Stock co-movement and governance bundles: Does the quality of national governance moderate this relationship?

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Abstract:

In this study we examine if corporate governance, as a bundle, can better explain stock co-movement. To test the implication of governance bundles on stock co-movement, we consider a monitoring and incentive alignment bundle. Using 2659 firm–year observations from 321 firms listed on the S&P 500 from 2009-2017, we find that the governance mechanism bundle can enhance the ability of stock prices to integrate better firm-specific information, which reflects on stock co-movement. In addition, we find the existence of a complementary relationship between National Governance Quality and a firm's board monitoring. This also helps in explaining the puzzle of stock co-movement. The findings will extend the understanding about the co-movement related literature mentioned in the corporate governance and corporate finance research. The findings are also helpful for decision makers and policy makers involved in the efficient controlling of stock co-movement.

Keywords: Stock co-movement; Board Monitoring; Incentive Alignment; Governance Bundle, National Governance Quality

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1. INTRODUCTION

In this study we investigate the influence of monitoring and incentive alignment provisions, as a bundle of corporate governance, on the ability of stock prices to integrate firm-specific information to allow the stock to co-move. In addition, we test if national governance quality (hereafter NGQ[2]) is able to moderate the above-mentioned relationship. The stock price is influenced by firm specific and market related information (Grossman and Stiglitz, 1980), where stock returns are mostly proxied by idiosyncratic volatility, illiquidity ratio, stock return synchronicity/non-synchronicity and stock return fluctuation range (An & Zhang, 2013; Bloom, 2014; Chelley-Steeley et al., 2015). Thus, it is important to emphasize the trading information provided by the market participants that influence stock co-movement. Following the existing literature (e.g., Schepker & Oh, 2013; Yoshikawa et al., 2014), we opine that it is unrealistic to suggest that governance factors can function independently because the movement of stock determines the firm's performance, which depends more on the "bundle" instead of any one type of governance factor (Aguilera et al., 2008). Motivated by the existing literature, we argue that monitoring mechanisms[3] and incentive alignment provisions[4] function as a bundle to improve the ability of stock prices to better integrate firm-specific information and thus increase the functional efficiency of stocks in the capital markets. In other words, governance bundles reduce the co-movements of stocks. Using a sample of 2,659 firm-year observations from non-financial[5] S&P 500 firms from 2009 to 2017, we find a statistically significant and negative association between monitoring and incentive alignment provisions as a bundle of practice and of co-movement. It implies that governance structures that function as

[2] See 3.2.3 for the construction of the variable
[3] See 3.2.1 for the construction of Monitoring Bundle
[4] See 3.2.2 for the construction of Incentive alignment bundle
[5] We exclude the financial firms from the sample because of differences in their reporting practice (Nandy et al., 2020). This is because the stock price co-movement is influenced by firm level factors and because of the differences in accounting practices and the difference in style of reporting of financial firms, the inclusion or exclusion of financial firms will not bias the model findings because of non-financial firms.

a bundle improve the ability of stock to reflect firm level information, which better informs investors about firm performance and stock co-movement. In addition, this study also shows evidence of a complementary relationship between the NGQ and a firm's board monitoring.

Our study differs significantly from the extant literature. Existing studies have either used single corporate governance mechanisms, such as gender, board independence, institutional ownership (e.g., Gul et al., 2011; 2010; Ferreira et al., 2011), or some form of unmotivated constructed composite indices (e.g., Gompers et al., 2003; Bebchuk et al., 2009; Karpoff et al., 2016) to explain co-movement. Thus, the findings of the vast majority of extant studies in the area of governance are mixed and raise major inquiries as to whether the indices that are often used are generally acceptable proxies in explaining the co-movement (Larcker et al., 2007; Aguilera et al., 2008). To address this, researchers have established governance indices that include several provisions. Nevertheless, there seems to be no theoretical framework for the selection of governance provisions as these indices are, according to Brown and Caylor (2006) "naively constructed" and therefore result in observational errors (Black et al., 2017). Furthermore, not only is it extremely difficult to include all useful governance provisions in one model, but also not all of the provisions are relevant to the study and therefore observational errors, such as selection bias, can be present in such governance indices (Larcker et al., 2007; Black et al., 2017; Karpoff et al., 2016). To counter this, we follow relevant prior literature to build a robust governance index (e.g., Black et al. 2017; Karpoff et al. 2016; Chen, Lu, & Sougiannis 2012 & Larcker et al. 2007). We construct board monitoring and incentive alignment bundles by combining three board monitoring variables, which are: board independence, CEO duality and board gender diversity and two TMT/CEO compensation variables, which are the total executives' compensation and total CEO compensation. Our main indicator for stock co-movement is the reciprocal of idiosyncratic volatility (Crawford et al., 2012; Piotroski and Roulstone, 2004; Morck et al. ,2000; Ferreira and Laux, 2007; Ferreira et

al., 2011). We add audit quality and good governance index variables and a set of control variables to account for transparency and/or voluntary disclosed information by firms as these factors are related to co-movement literature (Durnev et al., 2003; Gul et al., 2010; Kim, Zhang, Li, & Tian, 2014; Cheong & Zurbruegg, 2016). By using the above variables, our findings indicate that governance mechanisms as a bundle of practice and NGQs play an important role in promoting the flow of information to the market, and thereby, reduce stock co-movement.

Our study contributes to the existing literature in the area of corporate governance. We add to the corporate governance bundles literature by 1) employing board monitoring and incentive alignment bundles to explain stock co-movement 2) we provide insights into the avenues through which NGQ and board monitoring connection can have an effect on stock price performance and 3) our findings opened a new line of enquiry on the association between co-movement and incentive alignment provision. This study is of interest to decision-makers to better understand stock co-movement by considering a number of corporate governance strategies together, instead of autonomously examining each one of them. In addition, our findings help policy makers in understanding the combination of governance factors for an incentive alignment provision to determine the stock co-movement and, accordingly, they can revise their policy for better transparency in the stock market.

The rest of the paper is explained as follows. Section 2 explores the related literature and describes our research hypotheses. Section 3 sets out the methodology. Section 4 carries out the empirical analysis. Section 5 concludes the article.

2. LITERATURE SURVEY AND HYPOTHESES DEVELOPMENT

2.1. Literature review

2.1.1. Stock co-movement

Most of the theories explaining stock return use varied degrees of firm-specific and market-wide information embedded in the stock price and allow the identification of the co-movement of stock return from the R-square of the "market model regression" (Roll, 1988). The lower R-square indicates that the stock price is more informative and contains a higher level of firm-specific details (Todea & Buglea, 2017). Morck et al. (2000) found that there is more stock co-movement in poor economies than in wealthier ones. The higher investor's rights protection promotes trading on information that is yet to reflect in stock prices, which in turn makes it easier to add specific firm information into stock prices, leading to lower co-movement. Actuated by their paper, many studies have investigated the association between stock co-movement and corporate governance (Ferreira et al., 2011; Kim, Pantzalis & Wang, 2018; Gul et al., 2011; Yu, 2011). Firm specific information is helpful for the supply of incentives in a corporation and in constructing the mechanism of corporate governance (Ferreira et al., 2011). These studies indicate the importance of considering a useful set of governance factors in explaining the co-movement.

2.1.2. Need for corporate governance

The co-movement of stock can create an agency problem. The privately-owned gains from ownership privileges (opportunism) are recurrent examples of the agency problem and addressing such issues usually causes tremendous costs for a corporation arising from "opportunism", which is detrimental to firm performance (Shleifer and Vishny, 1997). Furthermore, to safeguard shareholders' interests and discourage the non-stewardship behavior of the controlling party, agency theory suggests that efficient governance structure is an

acceptable strategy for mitigating agency costs (Conheady et al.,2015). That is, in order to improve performance, companies need to implement governance frameworks as a monitoring system and incentive instruments to mitigate conflicts of interest between a firm's participants (Daily et al., 2003). In other words, corporate governance protects the interests of shareholders by establishing mechanisms in order to effectively reduce the impact of the agency problems (Nam & Nam, 2004; Velnampy, 2013). Two methods of mitigating agency conflicts exist, such as supervision and governance, which are not discussed together in the literature in the context of co-movement of stock. Thus, in this study we examine if monitoring and incentive alignment governance provisions act as a bundle which can influence stock co-movement.

2.1.3. Governance mechanisms

Supervisory methods rely on regulations, guidelines, or legislations to remove the disputes between the firm's managers and shareholders, whereas governance methods include 'monitoring' mechanisms and 'incentive' alignment provisions (Hansmann & Kraakman, 2004). Developing corporate governance systems to act as oversight instruments (monitoring) for shareholders to control executive actions can alleviate agency issues and protect the interests of shareholders (Weisbach, 1988; Shleifer & Vishny, 1997; Daily et al., 2003). Additionally, incentive alignment or the compensation contract are also used as a tool for controlling executive or managerial actions to align their interests with the preferences of the shareholders (Anderson & Bizjak, 2003; Florackis, 2008). Furthermore, corporate governance systems not only mitigate the abuse of power or corporate malfeasance between shareholders and managers, they also eliminate the issue of information asymmetry between them (Chen, 2007). Both the monitoring mechanisms of corporate governance and executive incentive alignment contribute to firm performance (Ntim et al., 2015), which is perceived in the extant literature as the core for designing managerial compensation contracts. Efficient corporate

governance not only contributes to stronger firm performance (Klapper & Love, 2004; Nelson, 2005), it also affects the firm's level of incentive alignment by enhancing firm efficiency and appropriately rewarding managers. In addition, as managers reap optimal compensation, they may fulfil their functions to correspondingly optimize firm performance (Sun, Cahan, & Emanuel, 2009), suggesting that an element of association exists between managerial compensation, firm performance related to stock co-movement and the corporate governance bundle, which is not discussed in detail in the extant literature.

2.1.4. Need for governance mechanisms as a bundle

Firm performance depends more on the bundle instead of any one type of governance factor (Aguilera et al., 2008). Multiple governance mechanisms function concurrently within firms and collectively represent the context of governance environments (Yoshikawa et al., 2014) and impact subsequent organizational choices and outcomes (Oh et al., 2018). Therefore, to make a case for the impact of governance practices on firm stock co-movement, it is imperative to think about a collection of reticulated governance mechanisms (Desender et al., 2013; García-Castro, Aguilera, & Ariño, 2013). Stock co-movement influences firm performance. As firm performance is explained by an interaction between corporate governance monitoring functions and incentive alignment provisions (Guo & Masulis, 2015; María-Victoria et al., 2018), it therefore motivates us to examine the nature of the relationship between co-movement and governance bundle.

2.2 Hypotheses development

To reduce the agency problem between the managers and the stakeholders of the firm there is always a need for a significant corporate governance structure. Corporate governance expects the firm to carefully develop the board structure to reduce the agency cost. It is evident

that the existence of an independent director on the firm's board enhances the monitoring capacity of the board (Walsh & Seward, 1990). Higher monitoring can allow managers to align their personal benefit with the profit-making objectives of the firm. The dynamics of the board structure, such as a higher concentration of outsider representations and separation between CEO and chairperson positions is considered as more independent (Daily & Dalton, 1994). Also, board gender diversity increases the consistency of decisions by adding new insights and enhancing team knowledge at board meetings, which in practice will enhance the monitoring of boards (Dalton, Daily, Johnson, & Ellstrand, 1999). Therefore, a richer information environment is generated with more board diversity, wherein the expense of gathering firm-specific information is lower. These narratives indicate that board monitoring encourages managers to take decisions that are in the best interests of shareholders by aligning managers with shareholders. Ultimately, to alleviate agency problems associated with diverse board structure and to subsequently reduce the co-movement of stock there is a need of the governance bundle. Thus, we formulate our basic hypothesis regarding the relationship between board monitoring and stock co-movement, as follows:

Hypothesis 1: Ceteris paribus, the effect of monitoring mechanisms as a bundle can scale back the co-movement of stocks.

The extant literature using agency theory (see Palmer & Wiseman, 1999; Sanders & Hambrick, 2007) documents that incentive compensation aligns managers interests with those of shareholders. A selection of compensation structures e.g., managerial shareholding, stock options, and earnings-linked incentives can help to better align managers' pay with shareholder interests. However, the agency problem can be reduced if the corporate governance bundle consisting of TMT and CEO incentives is in place. In addition, managers are also more apt at

aligning with shareholders when the motivation for managers is better matched with the shareholders' value. This in effect would alleviate agency problems and weaken stock co-movement. Motivated by this we propose the following hypothesis:

Hypothesis 2: Ceteris paribus, the effect of TMT and CEO incentive alignment as a bundle can scale back the co-movement of stocks.

Researchers (Aguilera, 2005; La Porta et al., 2000) posits that national governance structures or institutional environments are used to handle agency issues. Others (Kaufman, Kraay & Mastruzzi, 2011; Schiehll et al., 2014; Yoshikawa et al., 2014) argue that there are formal restraints (e.g., rules, laws and procedures) and informal rules containing ethical codes, social norms and values that are unwritten but comparatively essential in corporate governance discussion. The national governance quality (NGQ) could therefore serve as a determining factor ensuring that economic actors comply with the laid down rules. NGQs can mitigate agency problems and safeguard minority investor's rights. Therefore, stringent NGQs tend to demand necessary information disclosure and regulate the intermediaries within the market, thereby assuaging information asymmetries. Also, they pressure the board to implement their regulatory duty (Yoshikawa et al., 2014). In our research context, NGQs can even function as an important external corporate governance mechanism to guard shareholders and impact co-movement. Empirically, Morck et al., (2000) show that a relationship exists between stock co-movement and the institutional environment within which corporations are located. They argue that better protection of investors' rights using legal origin as proxy promotes information exchange, which adds firm related information into the price of stock, resulting in lower co-movement. Additionally, Ernstberger and Grüning (2013) propose that NGQ could be substitutive or complementary in the relationship between corporate governance and disclosure practices and further called for the examination of the role of the governance bundle

(combination of national and firm-level corporate governance structures) in the "Anglo-Saxon" countries. Furthermore, researchers (La Porta et al., 1997; 2000; Aguilera et al., 2008; Alon & Dwyer, 2014; Cahan et al., 2015) have documented that NGQ would potentially enhance corporate governance structure on the basis of legal rules and regulations and the level of mechanisms available to enforce those rules – meaning that NGQ could play a moderating role in the extant agency problems and have an influence over the co-movement of stocks. These arguments lead us to propose the following hypothesis on the impact of NGQ on the relationship between corporate governance bundle and stock co-movement relationship:

Hypothesis 3: Ceteris paribus, NGQs moderate agency issues which in turn buttress the negative relationship between monitoring and incentive alignment bundle and stock price co-movement.

3. METHODOLOGY

3.1. Sample description

Our sample includes companies listed in Standard and Poor's (S&P) 500 during the periods 2009 and 2017. The S&P 500 identifies the most influential listed companies from different business sectors and their market performance shows the actual position of the US economy and capital market. In addition, the total market cap of all 505 constituents in the S&P 500 index is approximately equivalent to ninety percent (90%) of the total value of the NYSE-listed companies compared to the DOW Jones Industrial Average (DJIA) which is only comprised of 30 large firms. Therefore, we use listed companies in the S&P 500 for any of the years in our sample period. Following the work of Billio et al., (2017) we use monthly[6] market data and firm-level returns collected from the Datastream Global Equity Index (DGEI) database from

[6] In this analysis, monthly data is used rather than daily or weekly data to avoid the mix of high-frequency data issues e.g. zero returns, significant and non-synchronicity. Puthanthong and Roll (2009) posits there are explanations "*thin trading and other microstructure effects*" to imply that extended returns intervals could be better even if the number of observations is reduced.

2009[7] to 2018. Financial data are collected from the World Scope database. Country-level economic statistics and national governance quality (NGQ) bundles data are taken from the World Bank. We limit our analysis to non-financial corporations. This is because financial corporation (SIC) codes 6000–6999 are governed differently, making it more difficult to equate their financial details with those of corporations in other industries (Boubaker et al., 2014). We exclude corporations with insufficient information on corporate governance and incentive alignment (compensation) or missing data for estimating our control variables. We also removed the year 2018 from our study due to lack of data for that year for the NGQ. After these requirements are applied, the (unbalanced) sample consists of approximately 321 companies, with a total of 2659 firm–year observations. There is no evidence of significant differentiation across the sample years within the range of observations. We employ Fama-French 12 industry classification for statistical distribution.

3.1.1. Measure of Co-movement

Following Crawford et al. (2012), we demonstrate the construction of stock co-movement. First, we measure the market regression model for every firm-year using monthly stock return data to extract the R^2. The following regression model is used:

$$r_{i,k,t} = \alpha_I + \beta_1 * r_{mt} + \beta_2 * r_{kt} + \varepsilon_{it} \ldots (1)$$

Here, $_{I,k,t}$ represents the monthly return of firm i in industry k in month t, r_{mt} represents the value-weighted market return in month m, r_{kt} is the value-weighted industry return k in month m. The industry return for day t, is computed using all firms with the same two-digit SIC code, with firm i's daily return excluded. The industries are classified by Fama-French 12 industries classification and ε_{it} is unspecified random factors. Secondly, as the R^2 from the first stage is

[7] As the sample in this paper starts in 2009, thus in the empirical model we have not controlled for the financial crisis. We followed the official timeline of financial crisis provided by the Federal Reserve Board and the Bank for the International Settlements (2009) as August 2007 until March 2009.

of bounded nature [0, 1], we use the log transformation of R^2 following Boubaker et al., (2014) from Model (1) into co-movement for each of the firm-years as follows:

$$CO\_MOVE = \log [R^2/ (1-R^2)] \ldots (2)$$

A higher CO_MOVE value indicates signs of correlations between the stock returns of a firm and the industry and market returns, indicating that there is comparably very little business-specific information which is impounded into the stock price and vice versa.

3.2. CORPORATE GOVERNANCE MEASURES

3.2.1. Board monitoring bundle (BOARD_MON)

Boards with a greater proportion of outsiders (Board Independence) are seen as useful monitors, worthy of strengthening management decision-making and improving firm performance (Daily & Dalton, 1994). Comparably, board governance structure (from separating the functions of the CEO and Chair of the board of directors) strengthens the capacity of a board to efficiently track the CEO's decision, allowing very little incentives for CEOs to engage in activities that will adversely affect shareholders. (Daily & Dalton, 1994). We assess the efficacy of board monitoring by drawing on board features that specifically explain analogous elements of board monitoring. We tested the impact of board monitoring on the basis of a composite measure of board governance consisting of Board Independence (proportion of outside directors), CEO-Duality (where the CEO is also the Chair of the Board), and Gender Diversity (the proportion of females on board). Considering that these different board attributes could work simultaneously to provide monitoring, this study used a tool for factor extraction - principal component analysis (PCA). Following the extant literature (Black et al., 2017; Karpoff et al., 2016) we obtained a common factor that summarizes the common knowledge in the aforementioned governance measures. Explicitly, as our measure of board monitoring, we extracted the first principal component of the three variables. A higher score

on our measure suggests greater efficacy of monitoring. However, as a result of measurement error we assume it is not possible that any single board feature can perfectly capture a firm's unobservable level of board monitoring. Nonetheless, by summing the common information among these measurable factors, PCA decreases the estimation error and provides a common link that underlies the maximum likelihood between these variables.

3.2.2. Top management team (TMT) & CEO incentive alignment bundle (BOARD_INCENTIVE)

An essential governance tool has been noted for aligning the CEO's interests with those of the shareholders through equity-based incentives (Armstrong et al., 2015). In this study we calculate CEO incentive alignment following the literature (Jensen, Murphy and Wruck, 2004 and Frydman and Saks, 2010) as the total amount of cash pay, equity-based and non-equity-based incentive payments. Specifically, using data from Bloomberg, our CEO incentive alignment proxy is measured as the total salaries awarded including restricted stock pay-outs from long-term pay and stock options granted to a CEO in any year under review. Although it is known that CEOs who perform well earn dramatically higher compensation (Wade et al., 2006, 2008), there is hardly any proof of how those higher compensations are applied to the rest of the TMT. Graffin et al. (2008) suggests that certain CEOs aim for a more equitable distribution of pay among their TMT. Studies, based on theories of equity and social comparison (Adams, 1965; O'Reilly et al., 1988), posit that it is highly likely that the CEO would want to extend the compensation earned from an increase to their performance to the rest of the TMT by pursuing a pay raise for its members to preserve a good relationship, teamwork and cooperation (Ensley et al., 2007; Carpenter and Sanders, 2002). We calculated the TMT incentive using the logarithm value of the remuneration of all the executives divided by the number of executives for each given period listed in Bloomberg. This offers an estimation of the average TMT pay consistent with previous research (Conyon & He, 2011;

Oh et al., 2018). On this basis, incorporating the work of Chen, Lu, & Sougiannis, (2012), we used the PCA to obtain a common factor summarizing the common information contained in these two measures. In particular, as our board incentive alignment metric, we obtained the first principal component of the two variables.

3.2.3. National governance quality (NGQ)

We used Kaufman, Kraay & Mastruzzi's (2011) six dimensions as a proxy for our NGQ bundles (NGQ). First, quality of voice and accountability. Second, the quality of the political stability. Third, quality of government effectiveness. Fourth, regulatory related quality. Fifth, rule of law. Sixth, corruption control. Correlation results of six dimensions suggest that a high correlation is present. The Kaiser-Meyer-Olkin (KMO) estimate shows the sampling adequacy test to be .8939. Our result is greater than the suggested least possible PCA score of .50 (Tunyi & Ntim, 2016). We therefore conducted a PCA to generate an NGQ bundle for our NGQ dimensions.

3.3. Control variables

Following the literature, we also controlled for other factors that could influence a co-movement decision. Firm size (*SIZE & MCAP*): defined as the log of total assets and log of market capitalization. Leverage (*LEV*): we define leverage as the ratio of total debt divided by total assets. Firm accounting performance (*Perf*): defined as the ratio of operating income before depreciation to total assets. Performance volatility (*Sd_roa*): defined as the volatility of profitability or return on company assets standard deviation over 7 years. Board Size (*B_SIZE*): defined as the number of board of directors. National governance variables: Annual Inflation (*INFLATION*): defined as the annual inflation rate in percentages per year. We also

control for other factors that may affect stock co-movement such as audit quality (*Audit_Q*) and good governance index using a parsimonious G-index (*P_index*). In addition, we control industry and year dummies to capture the differences in industry and changes during the year.

4. EMPIRICAL RESULTS

4.1. Descriptive statistics

<Insert Table 1 about here>

Table 1 provides the summary statistics of all the variables used in the study. Firm level and governance variables are winsorized at 1% upper and lower tails of the distribution. The *COMOVE* measure has a mean (median) of 0.049 (0.215) and varies from -0.689 (25th percentile) to 1.992 (95th percentile). The mean (median) value of *BORAD_SIZE* is 10 (11), indicating that our sample is comprised of, on average, significantly large boards. The mean (median) of the number of *INDEPENDENT_DIR* is 0.831 (0.875), showing that firms within our sample have on average more independent directors. The mean (median) of *P_index* which is the measure of good corporate governance is 3.745 (4.0) and varies from 3 (25th percentile) to 5 (95th percentile). *PERF*, *BOARD_MON* and *BOARD_INCENTIVE* and other variables used in this analysis have substantial variation.

4.2. Correlation

<Insert Table 2 about here>

In Table 2, we present the pairwise correlation matrix where the mean VIF (Variance Inflation Factor) of all variables is 2.42, below the rule threshold of 10 (Chatterjee and Hadi, 2006; Hair et al., 1995). Therefore, we do not have a multicollinearity problem in our study. Co-movement is positively and significantly correlated with CEO power (CEO DUALITY r = .11, p < .001) however, DIVERSITY and DIRECTOR'S PAY is negatively and significantly correlated to COMOVE (r = –.05, p < .05; r = –.12, p < .001, respectively). Suggesting that COMOVE is lower in the presence of DIVERSITY and DIRECTOR'S PAY and being consistent with Gul et al., (2011).

4.3. Multivariate results

<Insert Table 3 about here>

4.3.1. Effects of monitoring mechanisms and incentive alignments provision as a bundle on stock co-movement

Table 3 reports results related to the prediction that monitoring mechanisms and incentive alignment are related to lower co-movement. In particular, we estimate the following model:

$$Comove_{i,t} = \alpha_0 + \beta_1 NGQ_{i,t} + \beta_2 Lev_{i,t} + \beta_3 Perf_{i,t} + \beta_4 SdROA_{i,t} + \beta_5 Mcap_{i,t} + \beta_6 SIZE_{i,t} + \beta_7 Audit\ Q_{i,t} + \beta_8 P - index_{i,t} + \beta_9 Inflation_{i,t} + \beta_{10} BoardSIZE_{i,t} + \beta_{11} BoardMON_{i,t} + \beta_{12} BoardINCENTIVE_{i,t} + \beta_{13} BoardMON * BoardINCENTIVE_{i,t} + \beta_{14} BoardMON * NGQ_{i,t} + \beta_{15} BoardINCENTIVE * NGQ_{i,t} + \beta_{16} BoardMON * BoardINCENTIVE * NGQ_{i,t}\ \Sigma_{\alpha_i} Industry_i + \Sigma_{\alpha_j} Year_j + \varepsilon_{i,t} \ldots\ldots (3)$$

We use the first PCA of the three corporate governance variables (Board independence, CEO_duality and Gender Diversity) representing board monitoring bundle (*BOARD_MON)* and two corporate governance compensation variables (Executive remuneration and CEO total pay) representing the incentive alignment bundle (*BOARD_INCENTIVE)*. All observed t-statistics are corrected for heteroskedasticity and in-firm correlation using clustered standard

errors. Further, we included year and industry dummies to account for some cross-sectional reliance. In model 1, we regress *COMOVE* on the complete set of control variables in the study, and also control for firm-fixed effects. The fixed effects tend to be significant towards rejecting explanations of omitted variables as endogenous sources. The coefficients of *LEV* and *INFLATION* are significantly negative. In explaining the relationship between governance bundle and co-movement our results are adjusted for country-specific developmental factors. In addition, following the literature we control for firm level factors. In Table 3 Model 2, we present the results for our main independent variables of interest *BOARD_MON* and *BOARD_INCENTIVE* which show evidence of a negative and significant (-0.453, t= -2.20; -0.494, t=-1.68) relationship giving credibility to our H1 and H2, respectively. This result further contributes to the idea that the board of directors is monitoring, and incentivizing alignment provisions as stipulated by agency theorists (Dalton et al., 2007) to effectively mitigate agency problems which in turn allows the incorporation of firm specific information into stock prices, to a large extent reducing co-movement.

4.3.2. Moderating effects of NGQ

In Table 3 we measure institutional quality as NGQ, which has a significant negative effect on the co-movement of stocks, both when examined independently (variable NGQ, with a coefficient of – 3.577), as well as in consolidation with BOARD_MON (variable BOARD_MON*NGQ with a coefficient of – 0.556), supporting Hypothesis 3. On the other hand, this is not the case when it operates together with BOARD_INCENTIVE (variable BOARD_INCENTIVE*NGQ) or with both BOARD_MON and BOARD_INCENTIVE (variable BOARD_MON*BOARD_INCENTIVE*NGQ) whose coefficients are in both cases statistically insignificant. In addition, this study further estimates the economic significance of our results, which is best illustrated by computing elasticities, which is the percentage

change in NGQ for a given percentage change in the monitoring bundle. For example, the relative impact of BOARD_MON comparing its high with low levels indicates that an increase of NGQ by 1% reduces stock co-movement (COMOVE) by -0.556 • 0.01 • 2.46 (= -0.0136), wherein -0.556 is the coefficient on the interaction between BOARD_MON*NGQ as seen in Table 3 and 2.46 is the difference between high (0.006 + 1.23) and low (0.006 - 1.23) levels of BOARD_MON respectively. This reduction is about 2.7% of the mean value of *COMOVE*. Therefore, we conclude that the negative relationship between the interaction between the board monitoring bundle, NGQ, and COMOVE is both statistically and economically significant.

4.4. Robustness test

4.4.1. Endogeneity problem

<Insert Table 4 about here>

In this study, we could not rule out potential endogeneity of our measures of corporate governance in panel data using the augmented regression tests. In addition, it is often difficult to find instruments that satisfy the validity and relevant assumptions of instrumental variables. Thus, we follow Ferreira and Laux (2007) by separately calculating the instruments predicting the BOARD_MON and BOARD_INCENTIVE models. Then we check the correlations with the error terms and then use the predicted constructs (variables INSTR_BM and INSTR_BI) as instruments for BOARD_MON and BOARD_INCENTIVE. Therefore, in the second stages, we use INSTR_BM and INSTR_BI to run our original models again. Table 4 shows the second stage results for our panel data analyses using a 2SLS estimation. In addition, we conduct the Sargan test to check if there is any overidentification in the estimation. The reported Hansen J

is zero (0) for "just identified" model in our analysis. This is obvious because we use an instrument for an endogenous variable- BOARD_MON (or BOARD_INCENTIVE). The statistically significant negative results in Table 4 support the Hypotheses 1 and 2. The results of these fixed effects 2SLS panel data analyses are consistent with the results of our main cross-sectional analyses in Table 3. This implies that our results appear to be robust to possible endogeneities that may be caused by omitted variables bias.

We also use interaction of NGQ with corporate governance variables. First, we predict instruments following Ferreira and Laux's (2007) model by predicting a value of the interaction between *BOARD_MON*NGQ* and *BOARD_INCENTIVE*NGQ*. Secondly, we used the predicted values as instruments. In addition we carry out tests to check the reliability of the instruments. The tests indicate that neither of the models are "under-identified", nor do they have weak instruments. Our results for this test (unreported) did not show support for Hypotheses 3 and are therefore inconsistent with the results of our main cross-sectional analyses in Table 3. Inferring that the interaction term between country-level and firm-level governance does not indicate a strong interrelationship but indicates a possibility of a substitutability effect between NGQ and our corporate governance proxies.

4.4.2. Reverse causality problems

To address the reverse causality problem, we employ a dynamic panel GMM estimator following Wintoki et al., (2012). The results shown in Table 4 indicate a statistically significant negative relationship between BOARD_MON (instrumented) and COMOVE as well as between BOARD_INCENTIVE (instrumented) and COMOVE, implying that our results are robust to possible endogeneity issues that may be present due to reverse causality and heteroscedasticity.

4.4.3. Propensity Score Matching

We further investigate in this section whether our key research is motivated by endogeneity. As a result, we precisely implemented a treatment sensitivity analysis for propensity score matching (PSM) (see e.g., Rosenbaum and Rubin, 1984) to assess causality regarding whether companies with higher (less) board monitoring capacity or higher (lower) incentive alignment provision have lower stock co-movement. The PSM is a statistical tool used in non-randomized observational trials to predict treatment effects and to also minimize bias. The aim is to substitute the multiple confounding covariates in the empirical analysis with a single feature (i.e., propensity score) which measures the probability of exploratory individual firms receiving treatment based on observed covariates. Therefore, our predicted propensity score becomes the only confounding covariate to account for all of the covariates included in the estimate. In this study, we employ the *selection-on-observables*[8] assumption, which require the outcome variable (COMOVE) to be independent of the treatment depending on the propensity score.

<Insert Table 5a & 5b about here>

First, we begin by selecting the predictor (independent) variables for the logit regression specification in order to execute the propensity score, as discussed in Cushman and De Vita (2017), We assign both "potential confounders" impacting our outcome variable (i.e., COMOVE) and the "covariates" affecting both our treatment group(s) and the outcome variable. Following Ding, Zhou and LI (2019) we identify firms (coded as 1 = treatment firms) if BOARD_MON and BOARD_INCENTIVE are below the median values of 0.03, 0.20, respectively. Comparably, if they are above median values of 0.03, 0.20, respectively, we identify firms (codes as 0 = control firms). Further, we reviewed the variable list used by Kim et al., (2014) and Ding, Zhou and LI (2019), as they analyzed various variables that are likely to have an impact on stock co-movement and found that among the significant determinants

[8] The selection-on-observables assumption imply that the common variable that influences "*treatment assign-ment*" and "*treatment-specific*" result can be observed. Therefore, the reliance between treatment variable and treatment-specific results can be eliminated by moderating these observable variables. This is also known as *conditional-independence assumption*.

are: firm size, leverage, ROA, SDROA and audit quality. In addition, macroeconomic constructs such as inflation are widely used in NGQ studies as independent variables in regression analysis (see, e.g., Elamer, Ntim and Abdou, 2017). Consequently, the following covariates are therefore included: Leverage (LEV), Performance (ROA), SDROA, Market capitalization (MCAP), Firm size(SIZE), Audit_Q, Inflation. We also adopted the statistical significance approach following the "*sequential elimination of regressors*" technique[9]. (see Cushman & De Vita, 2017; De Vita et al., 2020). Consequently, we dropped the non-statistically significant covariate(s) at the 0.05 level, leaving leverage, SDROA, market capitalization, and Size as the first phase covariates used to evaluate the propensity score.

Once the propensity score is determined, each treatment firm is compared with two identical firms (those with BOARD_MON, BOARD_INCENTIVE above median value) with the nearest propensity score within a range of 1%. i.e., we use the 1:1 nearest-neighbor modelling approach to ensure that firms with BOARD_MON, BOARD_INCENTIVE below median value are functionally equivalent to the matched firms with BOARD_MON, BOARD_INCENTIVE above median value. We further specify that immense change between the propensity score of each firm with BOARD_MON, BOARD_INCENTIVE below the median value and that of its matching counterpart does not exceed 0.1 per cent. 2,669 observations are used in this analysis, and the findings in Table 5a show that for BOARD_MON (BOARD_INCENTIVE), all observed figures in the control (untreated) group are within the common support range, while 16(46) observed figures in the treated group are not within the common support range. The remaining 2,653 (2,623) observations were successfully balanced. To verify that there is no significant variation between the treatment and the control group the "pbalchk" programme in Stata (a statistical software) is employed and the results of the standardized differences i.e. the differences in terms of standard deviations shown in Table 5b indicate that our matching is effective.

[9] *"Bryson, Dorsett, and Purdon (2002) expressly caution against over-defined models when utilizing PSM in light of the fact that 1) over-definition is dependent on remembering unessential factors for the model which heightens susceptibility to the common support issues. 2), in spite of the fact that adding insignificant constructs or variables doesn't prompt or lead to a one-sided (or biased) evaluation, it however, increases their variance". (Vita et al, 2020)*

Finally, we calculate the sensitivity test on the treatment with the nearest neighbor technique, also known as the Average treatment on the Treated effect (ATT), which relates to the average score of the difference in the result for each treatment and control unit that is matched to the propensity score. Having said that, three additional matching algorithms were also employed to further measure ATT for reliability: specifically, ATT radius, ATT stratification, and ATT kernel. Our results in Tables 6a & b show that the Average Treatment Effect on the Treated Category (ATT) for both BOARD_MON, BOARD_INCENTIVE remains significantly negative, suggesting that lower board monitoring and incentive alignment provision effectively reduce stock-return co-movement. These results show evidence that our analysis is inconceivably induced by endogeneity.

<Insert Table 6a & 6b about here>

4.4.5. Subsample test

Sample selection bias is another issue that needs to be addressed in this analysis. As shown in Table 1 the firms in our sample are relatively large firms and are likely to be the driving force behind our test results. To address this possible selection bias, we depict the baseline model results across different sample size groups. In other words, we divide our sample into upper and lower size sub-samples based on the median values of *SIZE* and compare the baseline regression coefficients of *NGQ, BOARD_MON* and *BOARD_INCENTIVE* respectively. The findings are shown in Table 7.

<Insert Table 7 about here>

The coefficients for *NGQs* are negatively and statistically significant across all subsample groups. Further, *BOARD_MON* is negative and statistically significant among larger groups on the basis of total assets (-0.862, t -stat -2.28) and smaller firms on the basis of market capitalization (-0.642, t-stat -2.09). Consistent with Fama and Jensen (1983) "*scope of operations hypothesis";* this suggests that intensive board monitoring by outsiders is beneficial

to firms with intricate operating or financial structures. Therefore, greater growth prospects and higher equity market conditions represented by *MCAP* requires less monitoring. *BOARD_INCENTIVE* on the other hand, interestingly show a negative significant coefficient (-1.166, t-stat -2.73) amongst large groups on the basis of market capitalization and the implication here according to Ferreira et al., (2011) is that TMT/CEO shareholding in larger firms would provide incentives to boost growth opportunities that address the moral hazard issues which in turn reduces co-movement of stock. On the moderating effect of NGQs, the interaction between *BOARD_MON*NGQ* are both statically significant for both larger and smaller groups (TOTAL_ASSETs -0.999, t-stat -2.55; -0.533, t-stat -1.733)) and smaller group *MCAP* is (-0.775 t-stat -2.49). On the other hand, the interactions between *BOARD_INCENTIVE*NGQ* did not show any results of interest. Our findings have not shown support for the fact that our baseline results are not ascribable to large-sized firms.

5. CONCLUSION

In this study we highlight the role of corporate governance monitoring mechanisms and incentive alignment provision as a bundle in reducing stock co-movement. Previous studies (Madanoglu et al., 2018; Oh, et al., 2018). indicate that multiple mechanisms act together either as substitutes or complements. Misangyi and Acharya (2014) demonstrated, using a fuzzy set of QCA, that governance mechanisms interact in a manner that is somewhat substitutive and or complementary and therefore performance is best explained when governance monitoring mechanisms and incentive alignment provisions function act as complements. However, in this paper we extend the extant literature by analyzing stock co-movement on the basis of agency theory's monitoring and incentive alignment corporate governance practices, using a dataset containing comprehensive governance characteristics from firms listed within the S&P 500 from 2009 to 2017. We find that using a common factor that is present when corporate

governance monitoring mechanisms and incentive alignment provisions (never previously used in corporate governance bundles literature) are combined is negatively associated with stock co-movement, calculated by the log transformation of R^2. The conclusion that can be drawn is that corporate governance "bundles" increases the reliability of firm-specific information, which in turn evades agents self-serving practices, and validates the rewards of unbiased stock market transactions. In addition, our findings suggest that NGQs moderate agency issues which further supports the negative effect of board monitoring power and co-movement, specifically, for smaller and or firms with lesser growth opportunities and or market conditions as represented by market capitalization. The influence of incentive alignment provision is most apparent in firms with greater market conditions. This evidence opened a new line of inquiry to better understand the association between firm size and incentive alignment provision. Furthermore, we did not find any support where monitoring mechanisms and incentive alignment provision proxies interact concurrently to reduce co-movement. The implication here is that monitoring mechanisms and incentive alignment provisions are not required at the same time to reduce co-movement, this study empirically extends the validity. In order to bolster our findings, we conducted additional tests such as two-stage least squares (2SLS), dynamic panel GMM estimator and propensity score matching. Our results are consistent and robust with these additional tests. We also examined whether NGQs moderate the relationship between firm-level governance and stock co-movement. First using the principle of Kaufman, Kraay & Mastruzzi's (2011) six dimensions as a proxy for our NGQ bundles, we find evidence of a complementary relationship between NGQ and firm board monitoring.

This study is of interest to decision-makers because, 1) a number of corporate governance strategies are used to accomplish specific outcomes with firm effectiveness. 2) for corporations to build an accessible financial framework, policymakers should, *inter alia* find a balance

between corporate governance monitoring mechanisms and incentive alignment provisions, specifying how each bundle best suits them.

This study is susceptible to certain limitations. For example, our selection is comprised of the largest 500 US firms, we therefore, recommend that readers can moderately extrapolate the conclusions of the current analysis to a broader context.

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Table 1: Summary statistics

	N	min	max	Mean	St.Dev	Median
COMOVE	2669	-4.948	2.961	.049	1.321	.215
Board size	2669	5	18	10.747	2.092	11
Independent director	2669	0	1	.831	.103	.875
CEO duality	2669	0	1	.555	.497	1
P index	2687	0	6	3.746	1.063	4
Diversity	2669	0	.625	.172	.099	.167
Dir pay	2669	.837	2.796	1.417	.278	1.356
CEO pay	2669	0	15.342	13.826	1.315	13.955
LEV	2669	0	.828	.272	.169	.259
PERF	2669	-.167	.407	.118	.076	.108
SDROA	2669	.074	.08	.077	.002	.076
NGQ	2669	-1.092	-.787	-.957	.097	-.954
MCAP	2669	5.443	13.591	9.676	1.151	9.525
SIZE	2669	11.775	20.475	16.42	1.277	16.455
INFLATION	2669	-.356	3.157	1.433	.992	1.622
BOARD_MON	2669	-4.4	3.038	.006	1.233	.03
BOARD_INCENTIVE	2669	-9.895	2.075	-.005	1.087	.207
Audit_Q	2678	-1.217	.499	.07	.077	.068

Table 1 presents the descriptive statistics of the variables. The sample consists of 2,678 firm-year observations over the period 2009 to 2017. COMOVE, stock co-movement, is defined as the log-transformation of the adjusted R2 of the firm-year estimation regressing monthly stock return on monthly market- and industry-level returns; Board Size is the total number of directors on board; Independent_dir is the proportion of outside directors to insiders; Ceo_duality is a Boolean dummy variable of 1 wherever CEO is also the same person as the chairman, and zero otherwise; P_index is the sum of 6 parsimonious index from GIM namely limitations of directors liability, golden parachute, ability to call special meeting, poison pill, staggered board, and supermajority; Diversity is the proportion of females on the board; Dir_pay is the log of the remuneration of all directors scaled by the number of directors; CEO pay is the log of the total CEO remuneration; LEV is the total debt scaled by total assets at the end of the last fiscal year; PERF is operating income divided by total assets at the end of the last fiscal year; SDROA is the standard deviation of the ratio between operating income and total assets over seven years; NGQ is the first principal component of the six NGQ dimensions Kaufman et al. (2011) namely, voice and accountability, political stability, government effectiveness, regulations, rule of law, corruption; MCAP is the log of the firm's market capitalization at the end of the last fiscal year; SIZE is the log of total assets at the end of the last fiscal year; INFLATION is the annual inflation rate in percentages per year; Board_Mon is the first principal component of board governance comprising of independent director, CEO_duality, & Diversity; Board_incentive is the first principal component of TMT incentive alignment comprising of dir_pay & CEO_pay, Audit_Q proxied by the likelihood of loss avoidance is earnings scaled by total assets.

Table 2: Correlation table Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
1.COMOVE	1.000																	
2.Board_size	0.111***	1.000																
3.Independent Di	0.112***	0.135***	1.000															
4.CEO_duality	0.114***	0.069***	0.245***	1.000														
5.P_index	-0.014	-0.063***	-0.057***	0.009	1.000													
6.Diversity	-0.045**	0.241***	0.244***	0.133***	-0.096***	1.000												
7.Dir_pay	-0.121***	-0.951***	-0.134***	-0.064***	0.054***	-0.240***	1.000											
8.CEO_pay	0.046**	0.171***	0.118***	0.066***	-0.016	0.057***	-0.178***	1.000										
9.LEV	-0.023	0.169***	0.078***	0.040**	-0.031	0.090***	-0.179***	0.150***	1.000									
10.PERF	-0.114***	-0.121***	-0.095***	-0.027	0.013	0.007	0.103***	-0.039**	-0.144***	1.000								
11.SDROA	0.048**	0.033*	0.035*	-0.022	-0.044**	0.093***	-0.024	-0.006	0.080***	-0.067***	1.000							
12.NGQ	-0.022	-0.012	-0.022	0.016	0.009	-0.047**	0.008	0.026	-0.023	0.049**	-0.131***	1.000						
13.MCAP	0.025	0.389***	0.181***	0.138***	-0.200***	0.307***	-0.307***	0.042**	0.003	0.139***	0.061***	-0.035*	1.000					
14.SIZE	0.138***	0.521***	0.204***	0.151***	-0.196***	0.298***	-0.459***	0.132***	0.169***	-0.241***	0.035*	-0.009	0.803***	1.000				
15.INFLATION	-0.049**	-0.021	-0.020	0.012	-0.007	-0.039**	0.025	0.027	-0.027	0.084***	-0.542***	0.582***	0.034*	0.011	1.000			
16.BOARD_MON	0.109***	0.553***	0.680***	0.548***	-0.087***	0.689***	-0.533***	0.163***	0.150***	-0.092***	0.061***	-0.029	0.407***	0.465***	-0.029	1.000		
17.BOARD_INC	0.109***	0.731***	0.164***	0.085***	-0.046**	0.194***	-0.768***	0.767***	0.215***	-0.092***	0.012	0.012	0.227***	0.385***	0.001	0.453***	1.000	
18.Audit_Q	-0.086***	-0.068***	-0.053***	-0.001	0.000	0.011	0.066***	-0.056***	-0.218***	0.777***	-0.085***	0.039**	0.174***	-0.129***	0.103***	-0.043**	-0.079***	1.000

Table 2 presents the Pearson correlation matrix of the variables. The sample consists of 2,678 firm-year observations over the period 2009 to 2017. COMOVE, stock co-movement, is defined as the log-transformation of the adjusted R^2 of the firm-year estimation regressing monthly stock return on monthly market- and industry-level returns; Board Size is the total number of directors on board; Independent director is the proportion of outside directors to insiders; CEO_duality is a dummy variable of 1 wherever CEO is also the same person as the chairman, and zero otherwise; P_index is the sum of 6 parsimonious index from GIM namely limitations of directors liability, golden parachute, ability to call special meeting, poison pill, staggered board, and supermajority; Diversity is the proportion of females on the board; Dir_pay is the log of the remuneration of all directors scaled by the number of directors; CEO pay is the log of the total CEO remuneration; LEV is the total debt scaled by total assets at the end of the last fiscal year; PERF is operating income divided by total assets at the end of the last fiscal year; SDROA is the standard deviation of the ratio between operating income and total assets over seven years; NGQ is the first principal component of the six NGQ dimensions Kaufman et al. (2011) namely, voice and accountability, political stability, government effectiveness, regulations, rule of law, corruption; MCAP is the log of the firm's market capitalization at the end of the last fiscal year; SIZE is the log of total assets at the end of the last fiscal year; INFLATION is the annual inflation rate in percentages per year; BOARD_MON is the first principal component of board governance comprising of independent director, ceo_duality, & Diversity; BOARD_INCENTIVE is the first principal component of TMT incentive alignment comprising of Dir_pay & CEO_pay; Audit_Q proxied by the likelihood of loss avoidance is earnings scaled by total assets *, **, and *** evidence significance at the 10%, 5%, and 1% levels, respectively.

Table 3 Baseline Model

Effect of corporate governance monitoring and Incentive alignment on stock co-movement

Dependent variable	*Stock co-movement (COMOVE)*	
	(1)	(2)
BOARD_MON		-0.453**
		(0.206)
BOARD_INCENTIVE		-0.494*
		(0.294)
BOARD_MON*BOARD_INCENTIVE		-0.136
		(0.195)
BOARD_MON*NGQ		-0.556***
		(0.211)
BOARD_INCENTIVE*NGQ		-0.474
		(0.291)
BOARD_MON*BOARD_INCENTIVE*NGQ		-0.183
		(0.200)
NGQ		-3.577***
		(0.536)
LEV	-0.849**	-0.785**
	(0.338)	(0.337)
PERF	0.769	0.725
	(0.763)	(0.760)
SDROA	70.61**	47.99*
	(28.50)	(28.27)
MCAP	-0.0946	-0.0964
	(0.100)	(0.100)
SIZE	0.160	0.178
	(0.118)	(0.118)
Audit_Q	-0.636	-0.674
	(0.520)	(0.519)
P_index	-0.00273	-0.00573
	(0.0382)	(0.0381)
Board_size	0.0315	0.0314
	(0.0228)	(0.0289)
INFLATION	-0.218***	-0.183**
	(0.0831)	(0.0821)
Constant	-7.354***	-9.353***
	(2.805)	(2.862)
Observations	2,659	2,659
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
R-squared	0.102	0.112
Number of firms	321	321

Notes: Table 3 presents the pooled OLS regression results. The sample consists of 2,659 firm-year observations over the period 2009 to 2017. COMOVE, stock co-movement, is defined as the log-transformation of the adjusted R^2 of the firm-year estimation regressing monthly stock return on monthly market- and industry-level returns; NGQ is the first principal component of Kaufman et al. (2011) six NGQ dimensions Kaufman et al. (2011) namely, voice and accountability, political stability, government effectiveness, regulations, rule of law, corruption; LEV is the total debt scaled by total assets at the end of the last fiscal year; PERF is operating income divided by total assets at the end of the last fiscal year; SDROA is the standard deviation of the ratio between operating income and total assets over seven years; MCAP is the log of the firm's market capitalization at the end of the last fiscal year; SIZE is the log of total assets at the end of the last fiscal year; Audit_Q proxied by the likelihood of loss avoidance is earnings scaled by total assets; P_index is the sum of 6 parsimonious index from GIM (2003) good governance index namely: limitations of directors liability, golden parachute, ability to call special meeting, poison pill, staggered board, and supermajority; INFLATION is the annual inflation rate in percentages per year; Board Size is the total number of directors on board; BOARD_MON is the first principal component of board governance comprising of independent director, CEO_duality, & Diversity; BOARD_INCENTIVE is the first principal component of TMT incentive alignment. Additionally, Industry and year dummies are included but not reported for brevity. Robust standard errors are in parentheses. *, **, and *** represents significance at the 10%, 5%, and 1% levels, respectively.

Table 4: Effect of corporate governance monitoring and Incentive alignment on stock co-movement

Dependent variable	2SLS	2SLS	GMM	GMM
	Stock co-movement (COMOVE)			
	(1)	(2)	(3)	(4)
BOARD_MON (instrumented)	-0.386**		-1.735***	
	(0.182)		(0.638)	
BOARD_INCENTIVE (instrumented)		-0.857***		-0.927***
		(0.170)		(0.218)
NGQ	-3.360***	-3.892***	-1.900	-3.868***
	(0.627)	(0.670)	(1.219)	(0.726)
P_index	-0.0210	-0.00918	0.0166	-0.00812
	(0.0245)	(0.0279)	(0.0452)	(0.0285)
LEV	-0.255	0.252	0.0496	0.251
	(0.163)	(0.212)	(0.339)	(0.224)
Audit_Q	0.308	-0.102	0.756	-0.129
	(0.533)	(0.610)	(0.942)	(0.513)
PERF	-0.379	-0.0905	-2.866**	0.223
	(0.547)	(0.628)	(1.378)	(0.722)
SDROA	60.99*	61.22*	86.87	60.32
	(32.43)	(37.10)	(56.64)	(41.19)
SIZE	0.303***	0.402***	0.502***	0.477***
	(0.0848)	(0.0596)	(0.174)	(0.116)
INFLATION	-0.159*	-0.180*	-0.0498	-0.185
	(0.0948)	(0.108)	(0.170)	(0.121)
MCAP			0.504***	-0.0641
			(0.191)	(0.0751)
Constant	-13.17***	-15.92***	-22.64***	-16.47***
	(3.023)	(3.283)	(6.551)	(3.830)
Observations	2,659	2,659	2,659	2,659
R-squared	0.055			
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Cragg-Donald F statistics	47.52	86.58	16.00	72.56
K-Paap F statistics			9.968	46.69
Sargan statistics	0.00	0.00		
Hansen J -statistics			0.00	0.00

Notes: Table 4 presents the two-stage least squares (2SLS) and the dynamic panel generalised method of moments (GMM) analysis. The sample consists of 2,659 firm-year observations over the period 2009 to 2017. The two instrumental variables are INSTR_BM- the predicted value from the estimated models of board monitoring; INSTR_BI - the predicted value from the estimated models of board incentive alignment. BOARD_MON is the first principal component of board governance comprising of independent director, CEO duality, & Diversity; BOARD_INCENTIVE is the first principal component of TMT incentive alignment. P_index is the sum of 6 parsimonious index from GIM (2003) good governance index namely: limitations of directors liability, golden parachute, ability to call special meeting, poison pill, staggered board, and supermajority; LEV is the total debt scaled by total assets at the end of the last fiscal year; Audit_Q proxied by the likelihood of loss avoidance is earnings scaled by total assets; PERF is operating income divided by total assets at the end of the last fiscal year; SDROA is the standard deviation of the ratio between operating income and total assets over seven years; SIZE is the log of total assets at the end of the last fiscal year; INFLATION is the annual inflation rate in percentages per year; MCAP is the log of the firm's market capitalization at the end of the year. Industry and year dummies were included but not reported for brevity. Robust standard errors are in parentheses. *, **, and *** represents significance at the 10%, 5%, and 1% levels, respectively.

Table 5a: Propensity score matching results

(Panel Board_MON)

PSmatch 2: Treatment Assignment	Off support	On support	Total
Untreated	0	1,367	1,367
Treated	16	1,286	1,302
Total	16	2,653	2,669

(Panel Board_INCENTIVE)

PSmatch 2: Treatment Assignment	Off support	On support	Total
Untreated	0	1,335	1,335
Treated	46	1,288	1,334
Total	46	2,623	2,669

Notes: This table reports the results of propensity score matching. Our sample is an unbalanced panel which includes the listed firms from S&P500 from 2009 to 2017. The outcome variable here is *Comove*, and firms (coded as 1 = treatment firms) if BOARD_MON and BOARD_INCENTIVE are below the median values of 0.03, 0.20. Comparably, if they are above median values of 0.03, 0.20, respectively, firms (codes as 0 = control firms).

Table 5b: Balance test of covariates after PSM

(Panel BOARD_MON)

	Mean in treated	Mean in untreated	Standardised difference
SIZE	15.91	15.93	—0.019
SDROA	0.08	0.08	0.002
MCAP	9.30	9.36	—0.054
LEV	0.25	0.24	0.045

(Panel BOARD_INCENTIVE)

	Mean in treated	Mean in untreated	Standardised difference
SIZE	15.83	15.86	—0.033
SDROA	0.08	0.08	0.022
MCAP	9.28	9.25	0.035
LEV	0.24	0.24	0.014

Notes: This table reports the results of propensity score matching. Our sample is an unbalanced panel which includes the listed firms from S&P500 from 2009 to 2017. The outcome variable here is *COMOVE*, and firms (coded as 1 = treatment firms) if BOARD_MON and BOARD_INCENTIVE are below the median values of 0.03, 0.20. Comparably, if they are above median values of 0.03, 0.20, respectively, firms (codes as 0 = control firms). The output shows the results of the balance test after PSM, here, the treated and the untreated differ by less than 5% standard deviation. As seen in Ding, Zhou and LI (2019), suggesting, the treated and untreated groups are similar.

Table 6a: Sensitivity test results (Panel BOARD_MON)

COMOVE	Algorithm	No of Treated	No of Control	ATT	T-stat(B)	Std. Err.
	ATTnd	1302	608	—0.068	—0.931	0.073
	ATTr	1302	1358	—0.199	—4.676	0.043
	ATTs	1302	1358	—0.087	—1.043	0.083
	ATTk	1302	1358	—0.129	—3.540	0.036
	Average ATT			—0.121		

Table 6b: Sensitivity test results (Panel BOARD_INCENTIVE)

COMOVE	Algorithm	No of Treated	No of Control	ATT	T-stat(B)	Std. Err.
	ATTnd	1334	561	—0.066	—1.225	0.054
	ATTr	1329	1326	—0.227	—2.978	0.076
	ATTs	1334	1326	0.017	0.163	0.107
	ATTk	1334	1326	—0.139	—1.386	0.100
	Average ATT			—0.104		

Notes: The outcome variable here is *COMOVE*. "No of Treated" is equivalent to the number of treated firms used to compute ATT. 'No of Control' is equivalent to the number of matched control firms used to compute ATT. ATT is defined as the average treatment effect on the treated. t-stat(b) is the bootstrapped t-statistic. Std. Err. Is the standard error. First step covariates used in the analysis are: LEV, SDROA, MCAP, and SIZE.

Table 7:
Effects of corporate governance monitoring mechanisms as a bundle and Incentive alignment as a bundle on stock co-movement among small vs large company subsample

Dependent variable	(SIZE_L)	(SIZE_S)	(MCAPS)	(MCAPL)
	Stock co-movement (COMOVE)			
	(1)	(2)	(3)	(4)
BOARD_MON	-0.862**	-0.455	-0.642**	-0.178
	(0.378)	(0.305)	(0.306)	(0.352)
BOARD_INCENTIVE	-0.642	-0.457	-0.207	-1.166***
	(0.429)	(0.465)	(0.463)	(0.427)
BOARD_MON*BOARD_INCENTIVE	0.496	-0.328	-0.162	0.120
	(0.396)	(0.295)	(0.294)	(0.359)
NGQ	-1.846**	-5.348***	-5.239***	-2.600***
	(0.770)	(0.778)	(0.866)	(0.747)
BOARD_MON*NGQ	-1.000**	-0.533*	-0.775**	-0.240
	(0.392)	(0.309)	(0.311)	(0.363)
BOARD_INCENTIVE*NGQ	-0.467	-0.547	-0.223	-1.036**
	(0.410)	(0.475)	(0.473)	(0.410)
BOARD_MON*BOARD_INCENTIVE*NGQ	0.460	-0.329	-0.145	0.0317
	(0.407)	(0.302)	(0.301)	(0.371)
LEV	-0.377	-0.911**	-0.840*	-0.503
	(0.596)	(0.444)	(0.477)	(0.554)
PERF	0.0644	1.077	1.103	0.234
	(1.316)	(0.990)	(1.176)	(1.156)
SDROA	39.92	63.87	84.31*	34.72
	(38.36)	(42.15)	(46.09)	(36.88)
MCAP	-0.0871	-0.0475	-0.00119	-0.0482
	(0.158)	(0.137)	(0.145)	(0.187)
SIZE	0.363*	-0.0439	0.112	0.224
	(0.203)	(0.168)	(0.180)	(0.192)
Audit_Q	-0.267	-0.860	-0.982	-0.360
	(0.747)	(0.735)	(0.798)	(0.741)
P_index	0.0907	-0.0664	-0.0579	0.0913
	(0.0706)	(0.0487)	(0.0502)	(0.0702)
INFLATION	-0.248**	-0.107	-0.0949	-0.232**
	(0.110)	(0.122)	(0.133)	(0.107)
Board_size	0.0545	0.0194	0.00362	0.0642
	(0.0428)	(0.0473)	(0.0488)	(0.0426)
Constant	-10.86**	-9.068**	-13.24***	-9.347**
	(4.584)	(4.108)	(4.607)	(4.261)
Observations	1,280	1,379	1,323	1,336
R-squared	0.113	0.129	0.122	0.115
Number of firms	189	194	221	233

Notes: The sample is split into large and small sub-sample using the median value of SIZE (16.45) (SIZE_L: Large, SIZE_S: Small) & MCAP (9.525) (MCAPL: Large, MCAPS: Small). COMOVE, stock co-movement, is defined as the log-transformation of the adjusted R2 of the firm-year estimation regressing monthly stock return on monthly market- and industry-level returns; BOARD_MON is the first principal component of board governance comprising of independent director, CEO duality, & Diversity; BOARD_INCENTIVE is the first principal component of TMT incentive. NGQ is the first principal component of Kaufman et al. (2011) six NGQ dimensions Kaufman et al. (2011) namely, voice and accountability, political stability, government effectiveness, regulations, rule of law, corruption; LEV is the total debt scaled by total assets at the end of the last fiscal year; PERF is operating income divided by total assets at the end of the last fiscal year; SDROA is the standard deviation of the ratio between operating income and total assets over seven years; MCAP is the log of the firm's market capitalization at the end of the last fiscal year; SIZE is the log of total assets at the end of the last fiscal year;

Audit_Q proxied by the likelihood of loss avoidance is earnings scaled by total assets; P_index is the sum of 6 parsimonious index from GIM (2003) good governance index namely: limitations of directors liability, golden parachute, ability to call special meeting, poison pill, staggered board, and supermajority; INFLATION is the annual inflation rate in percentages per year; Board Size is the total number of directors on board; Additionally, Industry and year dummies were included but not reported for brevity. Robust standard errors are in parentheses. *, **, and *** represents significance at the 10%, 5%, and 1% levels, respectively.