sampling frames is needed to confirm the extent to which the results are generalizable.

Second, this study relies heavily on board composition to construct proxies for the board and CEO power. We acknowledge that board composition itself is not directly conducive to a detailed understanding of the influences of individual and social factors such as prestige (Finkelstein, 1992) on board and CEO power. Therefore, we encourage researchers to use multiple sources of data to gain further insights on board and CEO power, as well as their direct impact on the CEO-TMT pay gap.

Our study contributes to executive compensation literature by comparatively investigating the impacts of board power and CEO power on top executives' relative compensation. Although extant research has separately investigated the impact of board power and CEO power on top executive pay levels and pay gaps (Abernethy et al., 2015; McClelland & Brodtkorb, 2014; van Essen et al., 2015), limited efforts have been made to comparatively explore the impacts of board power versus CEO power on the CEO-TMT pay gap. Our theoretical analyses and corresponding hypotheses directly compare the predictions of agency theory with those of tournament theory. Our comparative approach not only helps investigate the determinants of the CEO-TMT pay gap but also helps resolve existing debates regarding the implications of the CEO-TMT pay gap. Consistent with agency theory predictions rather than tournament theory ones, our empirical results suggest that boards of directors are conscientious about the potential negative effects of a larger CEO-TMT pay gap and therefore stronger boards usually do not rely on larger CEO-TMT pay gap to incentivize CEOs.

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