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## Corporate governance “bundles” and firm acquisitiveness

Evriddiki Panayi<sup>1</sup>  | Konstantinos Bozos<sup>1</sup>  | Gianluca Veronesi<sup>2</sup> <sup>1</sup>Leeds University Business School, University of Leeds, Leeds, UK<sup>2</sup>School of Management, University of Bristol, Bristol, UK

## Correspondence

Konstantinos Bozos, Leeds University Business School, The Maurice Keyworth Building, The University of Leeds, LS2 9JT, Leeds, UK.  
Email: k.bozos@leeds.ac.uk

## Abstract

**Research Question/Issue:** We explore how the interrelations of governance mechanisms (“bundles”) influence a firm's propensity for corporate acquisitions. Focusing on four key internal and external mechanisms, namely, board of directors monitoring, CEO pay incentives, takeover market discipline, and institutional investor monitoring, we use a sample of 1171 completed M&A deals by 799 U.S. firms during the period 1998–2015 to test the *Substitution* versus *Complementarity Hypotheses*.

**Research Findings/Insights:** The findings provide, in the main, support for both the *Substitution* and the *Complementarity Hypotheses*, with several incentives alignment, internal and external monitoring mechanisms acting as substitutes and complements of each other toward firm acquisitiveness.

**Theoretical/Academic Implications:** Our results challenge the notion that corporate governance mechanisms purely function as independent factors and contribute to the *configurational* perspective of corporate governance. They offer new evidence that combinations or “bundles” of firm-level governance mechanisms can allow for differing degrees of firm acquisitiveness.

**Practitioner/Policy Implications:** Different governance “bundles” will have different implications for major strategic decisions such as corporate acquisitions. Firms seeking to control or increase acquisition propensity can thus consider “equifinal” governance configurations, whereby alternative combinations of governance mechanisms can lead to comparable, desired outcomes.

## KEYWORDS

Corporate governance, acquisitions, substitution, complementarity, governance bundles, configurational perspective

## 1 | INTRODUCTION

Mergers and Acquisitions<sup>1</sup> (hereafter referred to as M&A) are among the most significant corporate investments employed by firms in the pursuit of growth and shareholder wealth creation. Although there is a significant body of research across academic disciplines on the determinants of corporate acquisitions, this research has been rather

disparate in identifying the relative importance of different drivers and how multiple drivers may simultaneously work in influencing firm acquisitiveness (Haleblian et al., 2009; Laamanen, 2007). Accordingly, Haleblian et al. (2009) emphasize the need for additional evidence on the influence of governance mechanisms, such as board structure, executive compensation, and blockholder ownership on firm acquisition behavior.

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Corporate acquisitions represent major and discrete strategic events, but they have also been argued to exacerbate the inherent conflicts of interest between shareholders and managers in large public firms (Jensen, 1986; Masulis et al., 2007; Morck et al., 1990). M&A, for instance, can be the result of managerial self-interest, inconsistent with shareholder value maximization, such as empire building (e.g., Andrade et al., 2001; Jensen, 1986) and employment risk reduction (Amihud & Lev, 1981). Acquisition decisions can be the source of a wide divergence of interests between shareholders and managers and, therefore, have been frequently investigated using the agency theory lens, which is also very popular in governance research (Jensen & Meckling, 1976). A number of recent studies in the empirical literature further supports the notion that corporate acquisitiveness ranks highly in both finance and management research agendas in relation to behavioral, decision-making, gender-related, and personality dimensions (Huang & Kisgen, 2013; Jenter & Lewellen, 2015; Shi et al., 2017; Yim, 2013). Irrespective of their short- and long-term outcomes, acquisition decisions represent a conduit for managerial risk-taking, opportunism, and agency issues. Thus, the M&A framework provides a suitable setting to explore the role of governance in influencing corporate investment policy.

The relationship between corporate governance mechanisms and firm performance has long been at the center of governance scholarship. However, the evidence from this prolific research has yielded mixed results. For example, studies of the effects of board characteristics (e.g., board independence, leadership, and structure) and ownership structure on corporate financial performance have failed to provide consistent evidence of significant and systematic effects (e.g., Dalton et al., 1998; Dalton et al., 2007; Deutsch, 2005). The fact that the extant literature has produced mixed and inconsistent results is due, at least in part, to the examination of governance mechanisms in isolation from each other, without considering their joint effects (Desender et al., 2016; García-Castro et al., 2013; Oh et al., 2018).

To overcome this shortcoming, a more holistic approach to corporate governance has been proposed, by considering a *configurational* perspective of governance mechanisms. Under this *configurational* perspective, substitutive and/or complementary effects between governance mechanisms result in the creation of multiple combinations or “bundles” of such mechanisms (Rediker & Seth, 1995) that work effectively together toward specific firm outcomes (Aguilera et al., 2012; Aguilera et al., 2015; Cuomo et al., 2016). According to Rediker and Seth (1995, p. 87), “firm performance depends on the efficiency of a *bundle of governance mechanisms* (authors' italics),” which implies that different mechanisms can interact with each other in a complex way to influence organizational outcomes. Essentially, it is not unreasonable to expect that governance mechanisms will operate jointly, and therefore, organizational outcomes will be dependent on the effectiveness of some bundles of governance mechanisms (Aguilera et al., 2012). Governance practices share a common goal and collectively constitute the organizational context for the governance environments, but they do have different characteristics, roles, and functions. Thus, to understand how organizational outcomes are affected by multiple governance mechanisms, the attention should be

on their interactive influence and how they might have different effects depending on how they are combined (Oh et al., 2018).

To date, there has been limited empirical research into this configurational perspective of corporate governance. A growing number of studies have, however, confirmed the validity of the bundle approach. For example, Desender et al. (2016) show that, in order to protect their interests, shareholder-oriented foreign owners introduce their own practices in the existing bundle of governance mechanisms normally found in a stakeholder context within a certain country. Furthermore, using a panel sample of U.S. firms for 6 years, Oh et al. (2018) find that multiple governance mechanisms mainly work as substitutes in influencing corporate social responsibility (CSR) and suggest that different combinations of governance mechanisms can achieve similar levels of CSR. Additionally, Florackis et al. (2015) employ a semi-parametric approach and find that ownership and dividends act as substitute mechanisms in reducing agency costs of free-cash-flow, but only in the presence of high debt monitoring. Finally, employing a fuzzy set/qualitative comparative approach, García-Castro et al. (2013) reveal that in different national contexts, the bundle of governance practices in a firm entails relationships that are not necessarily monotonic and cumulative; they, thus, conclude that there are multiple bundles that can lead to superior organizational performance.

Drawing from this theoretical approach, the main objective of this study is, consequently, to address the aforementioned gaps both in the M&A and corporate governance literatures and explore the interrelations of certain firm-specific governance mechanisms with respect to influencing a firm's propensity to undertake corporate acquisitions. By deploying the “complement versus substitute framework” (Oh et al., 2018, p. 2717), we apply the concept of marginal effect to gauge if multiple governance mechanisms operate as complements or substitutes in the M&A setting, essentially whether they work synergistically or competitively.

Given the multifaceted nature of corporate governance, this study focusses on four key governance mechanisms, namely board monitoring, CEO pay incentives, external market discipline, and institutional investor monitoring. M&A are complex corporate investments with highly uncertain outcomes and can have major valuation effects for the acquirer's shareholders. Thus, as acquisition decisions require board approval, studying the impact of board monitoring characteristics on a firm's acquisition propensity is particularly salient. In addition, given that the CEO of a firm typically initiates an M&A deal, it is interesting to examine the role of CEO pay incentives in influencing acquisition decisions as these are important determinants in the alignment of governance mechanisms. Moreover, given the increasing importance of institutional investor ownership in U.S. public firms (Derrien et al., 2013), these shareholders have a vested interest in influencing acquisition decisions and represent another monitoring, yet external governance mechanism.

Using a sample of U.S. firm acquisitions for the period from 1998 to 2015 and drawing from the literature on the *configurational* perspective in corporate governance, we empirically test the *Substitution* versus *Complementarity Hypotheses* in the context of M&A decisions (e.g., Vives, 1990). As mentioned earlier, the substitutive

assumption (e.g., Oh et al., 2018; Rediker & Seth, 1995; Zajac & Westphal, 1994) suggests that one governance mechanism may weaken the marginal effects of another mechanism on firm outcomes. This, in turn, implies that simultaneously deploying multiple governance mechanisms may not always lead to optimal outcomes, as the associated costs of additional mechanisms may exceed their benefits. On the contrary, the complementarity view (e.g., Cremers & Nair, 2005; Misangyi & Acharya, 2014; Schepker & Oh, 2013) assumes that two (or more) governance mechanisms work in a synergistic fashion and that one mechanism could increase the marginal effects of another one. If this is the case, two (or more) governance mechanisms need to be simultaneously deployed to obtain optimal outcomes.

Our empirical results provide support for both the *Substitution* and *Complementarity Hypotheses*. We find that incentive alignment and external market discipline mechanisms can act as substitutes and complements of each other in influencing the likelihood of a firm to undertake an acquisition. We also detect complementary effects in the case of board and institutional investor monitoring and substitutive effects of institutional investor monitoring and external market discipline mechanisms toward acquisition propensity. As such, we make several contributions to both the M&A and corporate governance literatures. First, taking into account the under-examined interactive effects between different governance mechanisms (Cuomo et al., 2016), our results add to the existing M&A literature on the determinants of acquisition activity (Aktas et al., 2016) by identifying a set of predictor variables in the form of firm-level governance configurations. Furthermore, this study contributes to the *configurational* perspective of corporate governance research (Aguilera et al., 2008; Aguilera et al., 2012; Rediker & Seth, 1995; Ward et al., 2009), suggesting that degrees of firm acquisitiveness can be achieved through different combinations or “bundles” of firm-level governance mechanisms. In accordance with the idea of “equifinality” (Gresov & Drazin, 1997; Rediker & Seth, 1995), firms can be flexible in designing their bundle of governance practices so as to achieve predetermined outcomes and, in this case, the desired levels of acquisition propensity.

## 2 | THEORETICAL BACKGROUND

Agency theory-based research generally assumes that firm-level governance mechanisms operate independently and, therefore, has predominantly investigated them separately. However, as mentioned earlier, this line of research has not been able to establish a definitive link between individual governance mechanisms and firm performance (e.g., Dalton et al., 1998; Dalton et al., 2007; Deutsch, 2005). One possible explanation for these contrasting findings is that, since various governance mechanisms coexist within firms, more attention should be paid toward exploring the interconnections between these mechanisms, which essentially means treating them as a governance “bundle” (Aguilera et al., 2008; Aguilera et al., 2012; Rediker & Seth, 1995; Ward et al., 2009).

### 2.1 | The interdependence of governance mechanisms

A growing body within the governance literature has adopted a configurational perspective, which posits that firm performance depends on the effectiveness of the “bundle” of governance arrangements, rather than the effectiveness of any single governance mechanism (Aguilera et al., 2008; Aguilera et al., 2012; Rediker & Seth, 1995; Ward et al., 2009). The configurational approach in corporate governance assumes that in order to achieve a desired firm outcome, the interdependencies of governance mechanisms should be considered (Oh et al., 2018). This suggests the existence of multiple combinations or “bundles” of governance mechanisms and therefore challenges universalistic policy prescriptions (Aguilera et al., 2008; Cuomo et al., 2016). Additionally, it supports the notion of “equifinality,” whereby alternative combinations of governance mechanisms can lead to similar firm outcomes (Gresov & Drazin, 1997; Rediker & Seth, 1995). In these studies focusing on the interdependence of governance mechanisms, two alternative hypotheses have been developed, namely, the *Substitution* and *Complementarity Hypotheses*.

### 2.2 | The substitution hypothesis

First, the *Substitution Hypothesis* predicts that governance mechanisms can substitute one another and, in doing so, effectively mitigate agency costs, including considering the costly implementation of these mechanisms in a firm (e.g., Agrawal & Knoeber, 1996). This assumption has already received robust empirical support. For example, several studies provide evidence of substitutive effects between monitoring and incentive alignment mechanisms with respect to organizational outcomes such as firm value—as measured by Tobin's Q—(Kim & Lu, 2011; Randøy & Goel, 2003) and corporate social responsibility (Oh et al., 2018). In the same spirit, other studies find support for the substitutive perspective between various monitoring governance mechanisms with regard to outcomes such as firm performance—again measured by Tobin's Q (Agrawal & Knoeber, 1996)—and the impact on shareholder wealth associated with the adoption of antitakeover provisions (Sundaramurthy et al., 1997).

In the context of this study, our assumption is that the cost-benefit implication of having multiple governance mechanisms is a driver of firm acquisitiveness. The substitutive perspective implies that if certain governance mechanisms are sufficiently present, the costs of implementing additional mechanisms—either monitoring or incentive alignment—may exceed the benefits. Therefore, the joint presence of multiple governance mechanisms may not always be effective in achieving certain firm outcomes (i.e., acquisitions in our case).

Consequently, using the marginal effects concept—as employed in the field of economics (e.g., Vives, 1990)—we will observe the existence of substitutive effects between two governance mechanisms if one governance mechanism decreases the marginal effect of another mechanism on firm acquisitiveness. The substitutive perspective

implies that if certain governance mechanisms are sufficiently present, the costs of implementing additional mechanisms—either monitoring or incentives alignment—may exceed the potential benefits. Consequently, the simultaneous existence of multiple governance mechanisms may not always be optimal in achieving certain firm outcomes, and so, the marginal effect of each mechanism will not be strengthened or will even be weakened.

### 2.3 | The complementarity hypothesis

Conversely, the *Complementarity Hypothesis* posits that the coexistence of multiple firm-level governance mechanisms is required in order to reduce a firm's agency costs, which implies synergistic effects among governance mechanisms. A recent stream of research confirms the presence of complementary effects between monitoring and incentives alignment governance mechanisms, for instance, with respect to reducing information asymmetry and mitigating agency costs (Rutherford et al., 2007), repealing poison pills (Schepker & Oh, 2013) and improving firm profitability in terms of ROA (Misangyi & Acharya, 2014). Other studies also offer evidence in favor of complementarities between various monitoring governance mechanisms. Cremers and Nair (2005), for example, find evidence that shareholder activism and the market for corporate control work together as complements toward increasing shareholder wealth in terms of long-term equity returns, where annualized abnormal returns between 10% and 15% are generated only in the presence of high public pension fund (blockholder) ownership. Offering further evidence of complementarity effects, Masulis et al. (2007) extend the work of Cremers and Nair (2005) by demonstrating that acquirers that face more pressure from the market from corporate control, operate in industries with higher competition and separate the positions of CEO and chairperson, engage in more profitable acquisitions in terms of higher abnormal announcement returns.

In the specific context of M&A, the complementarity perspective implies that the adoption of multiple governance mechanisms would have a greater impact on a firm's acquisition propensity than either governance mechanism in isolation. As suggested by Oh et al. (2018), complementarity, therefore, assumes that governance mechanisms work in a synergistic fashion and the adoption of certain combinations of governance mechanisms is required to maximize their impact on firm outcomes, such as firm acquisitiveness in our case. On the basis of the *marginal effects* concept, two governance mechanisms are complementary when the marginal effect of one increases the marginal effect of the other on firm acquisitiveness.

### 2.4 | Governance bundles and firm acquisitiveness

Traditional agency theory-based assumptions suggest that higher levels of equity-based compensation should create long-term incentives for managers toward maximizing shareholder value (Eisenhardt, 1989; Fama & Jensen, 1983). As such, CEOs having

equity compensation as a substantial part of their compensation package are more likely to engage in strategic investments such as M&A, which could benefit not only shareholder value in the long-term but also enhance their personal wealth through these investments. In other words, if the CEO believes that undertaking M&A pays off over the long run, firms will be more likely to increase their acquisitiveness.

Since monitoring governance mechanisms, such as the board of directors or the presence of institutional investors, are employed in order to reduce managerial opportunism, acquisition decisions are expected to receive intensive scrutiny, given also their inherent complexity and the potential major long-term consequences on the shareholder wealth of the acquirer. For example, the board of directors, as the primary monitoring mechanism in a public firm, is involved in the approval (or rejection) of strategic initiatives proposed by the firm's management and is expected to constrain CEO discretion, particularly in cases where the proposed M&A may be driven by value-destroying motives, such as hubris (Roll, 1986), empire building (e.g., Andrade et al., 2001; Jensen, 1986), and employment risk reduction (Amihud & Lev, 1981). Likewise, large and concentrated institutional investors are expected to engage in active monitoring and scrutinize the acquisition decisions of their investee firms for shared gain. Therefore, monitoring governance mechanisms will be more likely to curb firm acquisition propensity.

With reference to the second governance mechanism, if the positive effect of CEO pay incentives (incentive alignment mechanism) on acquisition propensity becomes weaker (i.e., has a smaller marginal effect) in the presence of high levels of a monitoring governance mechanism, for example, in the form of a large or independent board of directors, then this would suggest that there is a *substitutive* effect between CEO pay incentives and board monitoring on firm acquisition propensity. In a similar vein, if the negative effect of a strong board of directors on acquisition propensity becomes weaker when there is a high level of large and concentrated institutional shareholders, then this would also suggest that these two monitoring mechanisms act as *substitutes* for each other in reducing firm acquisitiveness. In this case, additional monitoring by another monitoring mechanism would not significantly affect the firm's acquisition decision because monitoring by one mechanism would be sufficient. If, on the other hand, the negative effect of a strong board of directors increases in magnitude (i.e., has a greater marginal effect) concurrently with the presence of a high level of institutional ownership concentration (compared with when there is a low level of institutional ownership concentration), then this would imply a *complementary* effect between the two monitoring mechanisms.

Finally, the two conflicting hypotheses (*Substitution* vs. *Complementarity*) suggest that governance “bundles” will likely operate in different ways toward influencing firm outcomes. Given that extant research has not provided a uniform answer as yet, the synergies (or not) are dependent on the types of governance mechanisms investigated and the exploratory nature of the study, our main research question is, therefore, formulated as follows: “To what extent do firm-level governance mechanisms operate in a substitutive and/or a complementary fashion in influencing firm acquisitiveness?”

### 3 | RESEARCH DESIGN

#### 3.1 | Data and sample selection

The initial sample of this study comprises the whole population of U.S. public firms from Compustat Fundamentals Annual from 1997 through 2014. We collect the data on board of director characteristics and firm anti-takeover provisions from ISS (formerly known as RiskMetrics and IRRIC before that), CEO compensation data from ExecuComp and institutional ownership data from Thomson Financial 13F. The above merging process results in a sample of 2,476 unique firms with 21,696 firm-year observations. We obtain acquisition data for U.S. public acquirers from Thomson One Banker with domestic deals that took place between January 1, 1998, and December 31, 2015.<sup>2</sup>

We then match the two samples to identify both acquirers and non-acquirers. Following previous studies, we exclude all financials (SIC 6000–6999) and utilities (SIC 4900–4999). Finally, all firms must have complete data on the variables used in the empirical analysis. The above procedure resulted in an unbalanced panel<sup>3</sup> of 1,639 unique firms with 11,418 firm-year observations. Within this sample, there are 1,171 completed M&A deals by 799 acquirers during the 1998–2015 period.

#### 3.2 | Variables

##### 3.2.1 | Dependent variable

In order to measure *M&A activity*, we use a continuous variable which is the sum of the completed acquisition deal values in a given year scaled by the acquirer's total assets in the previous year as in Pan et al. (2016).

##### 3.2.2 | Independent variables

The main variables of interest are proxies for board monitoring, CEO pay incentives, institutional investor monitoring, and monitoring by the takeover market. First, board monitoring is proxied by three variables (previously discussed), which have been associated with the monitoring effectiveness of the board (e.g., Linck et al., 2008; Wintoki et al., 2012): *board size*, a refined measure of board independence (*non-co-opted independence*) and *CEO/Chair duality*. *Board size* equals the number of directors on the board. *Non-co-opted independence* is measured as the fraction of directors who are independent and were appointed before the CEO assumed office, as in Coles et al. (2014). *Non-co-opted independence* has been shown to increase the monitoring effectiveness of the board with regard to certain CEO features (turnover-performance sensitivity, total annual compensation, and pay-performance sensitivity or delta) and firm decisions (capital expenditure) (Coles et al., 2014). *CEO/Chair duality* is a binary

variable which is equal to one if the CEO serves also as the Chairman of the board.

Second, we employ CEO vega and delta as proxies for CEO pay incentives. These variables are estimated following the approximation method developed by Core and Guay (2002), which uses the Black and Scholes (1973) model, allowing for dividends. *CEO vega*, otherwise termed as pay-risk sensitivity, is the dollar change in the portfolio of options of the CEO for a 1% change in the annual standard deviation of stock returns at the fiscal year-end. In line with Guay (1999), the vega of the equity portfolio is assumed to be zero, so only the vega of the options portfolio is used. *CEO delta* (or the pay-performance sensitivity) is the dollar change in the portfolio of equity and options holdings of the CEO for a 1% change in the stock price at the fiscal year-end. Delta is calculated as the sum of the deltas of the stock and options portfolios. Furthermore, the CEO vega and delta are scaled by cash compensation (Graham & Rogers, 2002; Hagendorff & Vallascas, 2011; King et al., 2016), since pay incentives are correlated with firm size and are also highly correlated between them. Scaling the incentives measures also allows us to include both vega and delta in a single model and consider differences in their magnitude. In addition to CEO pay incentives, we include *CEO cash pay*, the fixed component in the compensation associated with CEO risk aversion. CEO cash pay is calculated as the natural log transformation of the total CEO pay in the form of cash compensation (salary and bonus).

Institutional ownership entails the third monitoring governance mechanism employed. Given the heterogeneous preferences and objectives of institutional investors, we employ *institutional ownership concentration*—expressed as the percentage of the sum of shareholdings by the five largest institutional investors to the total shares outstanding at the fiscal year-end—as a suitable proxy for the monitoring incentives of institutional investors following, among others, Hartzell and Starks (2003), Sauerwald et al. (2016), and Goranova et al. (2017). Institutional investors with large shareholdings are expected to have much stronger incentives to monitor and influence acquisition decisions because the M&A outcome can significantly affect shareholder value.

Finally, we include a proxy for the external discipline imposed by the takeover market, namely, the entrenchment index (*E-Index*), proposed by Bebchuk et al. (2009). The E-Index is based on six anti-takeover provisions (staggered boards, limits on amending the charter, limits on amending bylaws, supermajority requirements to approve a merger, poison pills, and golden parachutes) that limit shareholder rights and insulate managers from the pressure of the takeover market. The presence of anti-takeover provisions makes firms less vulnerable to takeovers and thus more likely to lead to managerial entrenchment and facilitate the display of opportunistic behavior by managers (Masulis et al., 2007). Each firm is assigned a score, from 0 to 6, based on the number of anti-takeover provisions that the firm has in the given year. The higher the E-Index value, the higher the probability of managerial entrenchment in the firm (Bebchuk et al., 2009). With respect to acquisition activity, Gompers et al. (2003) provide empirical evidence that firms with weaker shareholder rights or many anti-takeover provisions tend to be more acquisitive.



### 3.2.3 | Control variables

Following the extant literature, to control for other factors that potentially influence a firm's decision to undertake an acquisition, we include a variety of control variables in all model specifications. In particular, we include three sets of determinants focusing on firm, industry, and CEO-specific characteristics.

In terms of firm-level variables, we control for *firm size*. Large firms have been shown to undertake more acquisitions (e.g., Harford, 1999). Next, we control for *book leverage*, since excessive leverage may pose constraints on a firm's ability to acquire and thus may decrease a firm's likelihood of making an acquisition. Uysal (2011) documents a negative and significant effect between overleverage and acquisition probability. Previous studies on acquisitiveness (e.g., Levi et al., 2010, 2014) also control for a firm's *sales growth*. We additionally include *Market-to-book ratio* to account for the effect of growth opportunities and *Cash flows* as in Croci and Petmezas (2015). High levels of free cash flows enable firms to undertake investments, hence increasing acquisition propensity (Bauguess & Stegemoller, 2008). Furthermore, firms with excess cash reserves are more likely to carry out acquisitions (Jensen, 1986). To measure cash reserves, we include *cash holdings*. We also control for accounting performance using the firm's *ROA* (Sauerwald et al., 2016) and *CAPEX* (Bauguess & Stegemoller, 2008) as a proxy for the scope of managerial discretion in undertaking corporate investments. With regard to the industry characteristics which may have an impact on the acquisition likelihood, we add the *M&A Liquidity Index*, since there is evidence of a positive association between this variable and the likelihood of an acquisition (Uysal, 2011).

The last group of control variables refers to certain CEO characteristics which have been linked with acquisitiveness. We control for *CEO tenure* as a proxy for CEO power and entrenchment (Berger et al., 1997; Bertrand & Mullainathan, 2001), which may increase acquisition likelihood. Additionally, we include the age and gender of the CEO, two proxies of CEO risk aversion. Using a U.S. sample, Yim (2013) reports a negative relationship between *CEO age* and acquisition propensity, with younger CEOs pursuing more acquisitions. With respect to *CEO gender*, there is evidence that, due to female risk aversion and male overconfidence (Barber & Odean, 2001; Croson & Gneezy, 2009), female directors and executives undertake fewer acquisitions than their male counterparts (Huang & Kisgen, 2013; Levi et al., 2014). We also control for *CEO overconfidence* (Malmendier & Tate, 2008) under the assumption that overconfident CEOs will be more acquisitive, especially in firms with abundant cash reserves. Risk aversion and under-diversification are expected to induce CEOs to exercise their stock options early if the stock price is sufficiently high so as to "lock-in" a profit (Hall & Murphy, 2002). As in Croci and Petmezas (2015), we construct CEO overconfidence using the options-based measure developed by Campbell et al. (2011). As a final CEO characteristic, we control for *CEO ownership* although its effect on acquisition decisions is theoretically unclear. While incentives alignment mechanisms such as CEO equity ownership may encourage acquisitions with the objective of

shareholder wealth creation, undiversified CEOs may forego risky but value-increasing projects such as acquisitions (Coles et al., 2006).

To alleviate potential endogeneity concerns, all explanatory variables are lagged by 1 year with regard to the dependent variable. All continuous variables are winsorized at the 1% level in both tails to mitigate the influence of outliers on our results.

### 3.3 | Descriptive statistics

Table 1 presents the descriptive statistics of the variables used in the main analysis. Table A2 provides detailed definitions of all the variables. In line with Pan et al. (2016), Panel A shows that the average rate of M&A activity is 2.5% (median 0%). Panel B focuses on the statistics of the independent variables. The average board of directors consists of nine members, of which 36% are independent outsiders non-co-opted by the CEO, suggesting that roughly a third of the board consists of directors who are more likely to be truly independent, thus acting as more effective monitors. These values compare favorably with those reported by Coles et al. (2014). In about 60% of the sample firms, the CEO is also the firm's Chair. Concerning the CEO pay incentive structure, we observe that the pay incentives scaled by cash compensation vary considerably in our sample. For example, the median vega (delta) scaled is around 8% (25%) against a mean value of 13% (83%). There is also noticeable institutional ownership concentration in the sample firms; the average holdings of the top five institutions in a firm is 29%. For comparison, the equivalent number is approximately 25% in Goranova et al. (2017) with a sample over the years 1997–2006.

Moving onto the summary statistics of the firm and industry characteristics, as shown in Panel C, the average firm has total assets of \$7.6 billion, book leverage of 22.1%, sales growth of 9.4%, market-to-book ratio of 2.05, cash flows of 8.9%, cash holdings of 14.7%, ROA of 4.9%, and capital expenditures of 5.3%. These firm-level variables are largely in line with those reported in prior studies examining the impact of various governance or director characteristics on firm acquisitiveness (e.g., Croci & Petmezas, 2015; Levi et al., 2014). At the industry level, the mean M&A liquidity index is 0.015 and median 0.005. These figures are comparable with those in Uysal (2011).

Regarding the CEO characteristics, as reported in Panel D, the average tenure of the CEO is 7.7 years, the average CEO age is approximately 56 years old, and the CEO owns on average 1.8% of the firm's common stock, confirming previous literature (e.g., Aktas et al., 2019; Andreou et al., 2017). Furthermore, only a few firms have a female CEO (2.5%) and 18.9% of CEOs are overconfident on average.

As we deploy a relatively large number of corporate governance mechanisms (board monitoring, CEO pay incentives, institutional investor monitoring, and monitoring by the takeover market), caution needs to be exercised throughout the empirical analysis, especially with respect to the chance of multicollinearity. Table 2 illustrates all pairwise correlations along with variance inflation factors (VIF) of all the independent and control variables employed in the analysis. While

**TABLE 1** Sample descriptive statistics

Variables	Obs.	Mean	Std. dev.	Min.	25th Pctl.	Median	75th Pctl.	Max.
Panel A: Dependent variable								
M&A activity	11,418	2.50	10.60	0.00	0.00	0.00	0.00	78.70
Panel B: Independent variables								
Board size	11,418	9.06	2.28	5.00	7.00	9.00	11.00	15.00
Non-co-opted independence (NCI)	11,418	0.36	0.27	-0.05	0.11	0.36	0.57	0.90
CEO/chair duality	11,418	0.58	0.49	0.00	0.00	1.00	1.00	1.00
CEO vega (scaled)	11,418	0.13	0.16	0.00	0.03	0.08	0.17	0.93
CEO delta (scaled)	11,418	0.83	2.26	0.01	0.12	0.25	0.58	17.85
CEO cash pay	11,418	6.89	0.65	5.30	6.47	6.85	7.24	8.75
Institutional ownership concentration (IOC)	11,418	0.29	0.09	0.09	0.23	0.29	0.35	0.53
E-Index	11,418	3.13	1.33	0.00	2.00	3.00	4.00	6.00
Panel C: Firm and industry characteristics								
Firm size	11,418	7.60	1.50	4.68	6.51	7.47	8.58	11.48
Book leverage	11,418	0.22	0.17	0.00	0.08	0.21	0.33	0.70
Sales growth	11,418	0.09	0.20	-0.43	0.00	0.07	0.16	0.95
Market-to-book ratio	11,418	2.05	1.24	0.78	1.26	1.66	2.35	7.82
Cash flows	11,418	0.09	0.07	-0.19	0.06	0.09	0.12	0.26
Cash holdings	11,418	0.15	0.16	0.00	0.03	0.08	0.21	0.72
ROA	11,418	0.05	0.09	-0.39	0.02	0.06	0.09	0.27
CAPEX	11,418	0.05	0.05	0.00	0.02	0.04	0.07	0.27
M&A liquidity index	11,418	0.02	0.03	0.00	0.00	0.01	0.02	0.19
Panel D: CEO characteristics								
CEO tenure	11,418	7.71	7.11	0.42	2.67	5.58	10.33	35.33
CEO age	11,418	55.60	6.73	40.00	51.00	56.00	60.00	73.00
CEO gender	11,418	0.03	0.16	0.00	0.00	0.00	0.00	1.00
CEO overconfidence	11,418	0.19	0.39	0.00	0.00	0.00	0.00	1.00
CEO ownership	11,418	0.02	0.04	0.00	0.00	0.00	0.01	0.26

Note: The table presents the descriptive statistics of the variables used in the main regression analysis. Panel A reports the statistics for the dependent variable *M&A activity*. Panel B reports the statistics of the independent variables employed in the empirical analysis. Panel C reports the statistics for the firm and industry characteristics. Panel D reports the statistics for the CEO characteristics. Variable definitions are provided in Table A2.

a number of pairwise correlations appears significant, the VIFs of all the key governance variables of interest rest between 1.18 (for E-Index) and 1.64 (for Board Size) and well below the critical value of 4 (all tolerance scores >0.2).

### 3.4 | Methodology

We investigate the influences of the four key corporate governance mechanisms (i.e., board of directors' characteristics, CEO pay incentives, institutional ownership concentration and monitoring by the takeover market) in an exploratory way so as to identify which, if any, of these mechanisms act in a substitutive or complementary fashion with each other. We test the substitutive/complementary effects of these mechanisms on firm acquisitiveness by including in our specifications all pairwise two-way interaction terms by introducing product terms and examining the marginal effect of one mechanism on

acquisitiveness depending on the levels of the other for the significant interaction terms. For the purposes of this study, two governance mechanisms interact as complements (substitutes) if the marginal effect of one governance mechanism on firm acquisitiveness increases (decreases) as the other governance mechanism increases (Poppo & Zenger, 2002; Siggelkow, 2002). The aforementioned approach has been employed, for instance, by studies exploring interactive relationships between governance mechanisms in promoting a firm's corporate social responsibility (Oh et al., 2018).

Interaction effects are tested via *hierarchical moderated regression analysis* (Elbanna & Child, 2007) in two steps: in the first step, which represents the baseline model, only the main effects of the four governance mechanisms of interest are included. In the second step, the product terms are entered in a hierarchical manner, by adding each interaction term with the associated main effects in a separate model. In each case, a significant increase in  $R^2$  from the baseline model (by means of an  $F$  test, i.e., the ratio of the variance explained only by

**TABLE 2** Correlation matrix

	VIF	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. M&A activity	1.00											
2. Firm size	2.94	-0.02*	1.00									
3. Book leverage	2.22	-0.03***	0.26***	1.00								
4. Sales growth	2.11	0.06***	0.00	-0.02**	1.00							
5. Market-to-book ratio	2.08	0.10***	-0.05***	-0.21***	0.23***	1.00						
6. Cash flows	2.05	0.03***	0.02**	-0.18***	0.20***	0.34***	1.00					
7. Cash holdings	2.03	0.07***	-0.28***	-0.39***	0.04***	0.36***	-0.08***	1.00				
8. ROA	1.99	0.04***	0.12***	-0.20***	0.21***	0.38***	0.66***	0.00	1.00			
9. CAPEX	1.74	-0.03***	0.02*	0.05***	0.11***	0.03**	0.28***	-0.21***	0.07***	1.00		
10. M&A liquidity index	1.71	0.14***	-0.08***	-0.07***	0.07***	0.20***	-0.01	0.14***	-0.01	-0.05***	1.00	
11. Board size	1.64	-0.02**	0.57***	0.21***	-0.08***	-0.06***	0.00	-0.31***	0.07***	-0.01	-0.07***	1.00
12. NCI	1.62	0.00	0.17***	0.05***	-0.11***	-0.05***	0.01	-0.11***	0.04***	-0.05***	-0.06***	0.17***
13. CEO/chair duality	1.51	-0.01	0.17***	0.08***	-0.02**	-0.03***	-0.01	-0.12***	0.03***	-0.01	0.00	0.13***
14. CEO vega (scaled)	1.33	0.00	0.39***	0.00	-0.02**	0.16***	0.07***	0.09***	0.11***	-0.09***	0.00	0.18***
15. CEO delta (scaled)	1.32	0.02	0.08**	-0.09***	0.09***	0.26***	0.08**	0.12***	0.09***	0.04***	0.03***	-0.02**
16. CEO cash pay	1.22	0.01	0.61***	0.16***	0.06***	0.05***	0.11***	-0.24***	0.19***	-0.02**	-0.01	0.41***
17. IOC	1.21	-0.02**	-0.26***	0.02	-0.05***	-0.14***	-0.06***	0.06**	-0.09***	-0.06***	-0.05***	-0.25***
18. E-Index	1.18	-0.02*	-0.01	0.03***	-0.06***	-0.14***	-0.01	-0.06***	0.00	-0.06***	-0.11***	0.03***
19. CEO tenure	1.13	-0.02**	-0.10***	-0.06***	0.06***	0.04***	0.00	0.09***	0.02	0.02**	0.02**	-0.10***
20. CEO age	1.1	-0.04***	0.11***	0.03***	-0.05***	-0.07***	-0.02*	-0.11***	0.04***	-0.05***	-0.02**	0.11***
21. CEO gender	1.07	-0.01	-0.01	-0.04***	-0.02*	-0.01	0.00	0.03***	0.00	0.00	-0.01	-0.02*
22. CEO overconfidence	1.03	0.01	0.04***	-0.01	0.06***	0.08***	0.05***	0.00	0.08***	0.00	0.03***	0.03***
23. CEO ownership	1.01	-0.02**	-0.20***	-0.08***	0.02**	0.02**	-0.01	0.07***	0.01	0.04***	0.00	-0.15***

Note: The table presents all the pairwise correlations and Variance Inflation Factors (VIF) of the variables used in the main regression analysis. Variable definitions are provided in Table A2.

\*Statistical significance at the 10% level.

\*\*Statistical significance at the 5% level.

\*\*\*Statistical significance at the 1% level.

(Continues)



TABLE 2 (Continued)

	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.
1. M&A activity												
2. Firm size												
3. Book leverage												
4. Sales growth												
5. Market-to-book ratio												
6. Cash flows												
7. Cash holdings												
8. ROA												
9. CAPEX												
10. M&A liquidity index												
11. Board size												
12. NCI	1.00											
13. CEO/chair duality	-0.16***	1.00										
14. CEO vega (scaled)	0.02**	0.08**	1.00									
15. CEO delta (scaled)	-0.19***	0.05***	0.29***	1.00								
16. CEO cash pay	0.07***	0.22***	0.04***	-0.18***	1.00							
17. IOC	0.03***	-0.08***	-0.10***	-0.11***	-0.20***	1.00						
18. E-Index	0.14***	0.01	0.03***	-0.13***	-0.06***	0.16***	1.00					
19. CEO tenure	-0.61***	0.29***	0.03***	0.27***	-0.03***	-0.01	-0.07***	1.00				
20. CEO age	-0.19***	0.29***	0.00	0.06***	0.13***	-0.05***	0.01	0.41***	1.00			
21. CEO gender	0.04***	-0.05***	0.00	-0.01	-0.02*	0.04***	-0.01	-0.06***	-0.07***	1.00		
22. CEO overconfidence	-0.01	0.03***	0.09***	-0.01	0.07***	-0.03***	0.00	0.01	0.01	-0.02**	1.00	
23. CEO ownership	-0.31***	0.12	-0.09***	0.54***	-0.17***	-0.05***	-0.15***	0.46***	0.15***	0.00	-0.05***	1.00

Note: The table presents all the pairwise correlations and Variance Inflation Factors (VIF) of the variables used in the main regression analysis. Variable definitions are provided in Table A2.

\*Statistical significance at the 10% level.

\*\*Statistical significance at the 5% level.

\*\*\*Statistical significance at the 1% level.

the interaction term to the unexplained variance in the full model) is attributed to the interaction term included in that model.

To further examine significant interactions, we conduct simple slope tests (Aiken et al., 1991; Cohen et al., 2003) and calculate the marginal effects of one governance mechanism on acquisition propensity at different levels of the other governance mechanisms. In this way, we explore how governance mechanisms interact with each other across different levels toward acquisition propensity. Simple slopes are the sensitivity of the dependent variable on an independent variable at particular values of the moderator variable.

For the baseline specification, we employ a pooled OLS regression model, and we proceed with investigating the interactive relationships between the governance mechanisms of interest. Accordingly, the baseline model before including the two-way interaction terms is

$$\begin{aligned} M\&A_{i,t} = \beta_0 + \beta_1 BSIZE_{i,t-1} + \beta_2 NCI_{i,t-1} + \beta_3 DUAL_{i,t-1} + \beta_4 VEGA_{i,t-1} \\ &+ \beta_5 DELTA_{i,t-1} + \beta_6 CASH_{i,t-1} + \beta_7 IOC_{i,t-1} + \beta_8 EIND_{i,t-1} \\ &+ \sum \beta_k (FirmControls_{i,t-1}) + \sum \beta_k (CEOControls_{i,t-1}) \\ &+ Year_t + Industry_i + \varepsilon_i \end{aligned} \quad (1)$$

Subscripts  $i$  and  $t$  denote firm and year, respectively. The dependent variable  $M\&A$  is the rate of M&A activity. The main explanatory variables are defined as above, where  $BSIZE$  stands for board size,  $NCI$  stands for non-co-opted independence,  $DUAL$  stands for CEO/Chair duality,  $VEGA$  stands for CEO vega,  $DELTA$  stands for CEO delta,  $CASH$  stands for CEO cash pay,  $IOC$  stands for institutional ownership concentration, and  $EIND$  stands for E-Index.  $FirmControls$  and  $CEOControls$  are vectors of all the firm and CEO control variables respectively, as previously described.  $Year_t$  and  $Industry_i$  represent year and industry fixed effects, respectively. Industry fixed effects are based on the Fama–French 17-industry classification.

## 4 | EMPIRICAL RESULTS

### 4.1 | Main results

We begin our analysis by reporting the results of the baseline model, which includes only the main effects of the four governance mechanisms of interest. Then, we augment the baseline specification by introducing two-way interaction terms between heterogeneous governance mechanisms. All model specifications include calendar year and industry dummies (not displayed for brevity), as it has been shown that acquisitions occur in waves and are industry-clustered (e.g., Harford, 2005; Mitchell & Mulherin, 1996). We cluster robust standard errors at the firm level in all regressions to control for heteroscedasticity and within-firm correlation of residuals (Petersen, 2009).

To investigate the interplay of governance mechanisms on acquisition propensity, as explained, we perform an interaction

analysis (see Table 3). We explore all possible two-way interaction terms between the main explanatory variables. For brevity, we only present the significant pair-wise interaction terms in Models 2–6.<sup>4</sup> Figures 1–4 illustrate the significant interactions. We also report mean VIFs for all the estimated models in Table 3. All the mean VIF values are lower than 4, suggesting that multicollinearity is not an issue in our models.

Model 1 in Table 3 reports the estimates of the first-order terms for the firm fixed effects model. All governance and control variables are included as main effects. We mean-center all continuous regressors, before computing their product terms. Models 2 through 6 present the significant interactions of the governance mechanisms investigated on acquisitiveness. To plot interaction effects, we use the maximum (high) and minimum (low) values of the two governance mechanisms considered each time while holding all other covariates at their mean values.

With respect to the control variables, our findings corroborate previous studies (Bauguess & Stegemoller, 2008; Boulton et al., 2014; Croci & Petmezas, 2015; Yim, 2013). M&A activity is significantly and positively related to sales growth, market-to-book ratio, and cash holdings. As expected, firms with a more active market for corporate control in their industry, as proxied by the M&A liquidity index, exhibit higher M&A activity. In contrast, firms are less acquisitive when they have higher capital expenditures and when their CEOs are older and have higher stock ownership.

In Model 2, the interaction term of two monitoring mechanisms ( $NCI \times IOC$ ) is negative and significant ( $\Delta R^2 = 0.0004$ ,  $p < 0.05$ ). The simple slope test suggests that the relationship between non-co-opted independence and M&A activity is significant when institutional ownership concentration is both low (simple slope = 0.019,  $p < 0.10$ ) and high (simple slope =  $-0.019$ ,  $p < 0.10$ ). Figure 1 displays this finding. Thus, the presence of high non-co-opted independence on its own is not sufficient to constrain acquisitiveness. But, in the presence of highly concentrated institutional holdings, these two monitoring mechanisms work together and interact as complements in curbing acquisitiveness. This finding therefore lends support to the *Complementarity Hypothesis*.

In Model 3, we find a positive and significant interaction between CEO delta and E-Index ( $\Delta R^2 = 0.0006$ ,  $p < 0.10$ ). As shown in Figure 2, the simple slope test indicates that the relationship between CEO delta and M&A activity is not significant when E-Index is low (simple slope =  $-0.001$ , n.s.), but it is significant when E-Index is high (simple slope = 0.004,  $p < 0.05$ ). This result therefore suggests that M&A activity increases with CEO delta, but only in the presence of a higher E-Index (i.e., weaker shareholder rights or more anti-takeover provisions and thus weaker monitoring by the takeover market). Otherwise, in the presence of a lower E-Index (i.e., stronger shareholder rights or fewer anti-takeover provisions), CEO delta has a rather neutral effect on acquisitiveness (the slope is “flat”). We, therefore, conclude that there are *complementary effects* between CEO pay incentives—in the form of CEO delta—and E-Index (takeover market proxy) on acquisitiveness.

TABLE 3 Interaction effects

	Main effects expected sign	Main effects						Interactions					
		Model 1	Model 2	Model 3	Model 4	Model 5	Model 6						
Firm size		0.00 (−0.01)	−0.01 (−0.10)	0.02 (0.15)	0.00 (0.02)	0.00 (0.03)	0.01 (0.11)						
Book leverage		0.30 (0.38)	0.32 (0.40)	0.27 (0.34)	0.36 (0.45)	0.25 (0.32)	0.29 (0.37)						
Sales growth		1.79*** (2.69)	1.80*** (2.69)	1.75*** (2.63)	1.78*** (2.66)	1.77*** (2.66)	1.73*** (2.60)						
Market-to-book ratio		0.41*** (2.69)	0.41*** (2.67)	0.42*** (2.73)	0.41*** (2.68)	0.42*** (2.75)	0.42*** (2.74)						
Cash flows		2.77 (1.10)	2.81 (1.12)	2.87 (1.15)	2.68 (1.07)	2.72 (1.08)	2.75 (1.10)						
Cash holdings		2.61*** (2.74)	2.63*** (2.76)	2.60*** (2.73)	2.62*** (2.75)	2.64*** (2.76)	2.67*** (2.79)						
ROA		1.16(0.74)	1.12 (0.71)	1.14 (0.72)	1.15 (0.73)	1.07 (0.67)	1.00 (0.63)						
CAPEX		−9.29*** (−3.70)	−9.34*** (−3.73)	−9.43*** (−3.78)	−9.23*** (−3.67)	−9.12*** (−3.65)	−9.19*** (−3.70)						
M&A liquidity index		42.98*** (5.66)	42.98*** (5.66)	42.95*** (5.66)	43.09*** (5.67)	43.15*** (5.68)	43.23*** (5.69)						
CEO tenure		−0.02 (−1.10)	−0.02 (−1.09)	−0.02 (−1.08)	−0.02 (−1.08)	−0.02 (−1.08)	−0.02 (−1.04)						
CEO age		−0.03* (−1.68)	−0.03* (−1.69)	−0.03* (−1.68)	−0.03* (−1.69)	−0.03* (−1.70)	−0.03* (−1.71)						
CEO gender		−0.29 (−0.51)	−0.29 (−0.52)	−0.29 (−0.53)	−0.29 (−0.52)	−0.26 (−0.47)	−0.27 (−0.48)						
CEO overconfidence		0.06 (0.24)	0.06 (0.24)	0.07 (0.28)	0.06 (0.21)	0.08 (0.30)	0.08 (0.29)						
CEO ownership		−4.93* (−1.89)	−4.82* (−1.84)	−4.79* (−1.82)	−4.54* (−1.72)	−4.94* (−1.89)	−4.35 (−1.64)						
Board size	+/−	−0.06 (−0.90)	−0.05 (−0.86)	−0.06 (−0.92)	−0.06 (−0.95)	−0.06 (−0.94)	−0.06 (−0.97)						
Non-co-opted independence (NCI)	−	0.10 (0.19)	0.15 (0.30)	0.14 (0.28)	0.10 (0.21)	0.09 (0.18)	0.17 (0.34)						
CEO/chair duality	+	0.03 (0.14)	0.01 (0.04)	0.01 (0.05)	0.04 (0.18)	0.03 (0.14)	0.00 (0.02)						
CEO Vega	+	−0.75 (−1.00)	−0.80 (−1.07)	−1.13 (−1.45)	−0.73 (−0.98)	−0.83 (−1.11)	−1.13 (−1.44)						
CEO delta	+/−	0.07 (0.98)	0.08 (1.11)	0.14 (1.63)	0.07 (1.04)	0.08 (1.05)	0.14 (1.59)						
CEO cash pay	+/−	0.25 (1.07)	0.25 (1.08)	0.21 (0.91)	0.15 (0.64)	0.25 (1.09)	0.13 (0.57)						
Institutional ownership concentration (IOC)	−	−0.52 (−0.39)	−0.62 (−0.47)	−0.50 (−0.38)	−0.58 (−0.44)	−0.83 (−0.63)	−0.97 (−0.74)						
E-Index	+	0.12 (1.25)	0.12 (1.21)	0.11 (1.19)	0.12 (1.29)	0.11 (1.16)	0.11 (1.12)						
NCI × IOC		−	−8.69** (−2.14)	−	−	−	−6.98* (−1.68)						
CEO delta × E-Index		−	−	0.08* (1.90)	−	−	0.06 (1.37)						
CEO cash pay × E-Index		−	−	−	−0.23* (−1.87)	−	−0.22* (−1.81)						
IOC × E-Index		−	−	−	−	−1.85* (−1.94)	−1.86* (−1.90)						
Constant		3.80*** (3.92)	3.80*** (3.92)	3.82*** (3.94)	3.76*** (3.89)	3.84*** (3.97)	3.83*** (3.97)						
Year fixed effects		Yes	Yes	Yes	Yes	Yes	Yes						
Industry fixed effects		Yes	Yes	Yes	Yes	Yes	Yes						
Number of observations		11,418	11,418	11,418	11,418	11,418	11,418						
R <sup>2</sup>		3.58%	3.62%	3.64%	3.62%	3.62%	3.74%						
Adjusted R <sup>2</sup>		3.13%	3.16%	3.19%	3.16%	3.17%	3.25%						

(Continues)

TABLE 3 (Continued)

	Main effects		Interactions					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6		
F	4.27	4.21	4.30	4.22	4.23	4.10		
$\Delta R^2$ from model 1	0.04%	0.04%	0.06%	0.04%	0.04%	0.16%		
$\Delta F$ from model 1	4.58**	3.62*	3.50*	3.50*	3.78*	3.59***		
(Prob > F)	(0.03)	(0.06)	(0.06)	(0.06)	(0.05)	(0.00)		
Mean VIF	2.20	2.18	2.19	2.18	2.18	2.14		

Note: The table reports in Model 1 the main effects of a pooled OLS regression. Models 2–6 present the significant pair-wise interactions between the main governance mechanisms examined. The dependent variable is the total deal value of the acquisitions made in a given year scaled by the acquirer's total assets in the previous year.  $\Delta R^2$  denotes the change in  $R^2$  from the main effects model (Model 1).  $\Delta F$  denotes a test of the joint significance of the subset of coefficients that are introduced in each model compared to the main effects model (Model 1). Variable definitions are provided in Table A2. Year and industry fixed effects, whose coefficients are suppressed, are based on calendar year and Fama–French 17 industry classification dummies, respectively. T statistics, adjusted for heteroscedasticity-consistent standard errors and clustered at the firm level, are shown in parentheses.

\*Statistical significance at the 10% level.  
 \*\*Statistical significance at the 5% level.  
 \*\*\*Statistical significance at the 1% level.

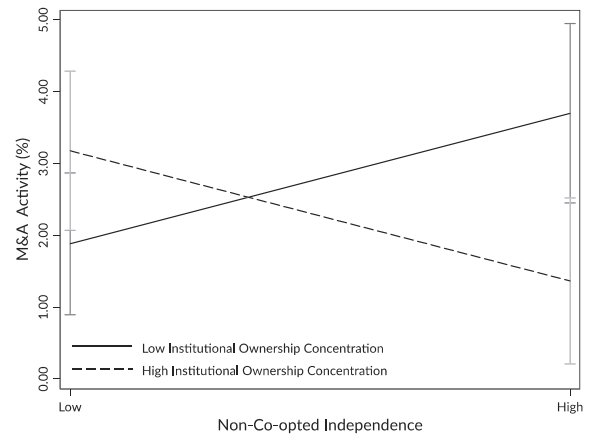


FIGURE 1 Complementary effect of non-co-opted independence and institutional ownership concentration on M&A activity

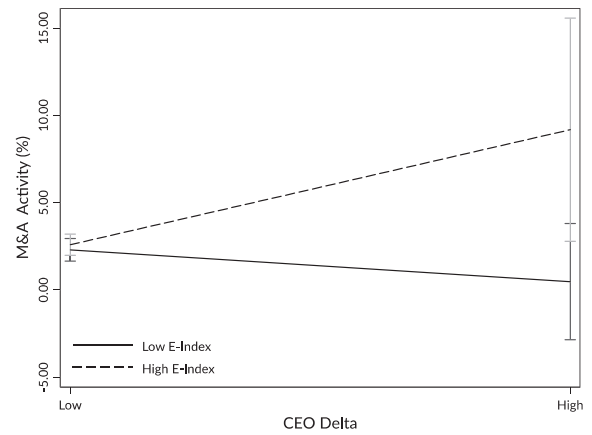


FIGURE 2 Complementary effect of CEO delta and E-Index on M&A

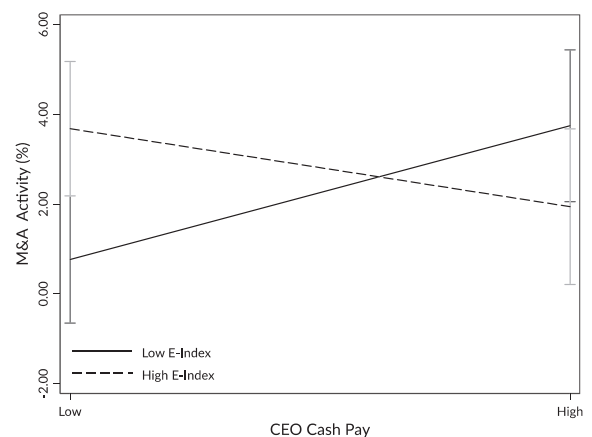
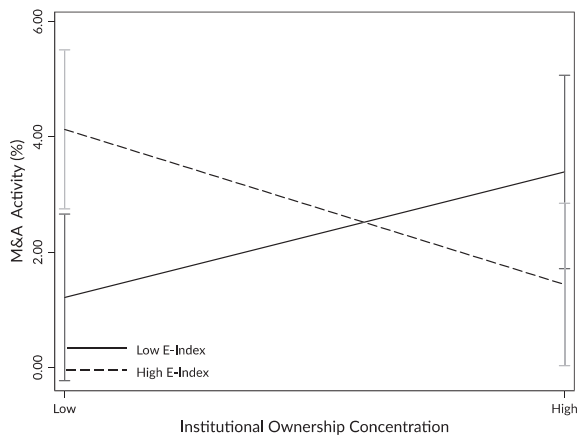


FIGURE 3 Substitutive effect of CEO cash pay and E-Index on M&A activity



**FIGURE 4** Substitutive effect of institutional ownership concentration and E-Index on M&A activity

In Model 4, there is a negative and significant interaction between CEO cash pay and E-Index ( $\Delta R^2 = 0.0004$ ,  $p < 0.10$ ). A simple slope test suggests that the relationship between CEO cash pay and M&A activity is significant when E-Index is low (simple slope = 0.009,  $p < 0.05$ ) but not significant when E-Index is high (simple slope =  $-0.005$ , n.s.). As shown in Figure 3, the results suggest that the presence of a low E-Index (i.e., strong shareholder rights or few anti-takeover provisions) in a firm, which has been associated with a better ability of the takeover market to exercise control over incumbent managers, increasing CEO cash pay is, in fact, more effective in encouraging the CEO to make risky strategic decisions in the form of undertaking acquisition investments. This finding supports the *Substitution Hypothesis*.

In Model 5, the interaction between institutional ownership concentration (IOC) and E-Index is negative and significant ( $\Delta R^2 = 0.0004$ ,  $p < 0.10$ ). As portrayed in Figure 4, simple slope test suggests that the effect of institutional ownership concentration on M&A activity is not significant when E-Index is low (simple slope = 0.050, n.s.), but it is significant when E-Index is high (simple slope =  $-0.061$ ,  $p < 0.05$ ). The presence of a high E-Index (i.e., weak shareholder rights or many anti-takeover provisions) in a firm suggests that managers are more insulated from the disciplinary power of the takeover market and are more likely to engage in acquisitions. In this case, the concurrent presence of highly concentrated institutional shareholdings is necessary in order to constrain firm acquisitiveness. This finding supports the *Substitution Hypothesis*.

Finally, in Model 6, we present together all the interactions found significant individually. Coefficients on three of the interactions remain negative and significant (NCI  $\times$  IOC, CEO cash pay  $\times$  E-Index, and IOC  $\times$  E-Index), while the positive coefficient on CEO delta  $\times$  E-Index becomes statistically insignificant. Thus, in this full model specification, the overall results we obtain are qualitatively similar, although unsurprisingly statistically weaker. Overall, the results of the interaction analysis provide support for both the *Substitution* and *Complementarity Hypotheses* between governance mechanisms in the M&A setting.

## 4.2 | Robustness tests

A potential concern with the interpretation of our main results is that the relationship between M&A activity and firm-level governance mechanisms is likely to be endogenous as firm acquisitiveness and corporate governance can be jointly determined (due to simultaneity or reverse causality issue). In the analysis, we lagged all independent variables by 1 year as a step toward addressing the reverse causality issue, but we acknowledge that this does not completely address the issue. Unobserved factors correlated with both acquisition decisions and corporate governance structure could bias our results. For instance, M&A activity is strongly associated firm-level characteristics, such as corporate culture and strategy which are difficult to obtain or measure. As a result, some firms may be more inclined to undertake acquisitions than others because of their own unobserved specificities. Fixed effects models allow for any correlation between firm-specific effects (unobserved firm heterogeneity) and the included regressors in the model. Thus, we include firm fixed effects in our regressions as a way to address omitted variable bias from omitted variables which are time-invariant, firm-specific and unobservable.

To further mitigate unobserved heterogeneity in our estimates of the interactive effects of governance mechanisms on firm acquisitiveness, we incorporate CEO fixed effects combined with firm fixed effects, to absorb any unobserved firm and CEO heterogeneity that is time-invariant during the tenure of a particular CEO. Prior research has documented that managerial fixed effects affect a wide range of firm practices including investment and financial policies, as well as other organizational strategy variables. In particular, Bertrand and Schoar (2003) report considerable differences in corporate decision-making when taking into account manager effects and provide empirical evidence that specific “styles” in managerial decision-making represent an important source of unexplained variation in several corporate practices. As such, a firm/board may determine the need to expand (refocus) and therefore decide to appoint a new CEO, who is more (less) aggressive or more (less) prone to engage in expansion strategies, such as acquisitions. In the same vein, Weisbach (1995) reveals a relationship between management turnover and an increased probability of divesting unprofitable acquisitions. It is therefore clear that differences across managers account for much of the unexplained variation in several corporate practices, including acquisition policies. In our case, a CEO who is the principal decision maker within the firm may have a particular acquisition “style” that can correlate with firm-level governance mechanisms and by taking into account these specific patterns we can estimate how much of the unexplained variation in acquisition decisions can be attributed to CEO fixed effects, after controlling for firm fixed effects and time-varying firm characteristics. In our sample, 53% of the 1639 firms employ just one CEO throughout the sample period, with the remaining 47% employing multiple CEOs. Finally, we include acquirer state fixed effects, to control for the potentially unusual flow of investments from various U.S. states (i.e., Delaware) and state-level regulatory and judicial variations, which may affect outward merger intensity.

TABLE 4 Robustness tests

	Main effects			Interactions		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Board size	-0.24** (-2.09)	-0.25** (-2.16)	-0.25** (-2.15)	-0.24** (-2.10)	-0.25** (-2.15)	-0.26** (-2.26)
Non-co-opted independence (NCI)	0.81 (0.90)	0.65 (0.72)	0.79 (0.88)	0.81 (0.89)	0.83 (0.91)	0.66 (0.72)
CEO/chair duality	1.22** (2.01)	1.23** (2.02)	1.15* (1.91)	1.22** (2.01)	1.22** (2.01)	1.15* (1.92)
CEO Vega	-1.19 (-0.92)	-1.01 (-0.78)	-1.35 (-1.03)	-1.19 (-0.91)	-1.28 (-0.98)	-1.25 (-0.96)
CEO Delta	0.11 (0.63)	0.11 (0.62)	0.15 (0.89)	0.11 (0.63)	0.11 (0.65)	0.15 (0.90)
CEO cash pay	-0.02 (-0.04)	-0.01 (-0.03)	-0.04 (-0.10)	-0.02 (-0.06)	0.00 (-0.00)	0.00 (-0.01)
Institutional ownership concentration (IOC)	4.11* (1.70)	3.15 (1.31)	4.25* (1.78)	4.10* (1.70)	3.93 (1.63)	3.20 (1.33)
E-Index	-0.11 (-0.51)	-0.11 (-0.51)	-0.16 (-0.76)	-0.11 (-0.51)	-0.10 (-0.47)	-0.15 (-0.72)
NCI × IOC	-	-19.88*** (-2.78)	-	-	-	-19.52*** (-2.73)
CEO delta × E-Index	-	-	0.15* (1.66)	-	-	0.15 (1.64)
CEO cash pay × E-Index	-	-	-	-0.03 (-0.14)	-	0.07 (0.38)
IOC × E-Index	-	-	-	-	-2.78** (-2.06)	-2.25* (-1.65)
Firm control variables	Yes	Yes	Yes	Yes	Yes	Yes
CEO control variables	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm-CEO fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Acquirer state fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	10,700	10,700	10,700	10,700	10,700	10,700
R <sup>2</sup>	28.37%	28.45%	28.46%	28.37%	28.42%	28.57%
Adjusted R <sup>2</sup>	9.72%	9.80%	9.82%	9.70%	9.76%	9.92%

Note: The table reports in Model 1 the main effects using firm-CEO, acquirer state, and year fixed effects in the regressions. Models 2–6 present the pair-wise interactions which were found significant in Table 2. The dependent variable is the total deal value of the acquisitions made in a given year scaled by the acquirer's total assets in the previous year. All models include the same firm and CEO characteristics as regressions of Table 3 with the exclusion of CEO gender. However, only the regression coefficients on the main governance variables of interest and the related two-way interaction terms are reported for brevity. Variable definitions are provided in Table A2. *T* statistics, adjusted for heteroscedasticity-consistent standard errors and clustered at the firm level, are shown in parentheses.

\*Statistical significance at the 10% level.

\*\*Statistical significance at the 5% level.

\*\*\*Statistical significance at the 1% level.



Table 4 reports the estimation results for the main and interaction effects using firm-CEO, acquirer state and year fixed effects in the regressions. The estimates of the three significant interaction terms found also in the main analysis are qualitatively similar to those reported in Table 3 (see Models 2, 3, and 5 of Table 3). However, while the coefficient on CEO cash pay  $\times$  E-Index (Model 4) remains negative, it becomes statistically insignificant. One possible explanation is that a more stringent specification, which includes firm-CEO fixed effects reduces the within firm-CEO variation available for estimation.

For comparison purposes, we add all the interaction terms together in Model 6. In the full model specification, the coefficients of NCI  $\times$  IOC and IOC  $\times$  E-Index remain negative and significant, and the coefficient of CEO cash pay  $\times$  E-Index remains insignificant as in Model 4. However, the coefficient of CEO delta  $\times$  E-Index becomes insignificant.

To sum up, although we include a variety of fixed effects (firm-CEO, acquirer state, and year fixed effects) to mitigate endogeneity (reverse causality) concerns and while we control for a wide range of governance, firm, and CEO characteristics to account for observable characteristics influencing firm acquisitiveness, our results should be interpreted with caution, as we cannot completely rule out other unobservable factors that could still be driving the explored relationships.

## 5 | DISCUSSION AND CONCLUSIONS

Building on the governance bundle assumption, this paper examines the interactive effects of firm-level governance mechanisms and whether they act as substitutes or complements of each other in influencing firm acquisitiveness. Departing from the traditional view of the independent effects of corporate governance mechanisms, we contribute to the governance literature by delving into the interdependencies between corporate governance mechanisms and how these influence a firm's acquisition propensity. In this regard, our study contributes to the nascent but highly promising body of governance research which adopts a *configurational* perspective. This suggests that organizational outcomes depend on the effectiveness of certain combinations or “bundles” of corporate governance practices, rather than on the effectiveness of any single governance mechanism (Aguilera et al., 2008; Aguilera et al., 2012; Rediker & Seth, 1995; Ward et al., 2009).

In sum, our results mainly provide support for both the *Substitution* and *Complementarity Hypotheses* when focusing on the interdependence of four key governance mechanisms (board monitoring, CEO pay incentives, external market, and institutional investor monitoring) in the M&A setting. Specifically, we detected significant complementary and substitutive effects between incentives alignment and external market discipline mechanisms (i.e., CEO delta and cash pay and antitakeover provisions) with respect to influencing the propensity of a firm to undertake an acquisition. These results suggest that CEO pay incentives, in the form of delta, are more effective in

encouraging high-risk projects such as acquisitions when the CEO is insulated from the pressures of the takeover market, while cash compensation is more effective in the presence of high levels of market discipline mechanisms. Likewise, when there are high levels of monitoring mechanisms in place, either in the form of a more vigilant board of non-co-opted directors or concentrated institutional investors, these mechanisms are complementary in constraining CEO discretion and, in doing so, minimize agency costs by weakening the positive effect of compensation-alignment mechanisms on acquisition propensity. Another noteworthy finding, offering support to the *Substitution Hypothesis*, was also that in the presence of a high E-Index, where managers can feel insulated from the takeover market and are more likely to engage in risky investment decisions, a high concentration of institutional shareholders can constrain firm acquisitiveness. Results were robust to the inclusion of CEO-firm and acquirer state-level fixed effects, after controlling for firm fixed effects and time-varying firm characteristics.

### 5.1 | Theoretical and practical implications

Our study provides valuable insights for both academics and practitioners. From a theoretical standpoint, our results reinforce the view that corporate governance mechanisms do not necessarily function as independent factors, but they operate more effectively if treated as a bundle (Desender et al., 2016; Oh et al., 2018; Rediker & Seth, 1995). Given that a firm's governance structure consists of various mechanisms, as stated by proponents of the governance “bundles” perspective it is important to consider their interrelations in order to better explain the effects of combinations (presence/absence) of governance mechanisms on firm decisions and outcomes. It is thus possible that one mechanism is more efficient than another one in producing a certain outcome, or that one mechanism would not be sufficient in the absence of another one. For these reasons, the line of investigation that focuses on the substitutive and complementary relationships between governance mechanisms has attracted considerable scholarly attention in corporate governance research (Aguilera et al., 2012; Cuomo et al., 2016; Schiehl et al., 2014). Our results provide a better and more nuanced understanding of how the substitutive and complementary effects of firm-level governance mechanisms operate in the context of M&A, specifically in relation to acquisitiveness.

We extend the validity of the bundles of governance mechanisms approach to the context of M&A and present important implications for the design of firm-level governance mechanisms. Using the configurational lens, we show that governance mechanisms focusing on the incentives alignment (i.e., CEO cash pay and delta), external market discipline, and internal and external monitoring functions operate synergistically, and hence, any governance configuration in relation to acquisitiveness should not treat them independently (Rediker & Seth, 1995). Nevertheless, our findings also reveal the emergence of complementarities between relatively dissimilar governance practices such as board monitoring and institutional investor monitoring. We therefore extend the work of García-Castro et al. (2013) in showing

the existence of complementarity between heterogeneous governance practices. From a contingency perspective, corporate governance as a system of interconnected elements will change depending on how multiple governance practices focused on effective monitoring and incentive alignment interrelate in influencing strategic decisions such as M&A propensity (Desender et al., 2016). As such, the governance system concept implies that the effectiveness of the different mechanisms cannot be considered in isolation but the interdependence between them influences acquisitiveness (Oh et al., 2018).

Moving beyond the M&A setting, it can be argued that these competing perspectives could be prevalent in other firm decisions which require intensive deliberation on behalf of the board of directors and other firm-specific governance mechanisms, such as decisions about the CEO appointment or other critical capital expenditure projects. Furthermore, our study complements and extends prior work on the interdependence of governance mechanisms by investigating their interactive effects on firm decisions and outcomes, whilst most of the previous studies in this area examined whether one governance mechanism substitutes or complements another mechanism (e.g., Hartzell & Starks, 2003; Rediker & Seth, 1995; Zajac & Westphal, 1994). Our study also makes important contributions to the extensive yet fragmented M&A research about the antecedents of corporate acquisitions. We provide evidence that firm-level governance configurations are a crucial determinant for explaining cross sectional differences in the acquisition propensity of firms, ranging from a more prudent to a more aggressive acquisition behavior. Our results demonstrate that firm-level governance mechanisms and their interrelations are influential in the acquisition decision. These results may help explain discrepancies in the previous M&A literature about the multiple drivers of acquisition decisions and how these drivers may operate in conjunction by influencing firm acquisition behavior (Haleblian et al., 2009). Therefore, they serve as an important step in advancing our understanding of what determines corporate acquisitions.

Finally, our study has important practical implications. The findings offer a better understanding of how different combinations or “bundles” of firm-level governance mechanisms influence a firm's propensity to undertake acquisitions. While individual governance mechanisms—whether intended at monitoring or incentives alignment—aim to reduce agency problems from the separation between ownership and control, the way these mechanisms “bundle” may have different implications for major strategic decisions such as corporate acquisitions. For instance, a firm that wishes to limit its managers in pursuing M&A activity will reduce CEO delta if the probability of managerial entrenchment is high or reduce CEO cash pay if the risk of entrenchment is low. A similar outcome can be achieved if a firm with high institutional ownership controls the number of co-opted board members, thus preserving high levels of non-co-opted independence, or if one with low institutional concentration appoints more co-opted members on the board. Alternatively, in the presence of concentrated institutional ownership, a firm can further limit acquisitiveness if it opts to limit shareholder rights and increase

anti-takeover provisions. On the other hand, if a firm with low institutional ownership aims to increase acquisitiveness, it will seek to control co-opted board memberships or alternatively limit shareholder rights and increase anti-takeover provisions. Meanwhile a firm with high institutional ownership can opt to increase the representation of co-opted members on the board to achieve a similar outcome. Finally, increasing CEO incentives such as CEO delta and cash pay can boost the acquisitiveness in the presence of high and low levels of anti-takeover provisions respectively.

Taken together, our findings imply that firms should consider different governance configurations for different levels of acquisition propensity, in line with the notion of “equifinality,” whereby alternative combinations of governance mechanisms can lead to similar firm outcomes (Gresov & Drazin, 1997; Rediker & Seth, 1995). For policymakers, these results challenge universalistic policy prescriptions and support the notion that in the design of governance frameworks, different, and equally valid, routes can allow firms to reach the same end result.

## 5.2 | Limitations and future research

As customary, it is necessary to acknowledge certain limitations of our study and consider avenues for future research. First, we have focused on the board of directors, institutional shareholders, and the external discipline imposed by the takeover market, namely, the entrenchment index (*E-Index*), as monitoring mechanisms and on certain CEO compensation-alignment mechanisms. Given a plethora of corporate governance mechanisms available to firms, future research could examine the interplay of other governance mechanisms in the context of acquisition decisions. An interesting avenue for future work would be to examine how the compensation of top management teams (TMT) interacts with other governance mechanisms in influencing key strategic decisions such as corporate acquisitions. Besides the CEO, other executives of the so-called “C-suite” like the Chief Financial Officer (CFO) contribute to the firm's strategic decision making. Other mechanisms relating to the board of directors include, for instance, the presence of board committees, board busyness, board diversity, directors' compensation, and other director characteristics. Importantly, as it is widely documented in the M&A and agency literatures, corporate acquisitions are often done for reasons other than shareholder-value creation. Therefore, acquisitiveness is certainly not a predictor of post-acquisition performance. As corporate governance can play a potentially pivotal role on acquisition performance, a further promising research avenue is the examination of the influence of governance bundles on the performance of M&A.

Second, our study used only archival data. Arguably, we have employed more refined proxies for our board characteristics than previously used “noisy” measures (e.g., non-co-opted board independence vs. conventional measure of board independence-proportion of independent directors). Nevertheless, our measures still prevent us from gaining an in-depth understanding of the underlying team-based and decision-making processes of boards of directors. Hence, a

fruitful avenue for enquiry would be to delve into the inner workings of boardrooms by collecting primary data through questionnaire surveys and interviews of board members in order to better capture the effects of board monitoring on acquisition decisions.

Third, we acknowledge some endogeneity concerns. In a similar context to our study, prior research shows that CEO compensation is higher when pursuing M&A that significantly increase firm size (e.g., Chen et al., 2017; Grinstein & Hribar, 2004; Harford & Li, 2007). Moreover, prior research has revealed that institutional investors are more likely to invest in large firms (e.g., Gompers & Metrick, 2001; Sias & Starks, 1997). Thus, an increase in firm size via M&A may attract a higher level of institutional ownership in that firm. In general, the reverse causality issue implies that we could observe different governance structures for more acquisitive firms. A widely used approach to address reverse causality is to find an instrumental variable, which satisfies two challenging conditions, namely, the “relevance” and “exogeneity” conditions (Larcker & Rusticus, 2010). However, in practice, it is very difficult to find valid strictly exogenous instruments (Wintoki et al., 2012), especially in the case of studies similar to ours where multiple independent variables and their interactions are employed. Furthermore, unobserved factors correlated with both acquisition decisions and corporate governance structure could introduce bias in our results. M&A activity may be strongly associated with firm-level characteristics, such as corporate culture and strategy which are difficult to obtain or measure. While we employ a host of fixed effects (firm-CEO, acquirer state, and year fixed effects) to mitigate such concerns and account for observable characteristics, our methods cannot completely rule out other unobservable factors that may be driving our results. Finally, some of the governance bundles that we observe are not strictly exogenous, such that changes in one mechanism may also trigger shifts in another. While our approach allows us to examine first-order complementary and substitutive effects on firm acquisitiveness, we cannot draw direct conclusions with respect to higher order (or subsequent) effects, driven by the potentially endogenous nature of certain governance mechanisms. We note however that—in the absence of a natural experiment—it is extremely challenging to completely rule out remaining unobservable characteristics.

Lastly, we have concentrated exclusively on U.S. firms in order to explore the interdependence of firm-level governance mechanisms on acquisition decisions. Thus, our findings apply mainly to the Anglo-American or shareholder-oriented governance system. More work is therefore needed to reveal if the observed interactive effects between the governance mechanisms under investigation hold in international settings, considering cross-national differences and differences in the national models of corporate governance. Future research could offer important contributions by extending the sample to include cross-border takeovers and explore how different governance arrangements may interact with one another to influence a firm's foreign market entry or foreign acquisitiveness. For example, this could be investigated in countries where the continental or stakeholder-oriented governance model is prevalent such as Germany and Japan.

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## ORCID

Evrudiki Panayi  <https://orcid.org/0000-0002-0832-8911>

Konstantinos Bozos  <https://orcid.org/0000-0003-2914-6495>

Gianluca Veronesi  <https://orcid.org/0000-0001-9956-863X>

## NOTES

<sup>1</sup> Henceforth, the terms “mergers” and “acquisitions” are used interchangeably.

<sup>2</sup> Following conventions in the M&A literature, we impose the following standard M&A sample selection criteria: (1) the acquirers must be publicly listed and the targets are either public or private firms, (2) all exchange offers, leveraged buyouts, repurchases, recapitalisations, spinoffs, minority stake purchases, acquisitions of remaining interest, self-tenders and privatisations are excluded, (3) the M&A deal should be completed, (4) the acquirer must control less than 50% of the target's shares prior to the transaction and more than 50% after the deal completion, to ensure that transactions included in the sample represent a transfer of control, and (5) the deal value must be at least \$1 million. These screening criteria yield a sample of 16,642 completed deals over the specified sample period.

<sup>3</sup> By using an unbalanced panel for a rather long time period (18 years), survivorship or attrition bias issues are mitigated, since we are able to study companies withdrawn from databases for reasons, such as being acquired or delisted.

<sup>4</sup> For the sake of completeness, we provide the results of the non-significant two-way interaction terms in Table A1.

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## AUTHOR BIOGRAPHIES

**Evriddiki Panayi**, PhD, is a post-doctoral research fellow in the Accounting and Finance Division at the Leeds University Business School. She received her PhD in Accounting and Finance from the University of Leeds. Her current main research interests lie in the intersection of empirical corporate finance and corporate governance, and she is particularly interested in the fields of Mergers and Acquisitions and the configurational perspective in corporate governance.

**Konstantinos Bozos**, PhD, is a Professor of International Accounting & Finance at the Leeds University Business School (LUBS). He

received his PhD from the University of Leeds. His research spans the areas of international accounting and finance and their intersections with institutions and governance. His works have been published, among others, in the *Strategic Management Journal*, the *Journal of World Business*, and the *European Journal of Operational Research*. He is a research associate at the Georgia State University (CIBER, J. Mack Robinson College of Business) and the co-chair of the International Symposium in Finance.

**Gianluca Veronesi**, PhD, is a Professor of Healthcare Management at the School of Management (FSSL), University of Bristol (UK). He received his PhD from Leeds University Business School, University of the Leeds (UK). His research interests include governance, management reforms, and organizational performance. His research mainly concentrates on public sector organizations in particular the healthcare sector. His works have been published, among others, in the *Public Administration Review*, *Journal of Public Administration Research and Theory*, *Organisation Studies*, and *Public Administration*.

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## APPENDIX A.

TABLE A1 Non-significant interactions

	Model A1	Model A2	Model A3	Model A4	Model A5	Model A6	Model A7	Model A8	Model A9
Board size	-0.06 (-0.89)	-0.06 (-0.90)	-0.06 (-0.91)	-0.05 (-0.87)	-0.06 (-0.91)	-0.06 (-0.90)	-0.06 (-0.90)	-0.06 (-0.90)	-0.06 (-0.90)
NCI	0.09 (0.19)	0.10 (0.20)	0.10 (0.19)	0.09 (0.19)	0.09 (0.18)	0.11 (0.22)	0.10 (0.20)	0.10 (0.19)	0.09 (0.18)
CEO/chair duality	0.03 (0.14)	0.03 (0.13)	0.03 (0.14)	0.03 (0.14)	0.04 (0.17)	0.03 (0.14)	0.06 (0.27)	0.03 (0.15)	0.04 (0.16)
CEO vega	-0.85 (-1.11)	-0.72 (-0.96)	-0.75 (-1.01)	-0.74 (-0.98)	-0.77 (-1.03)	-0.77 (-0.99)	-0.80 (-1.06)	-0.80 (-0.77)	-0.75 (-1.00)
CEO delta	0.07 (0.99)	0.07 (0.98)	0.07 (0.98)	0.07 (0.97)	0.07 (0.94)	0.08 (0.96)	0.07 (0.98)	0.07 (0.98)	0.04 (0.37)
CEO cash pay	0.25 (1.08)	0.26 (1.10)	0.25 (1.07)	0.25 (1.07)	0.24 (1.05)	0.25 (1.06)	0.20 (0.82)	0.25 (1.07)	0.25 (1.05)
IOC	-0.47 (-0.36)	-0.50 (-0.38)	-0.52 (-0.39)	-0.48 (-0.36)	-0.54 (-0.41)	-0.52 (-0.39)	-0.57 (-0.43)	-0.52 (-0.39)	-0.51 (-0.38)
E-Index	0.12 (1.27)	0.12 (1.25)	0.12 (1.23)	0.12 (1.23)	0.12 (1.22)	0.12 (1.25)	0.12 (1.22)	0.12 (1.25)	0.12 (1.23)
Board size × CEO vega	0.13 (0.64)	-	-	-	-	-	-	-	-
Board size × CEO delta	-	-0.01 (-0.35)	-	-	-	-	-	-	-
Board size × CEO cash pay	-	-	0.00 (-0.00)	-	-	-	-	-	-
Board size × IOC	-	-	-	0.19 (0.36)	-	-	-	-	-
NCI × CEO vega	-	-	-	-	-1.11 (-0.55)	-	-	-	-
NCI × CEO delta	-	-	-	-	-	0.03 (0.18)	-	-	-

TABLE A1 (Continued)

	Model A10	Model A11	Model A12	Model A13	Model A14	Model A15	Model A16	Model A17	Model A18
Board size	-0.06 (-0.90)	-0.06 (-0.89)	-0.06 (-0.89)	-0.06 (-0.91)	-0.06 (-0.96)	-0.06 (-1.03)	-0.06 (-0.90)	-0.06 (-0.90)	-0.06 (-0.90)
NCI	0.07 (0.15)	0.11 (0.22)	0.10 (0.20)	0.10 (0.20)	0.08 (0.17)	0.11 (0.23)	0.17 (0.35)	0.09 (0.18)	0.09 (0.18)
CEO/chair duality	0.05 (0.21)	0.03 (0.14)	0.03 (0.14)	0.03 (0.14)	0.04 (0.17)	0.03 (0.15)	0.02 (0.07)	0.03 (0.15)	0.03 (0.15)
CEO vega	-0.74 (-0.99)	-0.75 (-1.01)	-0.71 (-0.93)	-0.75 (-1.02)	-0.74 (-0.99)	-0.73 (-0.98)	-0.80 (-1.06)	-0.75 (-1.00)	-0.79 (-1.05)
CEO delta	0.07 (0.96)	0.07 (0.98)	0.07 (0.98)	0.07 (0.97)	0.08 (1.07)	0.07 (0.96)	0.07 (1.01)	0.07 (0.99)	0.07 (0.96)
CEO cash pay	0.09 (0.27)	0.25 (1.07)	0.25 (1.07)	0.25 (1.07)	0.21 (0.89)	0.22 (0.93)	0.23 (1.00)	0.25 (1.07)	0.25 (1.06)
IOC	-0.53 (-0.40)	-1.01 (-0.53)	-0.49 (-0.37)	-0.52 (-0.39)	-0.66 (-0.49)	-0.57 (-0.43)	-0.58 (-0.43)	-0.52 (-0.39)	-0.51 (-0.39)
E-Index	0.12 (1.25)	0.12 (1.23)	0.12 (1.24)	0.12 (1.25)	0.13 (1.30)	0.12 (1.22)	0.11 (1.11)	0.15 (1.20)	0.12 (1.21)
Board size × CEO vega	-	-	-	-	-	-	-	-	-
Board size × CEO delta	-	-	-	-	-	-	-	-	-
Board size × CEO cash pay	-	-	-	-	-	-	-	-	-
Board size × IOC	-	-	-	-	-	-	-	-	-
NCI × CEO vega	-	-	-	-	-	-	-	-	-
NCI × CEO delta	-	-	-	-	-	-	-	-	-

(Continues)

TABLE A1 (Continued)

	Model A1	Model A2	Model A3	Model A4	Model A5	Model A6	Model A7	Model A8	Model A9
NCI × CEO cash pay	-	-	-	-	-	-	-0.66 (-1.08)	-	-
CEO duality × CEO vega	-	-	-	-	-	-	-	0.08 (0.07)	-
CEO duality × CEO delta	-	-	-	-	-	-	-	-	0.05 (0.39)
CEO duality × CEO cash pay	-	-	-	-	-	-	-	-	-
CEO duality × IOC	-	-	-	-	-	-	-	-	-
CEO vega × IOC	-	-	-	-	-	-	-	-	-
CEO delta × IOC	-	-	-	-	-	-	-	-	-
CEO cash pay × IOC	-	-	-	-	-	-	-	-	-
Board size × E-Index	-	-	-	-	-	-	-	-	-
NCI × E-Index	-	-	-	-	-	-	-	-	-
CEO duality × E-Index	-	-	-	-	-	-	-	-	-
CEO vega × E-Index	-	-	-	-	-	-	-	-	-
Constant	3.78** (3.90)	3.81*** (3.93)	3.80*** (3.90)	3.83*** (3.92)	3.79*** (3.91)	3.80*** (3.92)	3.80*** (3.92)	3.80*** (3.91)	3.80*** (3.92)
Firm control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CEO control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	11,418	11,418	11,418	11,418	11,418	11,418	11,418	11,418	11,418
R <sup>2</sup>	3.58%	3.58%	3.58%	3.58%	3.58%	3.58%	3.59%	3.58%	3.58%
Adjusted R <sup>2</sup>	3.12%	3.12%	3.12%	3.12%	3.12%	3.12%	3.12%	3.12%	3.12%

(Continues)

TABLE A1 (Continued)

	Model A10	Model A11	Model A12	Model A13	Model A14	Model A15	Model A16	Model A17	Model A18
NCI × CEO cash pay	-	-	-	-	-	-	-	-	-
CEO duality × CEO vega	-	-	-	-	-	-	-	-	-
CEO duality × CEO delta	-	-	-	-	-	-	-	-	-
CEO duality × CEO cash pay	0.25 (0.75)	-	-	-	-	-	-	-	-
CEO duality × IOC	-	0.86 (0.36)	-	-	-	-	-	-	-
CEO vega × IOC	-	-	1.64 (0.22)	-	-	-	-	-	-
CEO delta × IOC	-	-	-	0.03 (0.04)	-	-	-	-	-
CEO cash pay × IOC	-	-	-	-2.73 (-1.51)	-	-	-	-	-
Board size × E-Index	-	-	-	-	-0.05 (-1.63)	-	-	-	-
NCI × E-Index	-	-	-	-	-	-	-0.45 (-1.49)	-	-
CEO duality × E-Index	-	-	-	-	-	-	-	-0.05 (-0.33)	-
CEO vega × E-Index	-	-	-	-	-	-	-	-	-0.35 (-0.82)
Constant	3.75*** (3.82)	3.81*** (3.93)	3.80*** (3.93)	3.80*** (3.92)	3.75*** (3.88)	3.77*** (3.88)	3.81*** (3.93)	3.79*** (3.92)	3.81*** (3.92)
Firm control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CEO control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	11,418	11,418	11,418	11,418	11,418	11,418	11,418	11,418	11,418
R <sup>2</sup>	3.59%	3.58%	3.58%	3.58%	3.60%	3.60%	3.60%	3.58%	3.58%
Adjusted R <sup>2</sup>	3.13%	3.12%	3.12%	3.12%	3.14%	3.15%	3.14%	3.12%	3.13%

Note: The table reports all pair-wise interactions which were found non-significant in Table 3, using year and industry fixed effects in the regressions. The dependent variable is the total deal value of the acquisitions made in a given year scaled by the acquirer's total assets in the previous year ×100. All models include the same firm and CEO control variables as in the regressions of Table 3. For brevity we report only the regression coefficients on the main governance variables of interest and the related two-way interaction terms. Variable definitions are provided in Table A2. T statistics, adjusted for heteroscedasticity-consistent standard errors and clustered at the firm level, are shown in parentheses.

\*Statistical significance at the 10% level.

\*\*Statistical significance at the 5% level.

\*\*\*Statistical significance at the 1% level.

**TABLE A2** Variable definitions

Variables	Definition	Data source
Panel A: Dependent variable		
M&A activity	It is the sum of the completed acquisition deal values in a given year, scaled by the acquirer's total assets in the previous year $\times 100$ .	Thomson One Banker, Compustat
Panel B: Independent variables		
Board size	The total number of directors on the board.	ISS
Non-co-opted independence (NCI)	The number of independent directors appointed before the CEO assumed office divided by the board size.	ISS, <a href="https://sites.temple.edu/Inaveen/data/">https://sites.temple.edu/Inaveen/data/</a>
CEO/chair duality	A dummy variable which takes the value of one if the CEO is also the chair of the board, and zero otherwise.	ExecuComp
CEO vega (scaled)	The dollar change in the portfolio of options of the CEO for a 1% change in the annual standard deviation of stock returns at the fiscal year-end, scaled by CEO cash pay and expressed as a percentage.	ExecuComp, <a href="https://sites.temple.edu/Inaveen/data/">https://sites.temple.edu/Inaveen/data/</a>
CEO delta (scaled)	The dollar change in the portfolio of options and equity holdings of the CEO for a 1% change in stock price at the fiscal year-end, scaled by CEO cash compensation and expressed as a percentage.	ExecuComp, <a href="https://sites.temple.edu/Inaveen/data/">https://sites.temple.edu/Inaveen/data/</a>
CEO cash pay	The natural logarithm of the CEO cash compensation (sum of salary and bonus in thousands of dollars) at the fiscal year-end.	ExecuComp
Institutional ownership concentration (IOC)	The percentage of the sum of shareholdings held by the five largest institutional investors to the total shares outstanding at the fiscal year-end.	Thomson Financial 13F, CRSP
E-Index	The Entrenchment Index of Bebchuk et al. (2009) based on six anti-takeover provisions (staggered boards, limits on amending the charter, limits on amending bylaws, supermajority requirements to approve a merger, poison pills, and golden parachutes). Each firm is assigned a score, from 0 to 6, based on the number of anti-takeover provisions that the firm has in the given year.	ISS
Panel C: Firm and industry characteristics		
Firm size	The natural logarithm of the book value of total assets in the fiscal year.	Compustat
Book leverage	The book value of total debt (long-term plus short-term debt) divided by the book value of total assets at the fiscal year-end.	Compustat
Sales growth	The ratio of the sales in the current fiscal year to the sales in the previous fiscal year minus one.	Compustat
Market-to-book ratio	The ratio of the market value of total assets to the book value of total assets at the fiscal year-end, where the market value of assets is defined as the book value of assets plus the market value of common stock minus the book value of common stock.	Compustat
Cash flows	Operating income before depreciation minus income taxes minus interest expenses minus dividends (common and preferred), divided by the book value of total assets at the fiscal year-end.	Compustat
Cash holdings	Cash and short-term investments, scaled by the book value of total assets at the fiscal year-end.	Compustat
ROA	Net income divided by the book value of total assets at the fiscal year-end.	Compustat
CAPEX	Capital expenditures scaled by the book value of total assets at the fiscal-year end.	Compustat
M&A liquidity index	The ratio of the value of all corporate control transactions of at least \$1 million reported by the Thomson One Banker for each Fama-French 49-industry classification and year to the total book value of assets of all Compustat firms in the same Fama-French 49-industry classification and year.	Compustat, Thomson one banker

(Continues)

TABLE A2 (Continued)

Variables	Definition	Data source
Panel D: CEO characteristics		
CEO tenure	The tenure of the CEO in years at the fiscal year-end. It is the difference between the fiscal year-end date and the date that the person became CEO.	ExecuComp
CEO age	The age of the CEO in years at the fiscal year-end.	ExecuComp
CEO gender	A dummy variable which takes the value of one if the CEO is female, and zero otherwise.	ExecuComp
CEO overconfidence	A dummy variable which takes the value of one if the CEO is identified as overconfident, and zero otherwise. CEOs are overconfident if they delay the exercise of vested options which are at least 67% in the money. We follow Campbell et al. (2011) in order to calculate the average moneyness of the CEO's option for each sample year. First, for each CEO-year, the average realizable value per option is calculated by dividing the total realizable value of options by the number of options held by the CEO. Second, the strike price is calculated by subtracting the average realizable value per option from the stock price at the end of the fiscal year. The average percent moneyness of the options is computed by dividing the stock price at the fiscal year-end by the estimated strike price minus one.	ExecuComp
CEO ownership	The shares held by the CEO, excluding options, divided by the number of shares outstanding at the fiscal year-end.	ExecuComp, Compustat