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Does Executive Compensation Dispersion Affect Firm Performance: The Moderating Role of Technology Intensity

Mr. Paul Mugeni[a], Mr. Christian Sarfo[b], Dr Ala' Omar Dandis[c*], Mr. Mohammad Al Haj Eid[d], Professor Azzam Abou-Moghli[e], [a]Gachon University, South Korea, [b,d]University of Otago, New Zealand, [c*]Applied Science Private University, Amman, Jordan. [e]Department of Business Administration, Applied Science Private University, Amman, Jordan. Email: [a]paulmugeni8@gmail.com, [b]chris.sarfo@postgrad.otago.ac.nz, [c*]A_dandis@asu.edu.jo, [d]mohammad.alhajeid@postgrad.otago.ac.nz, [e]a_aboumoghli@asu.edu.jo, [e]a_aboumoghli@yahoo.com

Basing on the disclosure rule of Executive Compensation in Korea which was amended through the Financial Investment Services and Capital Markets Act (FISCMA) in 2013, we use panel data for the period 2013-2017 of 133 Korean listed firms to investigate the moderating role Technology Intensity plays between the association of Executive Compensation Dispersion and firm performance. Consistent with the equity (fairness) theory, this paper enriches the current literature by providing evidence supporting a negative moderating role technology intensity plays on the relation between Executive Compensation Dispersion and firm performance. This study further indicates that Executive Compensation Dispersion is associated with better performance in labour-intensive firms than in technologically intense firms where collaboration and cooperation are fundamental requirements. However, we find a positive but insignificant relationship between Executive Compensation Dispersion and firm performance suggesting the possibility of organisational and environmental factors contributing to how firms execute the Executive Compensation Dispersion strategy.

Keywords: *Executive Compensation Dispersion, Firm Performance, Technology Intensity, Equity theory*

Introduction

Over the years, executive compensation has emerged as a widely debated corporate governance topic across the globe which plays a crucial role in any organisation (Zhang, You and Gao, 2015). Executive Compensation Dispersion has further remained controversial and inconclusive more so after the 2008 financial crisis yielding inconsistent results (Gupta et al. 2012). The urge for absolute transparency of how the top management team operates together with the alignment of the shareholders' interest with the executives has led to the changes in disclosure regulations of executive compensation of listed companies in a number of countries such as Japan in 2009, the European Commission in 2009, the USA in 2010, and most recently 2013 in Korea, where registered directors who earn more than 500 million Korean won in compensation per year are supposed to disclose their pay information (Kim, Lee and Shin, 2017). Early compensation studies focused on the CEO compensation solely and therefore shifting the research focus to the Top Management Team (TMT) has created new possibilities for increasing the understanding of the entire structure of top managers' rewards in organisations (Lee, Lev, and Yeo, 2008; Zhang, You and Gao, 2015; Baixauli-Soler and Sanchez-Marin, 2015), which is of critical importance because executives' jobs have higher internal and external worth to the organisation and the market at large that is visibly observed in the compensation packages allocated to such individuals (Gupta et al, 2012). However, the environment in which the firm operates has a critical role to play in the determination of whether the TMT engages in competition or cooperation through invariably sharing tasks while performing firm duties (Harbring and Irlenbusch, 2003), and this relationship is moderated by many factors, including task dependence and the individual incentive system (Shaw et al., 2002; Kepes et al., 2009), an issue which has been widely under looked in quite a few TMT compensation studies.

Our research contributes to the literature in several ways. First, considering technological innovation and its impact on the value of investment opportunities in an economy as a crucial attribute to how executives contribute to their firms along multiple dimensions (Frydman and Papanikolaou, 2018), we explore this interesting paradox for scholars and designers of executive compensation (Siegel and Hambrick, 2005; Zhang, You and Gao, 2015) by enriching the growing body of extant research concerning the Top Management Team compensation new compendious and contextual evidence hence adding to recent research that analyses the TMT compensation rather than CEO compensation only (Lee, Lev, and Yeo, 2008, Fredrickson, Davis-Blake and Sanders, 2010, Zhang, You and Gao, 2015).

Second, the study takes the lead role ever since the 2013 disclosure rule was enacted to examine the effect of Executive Compensation Dispersion (ECD) on firm performance in a country like Korea where group harmony together with collectivism practices are held in high regard (Kim and Bae, 2004). Thus, building on mixed empirical findings of Shin, J. Y. et al (2015) that indicate that the executive pay multiple (executive-employee pay disparity) has a statistically

significant negative relation with subsequent operating and stock return performance using a unique Korean data set from 2000 to 2009. Yang and Klass, (2011) observed a curvilinear relationship between pay dispersion (among employees in the same rank) and firm performance moderated by firm and human resource system characteristics. We, therefore, respond to the need for examining the effect of Executive Compensation Dispersion on firm performance in Korea, an area which has been left out in the previous studies.

Third, so far, mixed results have been obtained in studies conducted in different countries and the main discrepancy has come from studies carried out in countries other than the United States which brings in an element of the importance of an institutional context as well (Baixauli-Soler and Sanchez-Marin, 2015). This study therefore also aims to examine whether an institutional context element has a critical part it plays in the relationship between ECD and firm performance.

Theoretical background and hypotheses

Institutional background

Conventionally, strong collectivist norms and social harmony are highly regarded in workplaces within Korea. Therefore, traditionally most Human Resource practices were built under collectivist norms which encourage individuals to take up tasks and responsibilities in groups to achieve the set goal rather than distinguishing oneself from the group (Rowley and Bae, 2002). In face of the Asian financial crisis in 1997 to 1998, sudden adjustments within the Human Resource Management practices were adopted among Korean firms that led to the changes within the executive compensation pay systems from collectivist norms and social harmony style to a more Westernised performance-based pay system given that firms needed better quality and well-equipped executives who could handle the global competition after the financial crisis (Kang and Yanadori, 2011).

From that point in time, a lot of adjustments and policies have been established to push for better corporate governance within the firms through increasing shareholder protection, enhancing accounting transparency and strengthening monitoring (Kim and Kim, 2008). On May 28 2013, the Financial Investment Services and Capital Markets Act (FISCMA) was amended and first enforced on November 29, 2013. This would lead to the disclosure of the compensation level of all registered executives in listed firms paid in excess of 500 million Korean won (approximately 500 thousand US dollars) annually. This includes earned income (salary, bonus, and incentives), retirement income, and other income (Kim, Lee and Shin, 2017).

Executive Compensation Dispersion and Firm Performance in Korea

Modern finance theory stipulates that the appropriate objective of managers is to maximise the firm's value and the best way this can be achieved is by linking the managers' compensation to the firm's performance whereby some firms develop a dispersed or hierarchical pay structure while others opt for a compressed pay structure (Aggarwal et al. 2008). It is therefore in the interest of the shareholders to take the best actions that connect executive compensation to the level of firm performance. However, the idea of basing on pay-performance sensitivities has faced drawbacks given that executives can manipulate the output level when performance is unobservable through rent extraction (Hu, Pan, and Tian, 2013; Kale et al., 2009, Bebchuk and Fried, 2004; Bertrand and Mullainathan, 2001).

The extant literature is mainly built on two theories relating to the necessary and required level of pay dispersion – the tournament theory and equity (fairness) theory. Tournament theory (Lazear and Rosen, 1981) suggests that a large pay dispersion between the CEO and other executives is regarded as a "prize" that provides executives with incentives to compete since in the Top Management Team, top executives should try to do better than others to get a promotion. Based on the main principles of the tournament theory, the executives pushing for the leading positions can be viewed as competing in a tournament whose prizes are fixed in advance and tournament participants expend effort to increase the likelihood of attaining the prize since what eventually matters is the relative performance and not the absolute performance in relation to other competitors (Baixauli-Soler and Sanchez-Marin, 2015) considering a given individual's salary can possibly triple on the day they are promoted, hence supporting firms to retain top talented executives (Bloom and Michel, 2002). Eventually, the competition results will improve and enhance firm performance. Therefore, in order to induce higher effort level from the executives, a relative higher Executive Compensation Dispersion is deemed necessary and important (Zhang, You and Gao, 2015).

On the contrary, the equity (fairness) theory, based on concepts of justice and fairness posits social relations among employees' plays a crucial role since the way workmates interact is a defining factor influencing the firm's productivity (Adams, 1963). It is thus stipulated that a large pay dispersion negatively affects employee relations and morale ethics leading to deleterious organisational activities which hurt firm performance. This is highly felt in firms having a high task interdependency, close interactions among employees, desire for coordination and cooperation together with maintenance of social harmony within the group (Akerlof et al.,1988, 1990; Milgrom et al 1990; Pfeffer and Langton 1993, Henderson and Fredrickson 2001, Lee, Lev, and Yeo, 2008, Yang and Klass, 2011, Baixauli-Soler and Sanchez-Marin, 2015).

The empirical evidence concerning Executive Compensation Dispersion and firm performance is mixed and rather limited in the business setting as compared to evidence from the sports

studies. This also depends on which theory is under consideration. Many extant empirical studies also find a positive relationship between Executive Compensation Dispersion and firm performance. Studies such as Lee, Lev and Yeo, (2008); Kale et al. (2009); Lin and Lu (2009); Chen et al. (2011) and Baixauli-Soler and Sanchez-Marin, (2015). However, other studies argue that pay disparity among executives bears a negative impact on performance by initiating detrimental rivalries, and parochial and piecemeal behavior as the Top Management Team executives selfishly work hard to win the CEO promotion tournament which fosters extremely aggressive behavior reducing firm value (Lazear, 1989; Henderson and Fredrickson, 2001; Siegel and Hambrick, 2005; Ensley, Pearson and Sardeshmukh, 2007; Davis-Blake and Sanders, 2010; Bebchuk et al., 2011; Zalewska, 2014).

Furthermore, Akerlof and Yellen (1988, 1990), Milgrom and Roberts (1988), and Levine (1991) argue that low pay dispersion may have a positive effect on employee efforts and productivity by creating harmonious and efficient labor relations thereby leading to higher output and productivity. Levine (1991) also develops a model showing that lowering pay dispersion can increase employee cohesiveness, which in turn will enhance productivity.

Based on the above findings and arguments, we make an inference that Executive Compensation Dispersion will be appropriate for motivating the Top Management Team in working towards obtaining the prize, hence improving firm performance. However, a negative impact of pay disparity is also observed which is detrimental to firm performance. Thus, we develop the following hypotheses:

$H1_A$: Executive Compensation Dispersion is positively associated with firm performance

$H1_B$: Executive Compensation Dispersion is negatively associated with firm performance.

The Moderating Role of Technology Intensity in the Relationship between Executive Compensation Dispersion and Firm Performance

Following Zhang, You and Gao, (2015) and Lin, Yeh, and Shih (2013), Technology Intensity is asserted as one of the major contingent context variables which have often been neglected by the extant literature concerning Executive Compensation Dispersion and yet it impacts the final consequences of firm performances in relation to Executive Compensation Dispersion.

Technological intensiveness entails firms in the fields such as computer, biomedical, aerospace, and scientific equipment industries, among others, often defined as the degree of scientific activity and research-based innovation in an industry. Firms in such industries often require Top Management Team interdependence and thus technology intensity effects are expected to be pronounced. Technology intensive firms are information-intensive, characterised by intermittent developments that must be processed quickly by the Top

Management Team to keep pace with their competitive marketplace arena. Firms in such industries are also innovation-oriented, heavily dependent on new product formulations and designs which are focused on achieving research-based breakthroughs via information processing task. However, the information processing and product formulation tasks are not confined to just the CEO or a few top executives but rather to the entire Top Management Team to make effective firm decisions.

In sum, the greater the technological intensiveness of the firm, the greater the task interdependence among members of the Top Management Team (Siegel and Hambrick, 2005). Based on the task interdependence effect among the Top Management Team while making key decisions, a high level of collaboration and cooperation is therefore not a mere need but a fundamental requirement.

Lin, Yeh, and Shih (2013) find that a larger ECD might result in an adverse competition which could possibly weaken the joint efforts among individuals and harm firm performance. In addition, when executives in the Top Management Team feel that they are under-compensated in relation to their peers within and out of the firm, yet they highly contribute to the decision making of the firm, they usually regard it as an insult to themselves and their profession. With such a tense atmosphere in the workplace, this pay inequality brings about managerial turn over in that the top executives are most likely to make a common judgement with reference to their peers in the labour market leading to their resignation and this also enhances turnover intention among the top executives (Kale, Reis, and Venkateswaran, 2014). With the prospect of several jobs awaiting them in the market due to their unique and highly demanded skill-set, top executives in technology-intensive firms will find it easy to voluntarily resign and show a high turnover intention which often lowers their true commitment to the firm (Zhang, You and Gao, 2015). From the above discussion, the benefits of pay disparity in technology-intensive firms seem to bring about a harmful effect on collaboration and cooperation which consequently affects firm performance negatively. We develop the following hypothesis:

H2: *Technology intensity can negatively affect the relationship between Executive Compensation Dispersion and firm performance.*

Methodology

Data and sample selection

The sample contained annual data for listed non-financial companies on the Korean Stock Exchange that disclose compensation levels of all registered executives paid in excess of 500 million Korean won (approximately 500 thousand US dollars) whereby the compensation included salary, bonus, incentives, retirement income, and other incomes such as a realised gain from exercising stock options which were not related with the current firm performances.

In addition, firms in the financial sector (investment, banks and insurance companies) were excluded from our analysis due to the possibility of specific government regulations relating to financial firms which may, in turn, affect our analysis.

Data was obtained from the Financial Supervisory Service's DART system and in the Korea Listed Companies Association's TS2000. Financial data was gathered from the Korea Investor Service's (KISVALUE) database for the period from 2013 to 2017. The data collection period started from 2013 because that was when the disclosure rule was first enacted and enforced in Korea.

Measures

Variable definitions

Firm Performance

Performance was a proxy for firm performance which is a measure of either market performance (TOBINQ) or accounting performance (ROA). However, ROA bears little information about economic rates of return since it doesn't reflect the firm's strategic health or other developments that affect future profitability according to Siegel and Hambrick (2005) Following Baixauli-Soler and Sanchez-Marin, (2015) and Xu, Yunguo et al, (2016), we computed Tobin's Q, the sole dependent variable as the ratio of the book value of liabilities plus the market value of common equity, divided by the book value of the total assets of the firm at the end of the fiscal year.

Executive Compensation Dispersion

Denoted as ECD1, Executive Compensation Dispersion was defined as the natural logarithm of the ratio of CEO Pay to the Total compensation of other directors, consistent with Siegel and Hambrick, (2005). It should be noted that only firms having 3 or more registered directors were considered for the Top Management Team in our analysis.

Firm/Executive characteristics

Following prior studies by Lee, Lev, and Yeo, (2008); Xu, Yunguo., et al, (2016); Baixauli-Soler and Sanchez-Marin, (2015); Zhang, You and Gao, (2015), several firm/executive characteristics were included in the study as control variables since they had independent effects on the overall firm performance. Firm size denoted as SIZE was defined as the natural logarithm of the total assets at the end of the fiscal year. Debt ratio (LEV) was defined as the ratio of total debt to total assets of the firm. The age of the CEO (CEOAGE) was defined as the natural logarithm of how many years a CEO has. CEO tenure (CEOTENURE) was

measured as the number of years the current CEO has held his/her post. Firm age (FIRMAGE), indicated a measure of years since the Initial Public Offering of the firm. Stock return volatility (RV) was computed as the standard deviation of the firm's stock returns over the past 24 months.

Corporate Governance characteristics

According to previous studies, Yermack (1996), Conyon and Peck (1998), Lee, Lev, and Yeo, (2008), effective corporate governance was indicated by a high proportion of directors on the firm board (BOARDSIZE) and a high proportion of independent directors over the total directors (BOARDCOMP).

Technology Intensity characteristic

A technologically intensive firm (TECH) was captured using a dummy variable coded 1 if a firm is technology intensive and 0 if labour-intensive, following previous studies by Siegel and Hambrick (2005) and Zhang, You and Gao (2015). These firms were chosen basde on the Korean Standard Industrial Classification through observing the sub-classes, these included firms in information technology, consumer electronics, telecommunication, semiconductor, aerospace, precision machinery and automation, medical and specialised chemical, materials, biotechnology and green energy technologies industries.

Table 1: Definition of variables

Name	Variable	Definition
Firm performance	TOBINQ	(Market value of common equity + book value of liabilities)/Book value of total assets
Executive Compensation Dispersion	ECD1	In (CEO PAY/ Total pay of other directors)
Firm/Executive characteristics	SIZE	In (Total Assets)
	LEV	Total debt/Total assets
	FIRMAGE	In (Years since Initial Public Offering)
	RV	Standard deviation of 24 monthly returns
	CEOAGE	In (CEO Age)
	CEOTENURE	Number of years of being CEO
Corporate Governance	BOARDSIZE	Number of directors on firm board
	BOARDCOMP	Proportion of independent directors over total directors
Technology Intensity characteristic	TECH	Dummy variable coded 1 if firm is Technology Intensive

Model Specification

A panel data methodology was applied and a fixed-effect model, which presents several advantages, such as better effects' detection and measurement, minimisation in sample bias and control of individual heterogeneity (Damodar Gujarati, 2012). This was because executives and firms are generally heterogeneous having characteristics such as personal skills among others that could bias the model's results when overlooked. Thus, the individual effects to control for the unobservable heterogeneity are included within the error term.

Furthermore, according to M B Wintoki et al., (2012) the majority of empirical corporate finance researchers highlight at least two potential sources of endogeneity: un-observable heterogeneity and simultaneity leaving out one source of endogeneity that arises from the possibility that current values of firm performance variables are a function of past executive compensation and firm/executive related control variables.

Therefore, while prior empirical studies examined the consequences of pay dispersion by regressing current firm performance on to current pay dispersion, we expected that the current firm performance should be regressed on the past pay dispersion and control variables.

Therefore, in line with the growing theoretical analysis and relevant research (Lee, Lev, and Yeo, (2008), M.B. Wintoki et al, (2012), Baixauli-Soler and Sanchez-Marin, (2015), Zhang, You and Gao, (2015), we used the following models to examine the hypotheses:

Interaction effect of Technology Intensity in the Relationship between Executive Compensation Dispersion and Firm Performance

$$PERFORMANCE_{it} = \beta_0 + \beta_1 . ECD1_{it-1} + \beta_2 . SIZE_{it-1} + \beta_3 . LEV_{it-1} + \beta_4 . CEOAGE_{it-1} +$$

$$\beta_5 . CEOTENURE_{it-1} + \beta_6 . BOARDSIZE_{it-1} + \beta_7 . BOARDCOMP_{it-1} + \beta_8 . FIRMAGE_{it-1} +$$

$$\beta_9 . RV_{it-1} + \beta_{10} . TECH_{it-1} . ECD1_{it-1} + \varepsilon_{it-1} \quad (1)$$

In line with Zhang, You and Gao (2015), we assessed the reliability and validity of the empirical results obtained from model 1, the whole sample was divided into two sub-samples namely technologically-intense firms and labour-intensive firms.

Two models were then constructed to test the relationship between firm performance and ECD in these two sub-samples, below is the model to be tested:

$$PERFORMANCE_{it} = \beta_0 + \beta_1 . ECD1_{it-1} + \beta_2 . SIZE_{it-1} + \beta_3 . LEV_{it-1} + \beta_4 . CEOAGE_{it-1} +$$

$$\beta_5 . CEOTENURE_{it-1} + \beta_6 . BOARDSIZE_{it-1} + \beta_7 . BOARDCOMP_{it-1} + \beta_8 . FIRMAGE_{it-1} +$$

$$\beta_9 . RV_{it-1} + \varepsilon_{it-1} \quad (2)$$

If the regression coefficient of ECD1 in technologically-intense firms was significantly smaller than that in labor-intensive firms, then the negative interactional effect between ECD and technologically-intense firms on firm performance would hold and be considered valid.

Relationship between Executive Compensation Dispersion and Firm Performance:

$$PERFORMANCE_{it} = \beta_0 + \beta_1 . ECD_{it-1} + \beta_2 . SIZE_{it-1} + \beta_3 . LEV_{it-1} + \beta_4 . CEOAGE_{it-1} + \beta_5 . CEOTENURE_{it-1} + \beta_6 . BOARDSIZE_{it-1} + \beta_7 . BOARDCOMP_{it-1} + \beta_8 . FIRMAGE_{it-1} + \beta_9 . RV_{it-1} + \varepsilon_{it-1} \quad (3)$$

Several robustness tests were used to assert whether the empirical results hold; First, we change the measure of ECD, by using the ratio of CEO pay to the average pay of other directors (ECD2) instead of the ratio of CEO Pay to total pay of other directors (ECD1). Endogeneity is also a serious concern when studying the association between ECD and firm performance due to the possibility of reverse-causality effects. (Xu, Yunguo, et al, (2016)). This is dealt with by lagging all independent variables 1 year with respect to the dependent variable in all the model specifications and controlling for unobserved firm heterogeneity through applying a fixed-effects model.

Results

Diagnostic tests

Panel Unit Root Test

Basing on the Fisher-type (Choi, 2001) tests, we rejected the null hypothesis that all the panels contained a unit root in our variables indicating that we had stationary variables.

Table 2: Panel Unit Root Test Results

Variable	Order of Integration	Fisher-type Test statistic	P-value
TOBINQ	I (0)	1056.654	0.0000
ECD1	I (0)	1167.358	0.0000
ECD2	I (0)	1167.164	0.0000
SIZE	I (0)	731.156	0.0000
LEV	I (0)	505.039	0.0000
CEOAGE	I (0)	4754.021	0.0000
CEOTENURE	I (0)	678.223	0.0000
BOARDCOMP	I (0)	475.224	0.0000
BOARDSIZE	I (0)	389.683	0.0000
RV	I (0)	878.735	0.0000
FIRMAGE	I (0)	8073.778	0.0000

Heteroskedasticity and Autocorrelation tests

Table 3 indicated the presence of heteroskedasticity since the null hypothesis of the modified wald test was not rejected and it further revealed that errors associated with certain observations are correlated with each other, thus the presence of autocorrelation

Table 3: Results for Heteroskedasticity and Autocorrelation

Modified wald test		**Wooldridge test**	
χ^2 (p-value)	0.000	F-statistic (pvalue)	0.0182
χ^2 (Statistic)	2228.17	F-statistic	5.744

Therefore, our inferences in all model specifications were based on Huber-White robust standard errors clustered by firm, that are robust to both heteroskedasticity and serial correlation while analyxing panel data (Petersen 2009)

Descriptive Statistics and Correlations

Table 4 presents the descriptive statistics for the variables applied in the analysis containing 621 observations from 2013 to 2017. The mean and median TOBINQ are 1.252 and 1.014 respectively ranging between 0.107 and 10.845. Based on the Executive Compensation Dispersion measures, ECD1 and ECD2, the average pay disparities are -0.0842 and 0.933 with standard deviations of 0.972 and 0.944 respectively.

Control variables related to firm performance include SIZE, LEV, FIRMAGE and RV with mean values of 21.227, 0.420, 21.705 and 0.407 respectively. On average, the majority of firms in our sample have CEOs who are 60 years old (4.084) and usually serve for about 8 years (8.341). The longest serving CEO has held office for 50 years. It should also be noted that the Board of Directors in the majority of firms in our sample had an average of 7 directors (1.898) of which 43.6% are independent directors on the board. The sample also consists of 47% of technologically-intense firms thus implying 53% of the firms are labor-intensive.

Table 4: Summary of Descriptive Statistics

Variable	N	Mean	S. D	Median	Min	Max
TOBINQ	621	1.252	0.949	1.014	0.107	10.845
ECD1	621	-0.0842	0.972	-0.043	-2.989	3.588
ECD2	621	0.933	0.944	0.991	-1.89	4.281
SIZE	621	21.227	1.601	21.099	17.777	26.012
LEV	621	0.42	0.19	0.417	0.084	1.093
CEOAGE	621	4.084	0.140	4.094	3.555	4.533
CEOTENURE	621	8.341	9.560	4.000	1.000	50.000
BOARDCOMP	621	0.436	0.152	0.500	0.000	0.800
BOARDSIZE	621	1.898	0.289	1.946	1.099	2.639
TECH	621	0.470	0.5	0.000	0.000	1.000
RV	621	0.407	0.367	0.291	0.000	2.202
FIRMAGE	621	21.705	13.711	21.000	0.000	60.000

Table 5 presented the spearman rank correlations among the variables in the study. The main variable under study, TOBINQ (firm performance), was negatively related to the Executive Compensation Dispersion measures, however this relationship was not statistically significant. We also found that firm performance was negatively related to leverage, CEO age and firm age, all of which were significant at 1%, 1% and 5% levels respectively. We further observed a strong positive association between the ECD measures (ECD1 and ECD2), significant at 1%. This implied that our explanatory variables moved in the same direction and could act as direct substitutes to each other. The highest correlation between the independent variables was 0.697 which was statistically significant at 1% level, showing the relationship between firm size measured by the total assets and the board composition. Overall, the independent variables exhibited both positive and negative relationships amongst each other.

However, heedfulness is needed given that these were simple correlations that didn't consider the differences in other firm characteristics and this could be corrected through the panel fixed effects model specifications.

Table 5: ***Spearman's rank Correlation***

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
TOBINQ (1)	1.000										
ECD1 (2)	-0.039	1.000									
SIZE (3)	0.004	-0.361***	-0.367***	1.000							
LEV (4)	-0.095*	0.0958*	0.055	0.144***	1.000						
CEOAG (5)	-0.093*	-0.0996*	-0.010	0.104**	-0.105**	1.000					
CEOTENURE (6)	-0.032	0.192***	0.194***	-0.306***	-0.186***	0.163***	1.000				
BOARDCOMP (7)	0.038	-0.221***	-0.294***	0.697***	0.276***	0.017	-0.258***	1.000			
BOARDSIZE (8)	-0.030	-0.380***	-0.224***	0.559***	0.147***	0.176***	-0.200***	0.511***	1.000		
FIRMAGE (9)	-0.199***	-0.117**	-0.062	0.072	-0.028	0.099*	0.083*	-0.006	0.144***	1.000	
RV (10)	0.230	0.0890*	0.058	-0.195***	0.027	-0.039	0.147***	-0.179***	-0.143***	0.017	1.000
TECH (11)	-0.041	-0.0658	-0.046	0.194***	-0.023	0.096*	-0.039	0.129**	0.185***	0.215	-0.062

Hypothesis Testing

Table 6 reports the results of the models used to test the moderating effect of technological intensity on Executive Compensation and firm performance (Hypothesis 2). Tobin's Q is regressed on the interaction terms between ECD and the dummy variable representing technologically intense firms along with the firm, CEO and governance related control variables.

Controlling for the general forms of cross-sectional and temporal dependence together with heteroskedasticity in both models denoted by model 1 robust and model 2 robust.

It is observed that the interactional term between Executive Compensation Dispersion and Technology Intensity negatively affected firm performance in both model specifications, however, it was only statistically significant at a 10% level in our main model specification which implied that on average each percent positive change of technology intensity would lower the positive impact of ECD on firm performance by 0.102%. Collectively, these findings confirmed that technology-intensity negatively moderated the association between

ECD and firm performance due to the harmful effect it generates on collaboration and cooperation which consequently affects firm performance negatively.

However, these findings should be taken with caution since our second model specification doesn't hold to a large extent. It's further observed that the previous leverage and firm age had a negative and statistically significant effect on firm performance while the firm's stock return volatility positively affected firm performance. The corporate governance control variables in Board size and Board composition were positive but insignificant in all our model specifications reflecting the possibility of a non-independent board containing fewer directors on average.

Table 6: Regressions of Tobin's Q against the interaction effect of Technology Intensity and control variables

Explanatory variables	Model 1	Model 2
$ECD1_{it-1}$	0.091*	
	(1.72)	
$ECD2_{it-1}$		0.078
		(1.49)
$ECD1_{it-1}TECH_{it-1}$	-0.102*	
	(-1.75)	
$ECD2_{it-1}TECH_{it-1}$		-0.072
		(-1.30)
$SIZE_{it-1}$	0.027	0.010
	(0.06)	(0.02)
LEV_{it-1}	-0.889**	-0.852**
	(-2.14)	(-2.08)
$BOARDSIZE_{it-1}$	0.006	0.004
	(0.25)	(0.17)
$BOARDCOMP_{it-1}$	0.087	0.098
	(0.27)	(0.32)
$CEOAGE_{it-1}$	0.064	0.046
	(0.22)	(0.16)
$CEOTENURE_{it-1}$	-0.005**	-0.005**
	(-2.23)	(-2.12)
$FIRMAGE_{it-1}$	-0.355**	-0.349**
	(-2.13)	(-2.08)
RV_{it-1}	0.173***	0.173***
	(2.64)	(2.63)
Constant	1.683	2.048
	(0.19)	(0.23)

Observations	464	464
Adjusted R-squared	0.052	0.047
F-Statistic	1.88**	1.78**
Number of firms	133	133
Firm FE	YES	YES
Cluster	Firm	Firm

In parentheses are t-statistics significant at 1% (***), 5% (**) and 10% (*) levels

To confirm the reliability and validity of hypothesis 2, a negative interaction effect between ECD and Technology Intensity on firm performance, equation 2 was tested separately on the sub-samples containing labour-intensive and technologically intense firms as indicated in tables 7 and 8.

In table 7, it's observed that Executive Compensation Dispersion plays a positive and significant role towards firm performance in labour-intensive firms, a relationship which was also observed basing on ECD2 (the second measure of Executive Compensation Dispersion). This implied that labour-intensive firms can improve future firm performance by undertaking a Executive Compensation Dispersion strategy since it acts as a tool to foster competition for the tournament prize which later translates into positive firm performance. This is consistent with findings of Baixauli-Soler and Sanchez-Marin, (2015) and Zhang et al. (2015) that suggest that it's the relative performance and not absolute performance that matters especially in firms requiring less task interdependency. It's further observed that leverage statistically and negatively affected firm performance while return volatility had a positive and significant effect on the next year's firm performance in firms which use more labour than technology. However, CEO and Corporate governance-related control variables generally do not play a significant part in firm performance.

In table 8, Executive Compensation Dispersion coefficients are negative and positive but not statistically significant in both model specifications. This indicates that ECD in technologically-intense firms potentially plays no significant role in improving the overall firm performance, confirming that the net-impact of ECD on firm performance is nearly zero. This indicated that a rise in pay disparity among the TMT basically has no effect on the firm performance where development and research projects are often on-going, consistent with well-established findings of Lin, Yeh, and Shih (2013) and Conyon and Sadler (2001) that stipulated the need for top managers to harmonise their given specialties to achieve the set company targets. Firm age negatively and statistically affected the firm performance, and this may be linked on the ever-advancing technologies and innovations which most of the firms failed to adapt to due to the stiff ever-evolving competition which comes with large capital budgets.

Therefore, the sub-sample effects of ECD on firm performance suggested that on average ECD had a positive and significant role when it came to improving firm performance in labour-intensive firms while no net impact was observed between ECD and firm performance in technologically-intense firms. With this eventuality, it can be concluded that technology intensity negatively moderates the relationship between firm performance and ECD in Korea, thus Hypothesis 2 holds and is valid.

Table 7: Regression of Tobin's Q against ECD in labour-intensive firms

Explanatory variables	**Model 1**	**Model 2**
$ECD1_{it-1}$	0.096*	
	(1.80)	
$ECD2_{it-1}$		0.095*
		(1.75)
$SIZE_{it-1}$	-0.428	-0.446
	(-1.17)	(-1.21)
LEV_{it-1}	-1.183**	-1.151*
	(-2.02)	(-1.98)
$BOARDSIZE_{it-1}$	-0.023	-0.037
	(-0.49)	(-0.76)
$BOARDCOMP_{it-1}$	0.342	0.444
	(0.62)	(0.81)
$CEOAGE_{it-1}$	0.256	0.259
	(1.33)	(1.33)
$CEOTENURE_{it-1}$	-0.003	-0.003
	(-1.07)	(-1.04)
$FIRMAGE_{it-1}$	-0.113	-0.100
	(-0.87)	(-0.75)
RV_{it-1}	0.239**	0.242**
	(2.52)	(2.53)
Constant	9.958	10.210
	(1.34)	(1.37)
Observations	248	248
Adjusted R-squared	0.107	0.105
F-Statistic	2.01**	1.94**
Number of firms	70	70
Firm FE	YES	YES
Cluster	Firm	Firm

In parentheses are t-statistics significant at 1% (***), 5% (**) and 10% (*) levels

Table 8: Regression of Tobin's Q against ECD in technologically-intensive firms

Explanatory variables	**Model 1**	**Model 2**
$ECD1_{it-1}$	-0.012	
	(-0.54)	
$ECD2_{it-1}$		0.003
		(0.14)
$SIZE_{it-1}$	0.352	0.336
	(0.62)	(0.59)
LEV_{it-1}	-0.572	-0.573
	(-1.10)	(-1.11)
$BOARDSIZE_{it-1}$	0.018	0.020
	(0.66)	(0.71)
$BOARDCOMP_{it-1}$	0.015	0.017
	(0.04)	(0.04)
$CEOAGE_{it-1}$	-0.157	-0.241
	(-0.28)	(-0.42)
$CEOTENURE_{it-1}$	-0.003	-0.003
	(-1.24)	(-1.13)
$FIRMAGE_{it-1}$	-0.536*	-0.529*
	(-1.90)	(-1.88)
RV_{it-1}	0.085	0.088
	(1.53)	(1.56)
Constant	-4.064	-3.412
	(-0.36)	(-0.30)
Observations	216	216
Adjusted R-squared	0.031	0.030
F-statistic	0.76**	0.72**
Number of firms	63	63
Firm FE	YES	YES
Cluster	Firm	Firm

In parentheses are t-statistics significant at 1% (***), 5% (**) and 10% (*) levels

The whole sample was taken into consideration, as indicated by table 9, to assess the impact of ECD on firm performance. A positive but insignificant relationship was observed in both of our model specifications, results that are consistent with findings of Lin, Yeh, and Shih (2013) and Conyon and Sadler (2001). This suggested the possibility that the relationship between ECD and firm performance could be moderated by a variety of industry, environmental and organisational characteristics across our firm observations which led to different individual

coordinating needs that play a big role in how the TMT relates as postulated by Yang and Klass (2011).

It was further seen that the longer the CEO stayed in office, the more entrenched they became and thus didn't necessarily pursue the firm goals but rather pursued their own individualistic goals hence negatively affecting the firm performance as indicated by the negative significant coefficient in table 9. Firm age and leverage had a negative and significant effect on firm performance in all our model specifications whereas stock return volatility positively and significantly affected firm performance. Corporate governance characteristics such as Board size and Board composition had a positive relationship with firm performance, however, it was not significant.

Table 9: Regression of Tobin's Q against ECD using the whole sample

Explanatory variables	**Model 1**	**Model 2**
$ECD1_{it-1}$	0.039	
	(1.28)	
$ECD2_{it-1}$		0.041
		(1.46)
$SIZE_{it-1}$	-0.002	-0.009
	(-0.00)	(-0.02)
LEV_{it-1}	-0.803*	-0.791*
	(-1.98)	(-1.96)
$BOARDSIZE_{it-1}$	0.010	0.008
	(0.39)	(0.31)
$BOARDCOMP_{it-1}$	0.038	0.058
	(0.13)	(0.19)
$CEOAGE_{it-1}$	0.008	0.008
	(0.03)	(0.03)
$CEOTENURE_{it-1}$	-0.004*	-0.004*
	(-1.79)	(-1.78)
$FIRMAGE_{it-1}$	-0.354**	-0.347**
	(-2.13)	(-2.10)
RV_{it-1}	0.167**	0.169**
	(2.54)	(2.57)
Constant	2.480	2.560
	(0.71)	(0.29)
Observations	464	464
Adjusted R-Squared	0.044	0.044
F-Statistic	1.98**	1.97**

Number of firms	133	133
Firm FE	YES	YES
Cluster	Firm	Firm

In parentheses are t-statistics significant at 1% (***), 5% (**) and 10% (*) levels

DISCUSSION

Theoretical Contribution

Using panel data for the period 2013-2017 of 133 Korean listed firms, this paper enriches the current literature by providing evidence concerning the moderating role technology intensity plays in the relationship between ECD and firm performance. We further exploit the sub-sample comparison analysis between labour and technology-intensive firms to ascertain the moderating role of technology intensity on the relationship between ECD and firm performance (Zhang et al. 2015; Siegel and Hambrick, 2005) while at the same time investigating the relationship between ECD and firm performance in the context of Korean firms in a country where collectivist tendencies might still be upheld thus built on the extant literature (Lee, Lev, and Yeo, 2008; Lin, Yeh, and Shih, 2013; Baixauli-Soler and Sanchez-Marin, 2015).

First, our analysis supported and confirmed the equity (fairness) theory (Adams,1963) in the case that technology intensity can negatively moderate the relationship between firm performance and ECD, consistent with findings of Siegel and Hambrick, (2005); Lin et al, (2013); and Zhang et al. (2015).

We also provided additional supporting evidence of the negative role ECD brings to technologically advanced firms by observing that ECD positively and significantly contributed to firm performance in labour-intensive firms while it had no net impact on technologically intense firms. From, this finding, we can further support the notion that the ECD strategy works best for labour-intensive firms where the need for collaboration within the TMT is not necessary, however, this is not the case with technologically intense firms where collaboration and cooperation is a fundamental requirement.

Secondly, we found a positive but insignificant relationship between ECD and firm performance when we considered the whole sample in both our model specifications consistent with Lin, Yeh, and Shih (2013) and Conyon and Sadler (2001).

Overall, Equity theory was confirmed when assessing the moderating role of technology intensity on the relationship between ECD and firm performance, as expected, a negative sign was observed. On the other hand, no conclusion could be drawn from the association between ECD and firm performance since the observed sign was insignificant as indicated in table 10.

Table 10: Comparative Summary of Regression results and Theory

Hypotheses	Expected Sign	Observed Sign	Theory
H_{1A} / H_{1B}	+/-	+ (Insignificant)	Inconclusive
H_2	-	-	Equity Theory

Practical Implications

The practical implications realised from our study bring to light the significance technology holds within firms when it comes to the aspect of interdependence in an environment where information and intermittent developments must be processed quickly thus highlighting the need of cooperation within TMT. Therefore, human resource experts within firms must pay extra attention when implementing the ECD strategy with high-tech Korean firms where group harmony may also influence the entire TMT. In addition, extra attention should be paid to the tradeoffs from overall management performance, incentives and the ability of executives to accommodate each other.

Our results further suggested that ECD is expected to vary based on organisational and environmental aspects which could therefore lead to the effects of ECD to cancel each other out (Henderson and Fredrickson 2001; Siegel and Hambrick 2005). From this finding, it can also be concluded that the institutional element plays a role in determining the nature of the association between pay disparity and firm performance, thus should be critically considered while implementing the ECD strategy within a firm.

Limitations and Future Research

This study is limited in several ways; first, the selection of variables was influenced by lack of some data and on this note, the analysis could be modified by incorporating other measures of Executive Compensation Dispersion such as CEO pay slice, increasing the sample size and considering industry-level and country-level variables as soon as the data becomes available.

Secondly, basing the study on only listed firms did not entirely bring out the bigger picture of how executive compensation dispersion affected firm performance therefore, there is a need to incorporate non-listed companies in the future.

Thirdly, organisational and environmental factors might play a significant role when it comes to determining the optimal ECD (Yang and Klass 2011), yet we were not able to include variables capturing such factors due to lack of substantial and accurate data relating to them within the financial reports.

Therefore, we propose that future studies can identify a more solid relationship between ECD and firm performance by paying more attention to the limitations stated above.

Conclusion

Productivity within firms encompasses a lot of key issues which require ultimate attention. In this study we brought to light human-resource-related factors that are often ignored when assessing firm performance. Transparency has also often been a key driving force considering the 2008 financial crisis and this has led to strict measures concerning the disclosure rules in Korean listed firms. However, combined with the extant results, a clear consensus hasn't been attained as to whether firms follow the tournament theory or the social theory when implementing the ECD strategy, implying that the two theories are not paradoxical but interdependent which is supported by some empirical studies suggesting a possibility concave relationship existing between ECD and firm performance (Mahy et al. 2011; Yang and Klass 2011).

Conflict of Interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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REFERENCES

Adams, J. S. (1963). Towards an understanding of inequity. *The Journal of Abnormal and Social Psychology*, *67*(5), 422.

Aggarwal, R., Erel, I., Stulz, R., & Williamson, R. (2008). Differences in governance practices between US and foreign firms: Measurement, causes, and consequences. *The Review of Financial Studies*, *22*(8), 3131-3169.

Akerlof, G. A., & Yellen, J. L. (1988). Fairness and unemployment. *The American Economic Review*, *78*(2), 44-49.

Baixauli-Soler, J. S., & Sanchez-Marin, G. (2015). Executive compensation and corporate governance in Spanish listed firms: a principal–principal perspective. *Review of Managerial Science*, *9*(1), 115-140.

Bebchuk, L. A., & Fried, J. M. (2004). *Stealth compensation via retirement benefits* (No. w10742). National Bureau of Economic Research.

Bloom, M., & Michel, J. G. (2002). The relationships among organisational context, pay dispersion, and among managerial turnover. *Academy of Management Journal*, *45*(1), 33-42.

Carpenter, M. A., & Sanders, W. G. (2004). The effects of top management team pay and firm internationalisation on MNC performance. *Journal of Management*, *30*(4), 509-528.

Conyon, M. J., & Sadler, G. V. (2001). Executive pay, tournaments and corporate performance in UK firms. *International Journal of Management Reviews*, *3*(2), 141-168.

Fredrickson, J. W., Davis-Blake, A., & Sanders, W. G. (2010). Sharing the wealth: Social comparisons and pay dispersion in the CEO's top team. *Strategic Management Journal*, *31*(10), 1031-1053.

Frydman, C., & Papanikolaou, D. (2018). In search of ideas: Technological innovation and executive pay inequality. *Journal of Financial Economics*, *130*(1), 1-24 Gujarati, D. N. Sangeetha (2012), Basic Econometrics.

Gupta, N., Conroy, S. A., & Delery, J. E. (2012). The many faces of pay variation. *Human Resource Management Review*, *22*(2), 100-115.

Harbring, C., & Irlenbusch, B. (2003). An experimental study on tournament design. *Labour Economics*, *10*(4), 443-464.

Himmelberg, C. P., Hubbard, R. G., & Palia, D. (1999). Understanding the determinants of managerial ownership and the link between ownership and performance. *Journal of financial economics*, *53*(3), 353-384.

Hu, F., Pan, X., & Tian, G. (2013). Does CEO pay dispersion matter in an emerging market? Evidence from China's listed firms. *Pacific-Basin Finance Journal*, *24*, 235-255. Kale, J. R., Reis, E., & Venkateswaran, A. (2009). Rank-order tournaments and incentive alignment: The effect on firm performance. *The Journal of Finance*, *64*(3), 1479-1512.

Kang, S. C., & Yanadori, Y. (2011). Adoption and coverage of performance-related pay during institutional change: An integration of institutional and agency theories. *Journal of Management Studies*, *48*(8), 1837-1865.

Kim, E. H., & Kim, W. (2008). Changes in Korean corporate governance: A response to crisis. *Journal of Applied Corporate Finance*, *20*(1), 47-58.

Kim, D. O., & Bae, J. (2005). Workplace innovation, employment relations and HRM: two electronics companies in South Korea. *The International Journal of Human Resource Management*, *16*(7), 1277-1302.

Kim, S. Y., Lee, K. R., & Shin, H. H. (2017). The enhanced disclosure of executive compensation in Korea. *Pacific-Basin Finance Journal*, *43*, 72-83.

Landells, E., & Albrecht, S. L. (2013). Organisational political climate: Shared perceptions about the building and use of power bases. *Human Resource Management Review*, *23*(4), 357365.

Lazear, E. P., & Rosen, S. (1981). Rank-order tournaments as optimum labor contracts. *Journal of political Economy*, *89*(5), 841-864.

Lee, K. W., Lev, B., & Yeo, G. H. H. (2008). Executive pay dispersion, corporate governance, and firm performance. *Review of Quantitative Finance and Accounting*, *30*(3), 315-338.

Lim, E. N. (2015). The role of reference point in CEO restricted stock and its impact on R&D intensity in high-technology firms. *Strategic Management Journal*, *36*(6), 872-889.

Lin, T. C. (2011). The corporate governance of iconic executives. *Notre Dame L. Rev.*, *87*, 351. Lin, Y. F., Yeh, Y. M. C., & Shih, Y. T. (2013). Tournament theory's perspective of executive pay gaps. *Journal of Business Research*, *66*(5), 585-592.

Milgrom, P. R. (1988). Employment contracts, influence activities, and efficient organisation design. *Journal of political economy*, *96*(1), 42-60.

Pfeffer, J., & Davis-Blake, A. (1992). Salary dispersion, location in the salary distribution, and turnover among college administrators. *ILR Review*, *45*(4), 753-763.

Pfeffer, J., & Langton, N. (1993). The effect of wage dispersion on satisfaction, productivity, and working collaboratively: Evidence from college and university faculty. *Administrative Science Quarterly*,382-407.

Prendergast, C. (2002). The tenuous trade-off between risk and incentives. *Journal of political Economy*, *110*(5), 1071-1102.

Shin, J. Y., Kang, S. C., Hyun, J. H., & Kim, B. J. (2015). Determinants and performance effects of executive pay multiples: Evidence from Korea. *ILR Review*, *68*(1), 53-78.

Siegel, P. A., & Hambrick, D. C. (2005). Pay disparities within top management groups: Evidence of harmful effects on performance of high-technology firms. *Organisation Science*, *16*(3), 259-274.

Rowley, C., & Bae, J. (2002). Globalisation and transformation of human resource management in South Korea. *International Journal of Human Resource Management*, *13*(3), 522- 549.

Smith Jr, C. W., & Watts, R. L. (1992). The investment opportunity set and corporate financing, dividend, and compensation policies. *Journal of financial Economics*, *32*(3), 263-292.

Wintoki, M. B., Linck, J. S., & Netter, J. M. (2012). Endogeneity and the dynamics of internal corporate governance. *Journal of Financial Economics*, *105*(3), 581-606.

Xu, Y., Liu, Y., & Lobo, G. J. (2016). Troubled by unequal pay rather than low pay: The incentive effects of a top management team pay gap. *China Journal of Accounting Research*, *9*(2), 115-135.

Yang, H., & Klaas, B. S. (2011). Pay dispersion and the financial performance of the firm: Evidence from Korea. *The International Journal of Human Resource Management*, *22*(10), 2147-2166.

Zalewska, A. (2014). Gentlemen do not talk about money: Remuneration dispersion and firm performance relationship on British boards. *Journal of Empirical Finance*, *27*, 40-57. Zhang,

C. Z., You, Y., & Gao, Z. Q. (2015). Empirical study on the relationship between executive compensation dispersion and firm performance: the moderating role of technology intensity. *The Journal of High Technology Management Research*, *26*(2),196-204.