THE LINKAGES BETWEEN THE PERFORMANCE-BASED COMPENSATION OF CEOs, BOARD OF DIRECTORS CHARACTERISTICS AND FIRM PERFORMANCE IN NORDIC COMPANIES

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Abstract

The executive directors of firms are expected to serve in the best interests of the firms that they are affiliated with. However, agency costs can start appearing when the chief executive officer (CEO) and other top executives put their personal interests before those of the firm. Theoretically, the firm performance-based compensation is reckoned as an important bonding measure that can align utility functions of both principal and agent to minimize the agency costs, however, no clear consensus is found in the empirical research regarding the effectiveness of this measure. The current study explores, first, whether corporate boards of directors' characteristics impact the relative share of performance-based pay in the total compensation of CEOs, and second, whether the performance-based compensation of CEOs affects the firm performance. Based on the analysis of secondary data of 113 large-cap Nordic publicly traded manufacturing firms for the period from 2012 to 2022, the findings show that performance-based pay of CEOs has a positive impact on the financial performance of the sample firms. The results also demonstrate that board size and performance-based pay of CEOs are negatively associated as it is expected that there is a relative ease in forming optimal compensation contracts of CEOs in smaller boards. However, this finding is opposite to several other studies that identify a positive association between the board size and performance-based pay of CEOs as bigger boards are more resourceful in making optimal decisions including CEOs' compensation contracts. Furthermore, board independence affects the performance-based pay of CEOs favourably. Similarly, the proportion of debt in the total financing of firms unfavourably affects both accounting and stock market performance measures.

Keywords: Firm Performance, CEO Compensation, Performance-Based Pay, Corporate Governance, Board of Directors, Agency Costs, Managerial Power

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1. INTRODUCTION

Ownership and control are often decoupled in modern-day business organizations, especially in the case of publicly traded larger companies. Modern-day business organizations are not only big but complex too. The complexity in terms of business operations, and ownership structure along with firm size can be responsible for such decoupling, particularly in the context of large business organizations. According to the agency theory, the abovementioned decoupling can cause the phenomenon of managerial discretion to precede to the extent of sacrificing firm goals. Therefore, the divergence of utility functions of both principal and agent can be witnessed which consequently can inflict agency costs on firms (Shleifer & Vishny, 1997; Jerzemowska, 2006).

The diverse albeit inter-related narratives regarding the board of directors such as sustainable corporate performance, enterprise value maximization, optimum compensation contracts of corporate directors (especially of chief executive officers' [CEOs']), protection of stakeholders' interests, and regulatory developments (including enhanced responsibilities of boards of directors) have been gaining more and more prominence over time in the academic literature, corporate board practices, media, and legislature (Conyon, 2014). In particular, the CEOs have responsibilities with respect to the firm performance, formulating, and executing corporate objectives, risk management and decision making, among other things, that can impact the firms' future, therefore, considering the significance of the abovementioned responsibilities it is only reasonable to argue that the CEOs should be rewarded in line with their efforts and outcomes of such efforts (Core et al., 1999). For example, the Say-on-Pay passage under the Dodd-Frank Act, which became effective with effect from January 2011, aims to increase the transparency of executive compensation and its linkages with firm performance in public companies in the U.S. (Ludwig, 2019). The topic of fair executive compensation is placed very high in various theoretical paradigms of corporate governance (Bebchuk & Fried, 2003; Pepper, 2019). Fair executive compensation is vital for attracting, retaining, and motivating managerial talent. The concept of executive compensation is not merely related to the business organization alone as it also underscores the public perception of the corporate practices, business objectives, managerial motives, and efficacy of the regulatory system, among other things. The incentives-based executive compensation contracts highlight the bonding measures between the principal and the agent with the objective of minimizing agency cost as such compensation contracts help to align their respective utility functions (Jensen & Murphy, 1990; Canarella & Nourayi, 2008; Mayers & Smith, 2010). Therefore, creating fair and just compensation arrangements that reward excellent performance and chastise poor ones is seen as one of the potential remedies to solve the agency problem. However, there are several theoretical and practical limitations when aligning executive pay with the firm performance. For example, firm performance can be affected by several macroeconomic variables, therefore, it is difficult to discern the portion of firm performance that can be explicitly and objectively attributed to managerial efforts and characteristics. Therefore, although the problem statement of the phenomenon of aligning pay with performance appears relatively simple, however, its nuances can be so many and so complex. Furthermore, managerial compensation can be a function of the performance benchmark among other things, in theory, however, there are several complexities ingrained in this functional relationship including the very meaning of "firm performance". Similarly, the other unresolved problem is whether the firm performance should be realized or expected, and current or lagged.

The purpose of the current study is to explore whether the composition of the remuneration of CEOs synchronizes with the firm's financial performance. Similarly, the impact of firm-level board of directors characteristics on the level of performance-based incentives is investigated in order to determine whether the board of directors characteristics in the Nordic countries are effectively incentivizing the CEOs. The current study explores the following research questions:

RQ1: Do board characteristics impact the relative share of performance-based pay in the total compensation of CEOs?

RQ2: Does performance-based compensation of CEOs affect the firm performance?

To answer the abovementioned questions data from 113 large-cap Nordic (including Finland, Sweden, Norway, and Denmark) publicly listed companies in the manufacturing sector have been analyzed for the period of 2012–2022. The findings show that the effect of board size on performance pay is inversely associated, indicating that as the board size decreases, the CEOs' performance pay increases. Similarly, more board independence leads to a higher proportion of performance-based pay for CEOs. Furthermore, the findings reveal that as CEOs' pay-performance sensitivity (lagged by one year) increases the firm performance (both accounting and stock market) improves.

The study makes several contributions to the extant literature and attempts to fill in the existing research gap. First, the current study is one of the few studies that explores the abovementioned research questions in the Nordic corporate setting. Second, the current study specifically emphasizes the dynamics of the performance-based element of CEO compensation as against total compensation, and it is noteworthy that most of the previous studies have explored total compensation instead of the performance-based element of CEO compensation. Third, the current study underpins that, when investigating the linkages between performance-based compensation and firm performance, it is important to recognize performance-based compensation not as an exogenous phenomenon since it can be affected by several firm-specific characteristics of boards of directors.

The rest of the paper consists of the following sections. Section 2 explores the relevant literature review, and hypotheses based thereon. Section 3 throws light on research design: research methods, data, key variables, theoretical models, and econometric techniques applied in the data analysis. Section 4 presents the empirical findings of the study and interprets them in conjunction with the hypotheses. Finally, Section 5 underlines the discussion including recommendations for future research and limitations of the current study.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Any discussion regarding executive compensation is incomplete without considering the dynamics of corporate boards of directors (Core et al., 1999). One of the key responsibilities of the independent boards of directors is to effectively monitor and control the actions of top executives of firms. Effective monitoring by independent directors can reduce the CEOs' undue influence over their remuneration contracts (Bebchuk et al., 2010). In an extreme situation, when CEOs and other top executives have significant control over the boards, they often receive disproportionately more compensation, especially that portion of total pay which is not linked to the performance benchmarks (Ataay, 2018). In another extreme situation, on the other hand, too many independent boards can curb the independence of executives to the extent that the latter not only have lesser freedom to make important decisions but are also under-remunerated. In both of the abovementioned scenarios, the market of corporate directors can witness disequilibria which can be corrected by linking executive remuneration with the firm performance. For example, Capezio et al. (2011) find that more board independence leads to a higher pay-performance sensitivity coefficient. On the other hand, the same study also finds that top managers often have a better understanding of the firm's financial health, strategic dimensions and operational aspects, therefore, they know when and how to capitalize the performance-based remuneration contracts in their favour. Therefore, it is not conclusive whether independent directors can truly be more effective in controlling the discretionary powers of top management and avoiding managerial entrenchment by aligning pay with firm performance.

Agency theory is one of the most widely used theories related to the theme of executive compensation. An important aspect of the agency theory is reflected through the traditional optimal contracting approach, which acknowledges that managers motivated by the maximization of their personal utility function can sideline the interests of the firms including the maximization of shareholders' wealth. According to the optimal contracting approach the company boards are supposed to be working to protect the shareholders' interests by developing compensation packages that effectively incentivize managers to increase company and shareholder wealth, among other things (Bebchuk & Fried, 2003). Nevertheless, it is important to note that there may be divergences in the utility functions of the principal and the agent, i.e., the factors that motivate an agent to work for the firm may not be the same as those of principal to invest or not to invest in the firm and resultantly such divergences can inflict agency costs to firms. Furthermore, in situations when a firm is exposed to market noise and volatility, the connection between CEO compensation and firm performance is evidently weaker due to CEOs' inherent attitude of risk aversion (Black, 1986). Therefore, the optimal contracting approach is not free from limitations.

The second theoretical underpinning that can be associated with CEO compensation is the managerial power approach. Bebchuk and Fried (2004) state that the managerial power approach opposes the agency theory view of incentives-based executive compensation being a solution for the agency problems faced by firms. The managerial power approach considers incentive-based executive compensation as a part of the problem since it can add up to firms' agency costs. The agency theory suggests that the right corporate governance mechanisms can work in safeguarding the shareholders' interests in determining executive remuneration, whereas the managerial power theory contends that top managers, especially CEOs, can obtain disproportionately more power over the process of setting their own pay (Bebchuk & Fried, 2004; Harvey et al., 2020). The managerial power theorists view that CEOs are not controlled by the boards but instead, they are the ones who control the boards. For example, CEOs can devise their own compensation packages inclusive of generous rewards which are not aligned with any rational performance benchmarks (Kolb, 2012). Similarly, Ataay (2018) argues that although boards are responsible for setting the executive compensation packages, however, CEOs and other top executives can still utilize considerable bargaining power over the board, which can lead to compensation packages that do not serve the shareholders' best interests. Similar to agency theory, managerial power theory also emphasizes the importance of director independence in monitoring and controlling managerial actions and discretions (Gümbel, 2006).

The underlying assumption of the traditional notion of performance-based executive pay is that CEOs contribute to the improvement of firm value only if the utility they derive from the compensation increment is more than the efforts that they must make to improve the firms' value. Therefore, the traditional models recognize the relevance of sufficient consumption incentives to motivate CEOs to improve firm value. Therefore, traditional models of executive remuneration recognize that ex-ante performance-based pay models aim to strengthen the bond between the firm executives and the firm. However, Edmans et al. (2023) provide empirical evidence to criticize the abovementioned assumption as they find that CEOs do not need to be incentivized with additional remuneration from the consumption perspective, rather they should receive performance-based pay as a recognition for the firm performance targets already achieved. Therefore, Edmans et al. (2023) advocate that performance-based pay compensation should be the ex-post phenomenon.

Hundal (2017) highlights the resource-dependence theoretical dimension as corporate board members can play an important role in resource provision by providing skilled human capital (education, experience, expertise, skills) and relational capital (a network of ties to other firms, external environment and external contingencies). The board of directors are expected to work to per best of their capabilities and in good faith *vis-à-vis* their stakeholders, particularly owners and managers and monitor, and counsel managers based on their assessment of the business environment, among other things. Similarly, board members bring much-valued relational capital that can help the firms face market volatilities and business uncertainties effectively. In return for their effort, remuneration in general and performance-based remuneration, in particular, can be a fair and effective motivation for board members to show their commitment to the business entities they are affiliated with.

Often, firm non-executive directors and investors view CEO remuneration differently. For example, non-executive directors of the firms may consider higher compensation of CEOs as an explicit motivation to the latter, which not only helps CEOs to improve the quality of services rendered to the firms they are affiliated with but also enhances the reputation of the firms; whereas investors can perceive higher CEO compensation as a sign of "power" and "clout" the CEOs wields over the boards of directors. For example, powerful CEOs can influence the quality of financial data as well as the timings of the release of the data to leverage equity-based compensation. However, Alkebsee et al. (2022) advocate that there is less room for managerial influence when it comes to in-cash compensation. The top managers are less likely to influence financial data in their favour when their total compensation has a relatively higher proportion of cash-based compensation. Similarly, cash has a higher level of visibility than non-cash components of remuneration, therefore, senior executives are deterred to pay themselves excessively in cash as the reactions of stock markets and institutions (for example, regulatory bodies and financial media) can be adverse. It can be argued that top management finds it easier to camouflage non-cash compensation from public scrutiny.

Yermack (1996) finds that firms having smaller boards of directors often experience more efficient compensation decisions, for example aligning pay with performance, when additional board members are added. However, the abovementioned favourable outcomes turn unfavourable when the board size reaches beyond the optimal level as the incremental agency costs related to the bigger boards exceed the incremental resources provided by additional board members.

Some studies also suggest that it is important to have an outside chairperson along with a higher proportion of independent directors to increase the proportion of performance-based pay in the total compensation of top executives of the firm and board independence alone is not effective for this purpose (Capezio et al., 2011; Conyon, 2006; Murphy, 2002).

Emphasizing the role of board diversity in the context of executive remuneration, Grey et al. (2024) provide empirical evidence that Chair-CEO diversity in terms of gender and age is accompanied by, first, lower levels of total compensation of both CEO and top executives and second, improvement in firm performance, both financial and non-financial. The abovementioned findings can be attributed to the improved monitoring and controlling roles of the boards of directors. Notably, the study shows that women directors, particularly when being the chair of the board, contribute significantly to improving the effectiveness of the monitoring and advisory roles of the board and for not allowing the disproportionate increase in the remuneration of CEO and other top managers.

Regarding the impact of the corporate boards and specialized committees such as audit committees, nomination committees and remuneration committees on executive remuneration, Kanapathippillai et al. (2024) contend that well-functioning nomination and remuneration committees are capable of providing fair and competitive remuneration to its top management, which in turn can act favourably to retain the existing executives and attract new managerial talent. Similarly, Liu et al. (2024) provide evidence that firms offering executive equity incentive plans (EEIP), benchmarked against both targeted and non-targeted performance measures, are more successful in retaining their managerial talent in comparison to their counterparts who do not offer EEIP.

Zhao et al. (2024) highlight that the difference in the level of education of corporate executives can lead to their remuneration gaps. Interestingly, such remuneration gaps are relatively profound in non-state-owned and capital-intensive enterprises. The study further explores that exorbitant remuneration gaps create a sense of unfair treatment and demoralize the employees, who are paid unfairly low.

Based on the extensive literature review, the following hypotheses have been formulated:

H1: Board characteristics influence performance-based pay.

H1a: Firms having larger board sizes give more performance-based pay to their CEOs.

H1b: More independent boards of directors give more performance-based pay to their CEOs.

H2: Performance-based pay influences the company's financial performance.

H2a: Firms giving higher performance-based pay to their CEOs experience higher accounting performance.

H2b: Firms giving higher performance-based pay experience higher stock market performance.

3. RESEARCH METHODOLOGY

The current study analyzes data from 113 large-cap manufacturing firms in the Nordic region for an eight-year period 2012–2022. The country-wise distribution of sample firms is Finland (27), Sweden (45), Norway (20), and Denmark (21). The data of some firm years has been lost due to the non-availability of information owing to delisting, bankruptcy, mergers and acquisitions and other types of restructuring. The final unbalanced panel data is comprised of 783 firm-years. The stock market-related data have been extracted from the NASDAQ OMX Nordic, whereas the data related to accounting, and board of directors-related variables have been obtained from the annual reports and corporate governance reports of the sample firms.

Table 1 below explains various variables that have been analyzed in the quantitative data analysis. Notably, some variables have been measured in the natural logarithmic form to mitigate linearity and side effects.

Using a multivariate ordinary least squares (OLS) regression analysis the functional relationships of various variables have been given after Table 1.

Table 1. Description of variables

Variable	*Symbol*	*Definition*
Performance-pay		
Performance pay	*PPay**	Total performance-based compensation of CEO.
Performance pay-to-total compensation ratio	*PPay1*	CEO performance pay divided by CEO total compensation.
Performance pay-to-fixed-pay ratio	*PPay2*	CEO performance pay divided by CEO fixed compensation.
Board of directors		
Board size	*BS**	Total number of board members in a firm.
Ratio of board independence	*BInd*	The number of independent directors is divided by the total number of directors.
Accounting performance		
Net profit	*NP**	Net income for the period.
Operating profit	*OP**	Earnings before interest and tax.
Operating profit rate	*OPR*	Operating profit divided by total revenue for the period.
Marginal productivity	*MP*	The subtraction of the net revenue of the previous year from the current year's net revenue is divided by the subtraction of the previous year's total cost from the current year's total cost.
Return on assets	*ROA*	Profitability measure is calculated by dividing net profit by the book value of total assets.
Return on capital employed	*ROCE*	Operating profit is divided by the difference between the book value of assets and current liabilities.
Earnings per share	*EPS*	Net profit divided by the number of shares outstanding.
Stock market performance		
Stock return	*SRet*	The subtraction of the closing price of the previous day from the closing price of the current day divided by the closing price of the previous day. The average daily stock return has been annualized, subsequently.
Beta	*Beta*	A measure of systematic (market) risk. Calculated by dividing the product of covariance of the stock return and market return by the variance of the market return.
Hybrid performance[a]		
Tobin's Q proxy	*TQ*	The sum of market capitalization and book value of debt divided by book value of assets.
Capital structure and control variables		
Market capitalization	*MarCap**	Market capitalization is obtained by the year-end price with the number of equity shares.
Book value of assets	*BVA**	Book value of total assets.
Debt-to-market value of equity ratio	*DE*	The firm's capital structure is calculated by dividing the book value of debt by the market value of equity (market capitalization).

*Note: * Wherever applicable values in Swedish, Danish, and Norwegian companies in the sample are deflated by the year-ending exchange rate of the euro against Swedish, Danish, and Norwegian krone before the absolute values are used in the descriptive statistics and natural logarithm values are analyzed in correlation and multiple OLS regression analysis. [a] Tobin's Q proxy is referred as a hybrid performance measure since it is calculated by taking both stock market and historical accounting data due to the fact that debt is traded in several financial markets.*

$$PPay_{it} = \alpha_{it} + \beta_1 OPR_{i(t-1)} + \beta_2 MP_{i(t-1)} + \beta_3 BVA_{it} + \beta_4 DE_{it} + \beta_5 ROA_{i(t-1)} + \beta_6 ROCE_{i(t-1)} + \beta_7 EPS_{i(t-1)} + \beta_8 MarCap_{it} + \beta_9 TQ_{i(t-1)} + \beta_{10} SRet_{i(t-1)} + \beta_{11} Beta_{i(t-1)} + \beta_{12} BS_{it} + \beta_{13} BInd_{it} + \varepsilon_{it} \quad (1)$$

$$PPay1_{it} = \alpha_{it} + \beta_1 OPR_{i(t-1)} + \beta_2 MP_{i(t-1)} + \beta_3 BVA_{it} + \beta_4 DE_{it} + \beta_5 ROA_{i(t-1)} + \beta_6 ROCE_{i(t-1)} + \beta_7 EPS_{i(t-1)} + \beta_8 MarCap_{it} + \beta_9 TQ_{i(t-1)} + \beta_{10} SRet_{i(t-1)} + \beta_{11} Beta_{i(t-1)} + \beta_{12} BS_{it} + \beta_{13} BInd_{it} + \varepsilon_{it} \quad (2)$$

$$PPay2_{it} = \alpha_{it} + \beta_1 OPR_{i(t-1)} + \beta_2 MP_{i(t-1)} + \beta_3 BVA_{it} + \beta_4 DE_{it} + \beta_5 ROA_{i(t-1)} + \beta_6 ROCE_{i(t-1)} + \beta_7 EPS_{i(t-1)} + \beta_8 MarCap_{it} + \beta_9 TQ_{i(t-1)} + \beta_{10} SRet_{i(t-1)} + \beta_{11} Beta_{i(t-1)} + \beta_{12} BS_{it} + \beta_{13} BInd_{it} + \varepsilon_{it} \quad (3)$$

$$OPR_{it} = \alpha_{it} + \beta_1 PPay_{i(t-1)} + \beta_2 PPay1_{i(t-1)} + \beta_3 PPay2_{i(t-1)} + \beta_4 BVA_{it} + \beta_5 MarCap_{it} + \beta_6 BS_{it} + \beta_7 BInd_{it} + \beta_8 DE_{it} + \varepsilon_{it} \quad (4)$$

$$MP_{it} = \alpha_{it} + \beta_1 PPay_{i(t-1)} + \beta_2 PPay1_{i(t-1)} + \beta_3 PPay2_{i(t-1)} + \beta_4 BVA_{it} + \beta_5 MarCap_{it} + \beta_6 BS_{it} + \beta_7 BInd_{it} + \beta_8 DE_{it} + \varepsilon_{it} \quad (5)$$

$$ROA_{it} = \alpha_{it} + \beta_1 PPay_{i(t-1)} + \beta_2 PPay1_{i(t-1)} + \beta_3 PPay2_{i(t-1)} + \beta_4 BVA_{it} + \beta_5 MarCap_{it} + \beta_6 BS_{it} + \beta_7 BInd_{it} + \beta_8 DE_{it} + \varepsilon_{it} \quad (6)$$

$$ROCE_{it} = \alpha_{it} + \beta_1 PPay_{i(t-1)} + \beta_2 PPay1_{i(t-1)} + \beta_3 PPay2_{i(t-1)} + \beta_4 BVA_{it} + \beta_5 MarCap_{it} + \beta_6 BS_{it} + \beta_7 BInd_{it} + \beta_8 DE_{it} + \varepsilon_{it} \quad (7)$$

$$EPS_{it} = \alpha_{it} + \beta_1 PPay_{i(t-1)} + \beta_2 PPay1_{i(t-1)} + \beta_3 PPay2_{i(t-1)} + \beta_4 BVA_{it} + \beta_5 MarCap_{it} + \beta_6 BS_{it} + \beta_7 BInd_{it} + \beta_8 DE_{it} + \varepsilon_{it} \quad (8)$$

$$MarCap_{it} = \alpha_{it} + \beta_1 PPay_{i(t-1)} + \beta_2 PPay1_{i(t-1)} + \beta_3 PPay2_{i(t-1)} + \beta_4 OPR_{it} + \beta_5 MP_{it} + \beta_6 BVA_{it} + \beta_7 ROA_{it} + \beta_8 BS_{it} + \beta_9 BInd_{it} + \beta_{10} DE_{it} + \varepsilon_{it} \quad (9)$$

$$TQ_{it} = \alpha_{it} + \beta_1 PPay_{i(t-1)} + \beta_2 PPay1_{i(t-1)} + \beta_3 PPay2_{i(t-1)} + \beta_4 OPR_{it} + \beta_5 MP_{it} + \beta_6 BVA_{it} + \beta_7 ROA_{it} + \beta_8 BS_{it} + \beta_9 BInd_{it} + \beta_{10} DE_{it} + \varepsilon_{it} \quad (10)$$

$$SRet_{it} = \alpha_{it} + \beta_1 PPay_{i(t-1)} + \beta_2 PPay1_{i(t-1)} + \beta_3 PPay2_{i(t-1)} + \beta_4 OPR_{it} + \beta_5 MP_{it} + \beta_6 BVA_{it} + \beta_7 ROA_{it} + \beta_8 BS_{it} + \beta_9 BInd_{it} + \beta_{10} DE_{it} + \varepsilon_{it} \quad (11)$$

$$Beta_{it} = \alpha_{it} + \beta_1 PPay_{i(t-1)} + \beta_2 PPay1_{i(t-1)} + \beta_3 PPay2_{i(t-1)} + \beta_4 OPR_{it} + \beta_5 MP_{it} + \beta_6 BVA_{it} + \beta_7 ROA_{it} + \beta_8 BS_{it} + \beta_9 BInd_{it} + \beta_{10} DE_{it} + \varepsilon_{it} \quad (12)$$

In the empirical analysis involving several explanatory variables, it is likely that the nature of some of these variables is similar and as a result of the mutual association between the explanatory variables the problem of multicollinearity can arise, which can jeopardize the reliability of variables. For example, the mutual correlation between variables highlighting firm performance can lead to multicollinearity. Among other things, the principal component analysis (PCA) technique, which essentially is a dimension reduction technique, can help to filter out lesser important variables and thereby help to analyze important variables, known as principal components or factors, written as Z_{it} in the equation below (Cadima & Jolliffe, 1995).

$$Y_{it} = \alpha_{it} + \sum_{k=1}^{p} \beta_k Z_{it} + \beta_r R_{it} + \varepsilon_{it} \quad (13)$$

where,

- Y_{it} — explained variable of firm *i* in period *t*;
- α_{it} — intercept term;
- Z_{it} — corresponds to the *i*-th principal component;
- R_{it} — control variable of firm *i* in period *t*;
- ε_{it} — the random error term.

4. EMPIRICAL FINDINGS

The descriptive statistics of all the variables used in the analysis are presented in Table 2. The table illustrates the minimum and maximum as well as the range between the variable values for the period. The mean and standard deviation of the values are also shown in the table. The absolute values of the firm-level variables are presented in millions of euros for all the sample firms including those based in Sweden, Denmark, and Norway. Non-euro values are converted to euro values after deflating original values given in Swedish, Danish, and Norwegian krone by the year-ending exchange rate of the euro. It is noted that unlike the natural logarithmic values used in correlation and regression analyses the absolute values are given in the descriptive statistics.

Table 2. Descriptive statistics

Variable	*Range*	*Minimum*	*Maximum*	*Mean*	*Standard deviation*
*NP**	11668	-3789	7879	416	126.11
*OP**	11383	-1318	10065	678	148.23
OPR	1.09	-0.63	0.46	0.08	0.12
MP	14.00	-2.62	11.38	1.12	1.54
*BVA**	52857	4555	57412	14224	112.38
DE	2.20	0.00	2.20	0.59	0.43
ROA	0.52	-0.14	0.38	0.05	1.08
ROCE	0.67	-0.29	0.38	0.07	0.13
*EPS**	10.73	-4.76	5.97	1.16	1.68
*MarCap**	128358	956	129314	14088	195.92
TQ	16.23	0.18	16.41	1.83	2.54
SRet	13.02	-0.73	12.29	3.31	1.19
Beta	1.83	-0.37	1.46	0.36	1.43
*PPay**	28	0	28	5.84	7.62
PPay1	0.66	0	0.66	0.35	3.16
PPay2	1.92	0	1.92	0.52	2.42
BS	8	7	15	10	1.39
BInd	0.67	0.33	1	0.84	1.16

*Note: * In this table the absolute values of the variables are taken. The values in Swedish, Danish, and Norwegian companies in the sample are deflated by the year-ending exchange rate of the euro against Swedish, Danish, and Norwegian krone. Number of observations is 783.*

Regarding the accounting variables, the mean values of net profit and operating profit are €416 million and €678 million. The maximum value is €7.879 billion for net profit and €10.065 billion for operating profit. The standard deviation has been observed to be relatively high for both variables implying that values of both variables are highly dispersed around their mean values. The mean operating profit rate is 0.08 indicating that for every euro of sales, the companies generated 0.08 euros of profit (before interest and tax) on average. The maximum value of both *ROA* and *ROCE* is 0.38, indicating that the best return demonstrated by the companies is 0.38 euros for every 1 euro of assets owned or capital employed. The mean values of *ROA* and *ROCE* have been 0.05 and 0.07, respectively. The *EPS* on the other hand demonstrates a mean of 1.16, a maximum of 5.97, and a minimum of -4.76 with a standard deviation of 1.68 indicating that the companies show high variance in terms of their *EPS* generated during the study period.

The mean values of *TQ, SRet,* and *Beta* are 1.83, 3.31, and 0.36, respectively. The mean value of market capitalization is 14.088 billion euros indicates that on average the sample companies can be categorized as large-cap. Regarding the board of directors-related variables, it can be observed that the average size of the board of directors in the Nordic large-cap manufacturing sector is approximately 10 members. The mean value of the board independence ratio is 0.84 indicating that the boards of directors of the sample firms have been predominantly independent. For the performance pay measures ratio 1 (*PPay1*) measuring the amount of performance pay relative to total compensation indicates a mean value of 0.35 indicating that on average the CEOs of the sample companies received a performance bonus that was approximately 35% of the total pay. The maximum value is 0.66, which

shows that the highest ratio of performance pay was 66% of the CEO's total compensation. Illustrated by ratio 2 (*PPay2*), the mean for performance pay relative to fixed pay is 0.52 presenting that on average the performance pay was 52% of the fixed element of CEO compensation.

Table 3. Pairwise correlation matrix of variables

Variable	*BS*	*BInd*	*OPR*	*MP*	*BVA*	*DE*	*ROA*	*ROCE*	*EPS*	*MarCap*	*TQ*	*SRet*	*Beta*	*PPay*
BS	1	0.15	0.11*	0.03	0.13	0.11	0.06	0.01*	0.09	0.23	0.11	0.01	0.13	-0.23*
BInd	0.15	1	-0.11	-0.08	-0.08*	-0.01	-0.13	-0.04	-0.05*	-0.07	-0.06	0.18	0.08	0.33**
OPR	0.11*	-0.11	1	0.14	0.14	0.10	0.78	0.51	0.32	0.18	-0.00	0.00	-0.02	-0.12
MP	0.03	-0.08	0.14	1	0.09	-0.02	0.22	0.08	0.17	0.16	0.09	-0.01	-0.00	0.24*
BVA	0.13	-0.08*	0.14	0.09	1	0.08	0.06	-0.11	0.29*	0.61*	-0.20	-0.16	0.00	0.34**
DE	0.11	-0.01	0.10	-0.02	0.08	1	-0.07	-0.02	-0.12	-0.48*	-0.23	-0.03	-0.11	0.17
ROA	0.06	-0.10	0.78	0.22	0.06	-0.07	1	0.65**	0.38	0.34*	0.37	0.00	0.00	0.19
ROCE	0.01*	-0.04	0.51	0.08	-0.11	-0.02	0.65**	1	0.26	0.06	0.11	-0.02	0.01	0.29*
EPS	0.09	-0.05*	0.32	0.17	0.29*	-0.12	0.38	0.26	1	0.34	0.00	-0.06	0.16	0.26*
MarCap	0.23	-0.07	0.18	0.16	0.61*	-0.48*	0.34*	0.06	0.34	1	0.44	-0.00	0.04	-0.25*
TQ	0.11	-0.06	-0.00	0.09	-0.20	-0.23	0.37	0.11	0.00	0.44	1	0.17	-0.08	0.29*
SRet	0.01	0.18	0.00	-0.01	-0.16	-0.03	0.00	-0.02	-0.06	-0.00	0.17	1	-0.08	0.25*
Beta	0.13	0.08	-0.02	-0.00	0.00	-0.11	0.00	0.01	0.16	0.04	-0.08	-0.08	1	0.22*
PPay	-0.23*	0.33**	-0.12	0.24*	0.34**	0.17	0.19	0.29*	0.26*	-0.25*	0.29*	0.25*	0.22*	1

*Note: * Significant at a 5% level of significance. No correlation coefficient value is observed at 0.1% and 1% level of significance. Number of observations is 783.*

Table 3 reports pairwise coefficients of correlation between various pairs of variables. Overall, the coefficients of correlation between various pairs of independent variables are very low except for *ROA* and *ROCE*. On the other hand, the natural logarithm value of performance pay is significantly correlated with all the independent variables except for *OPR, DE*, and *ROA*. The same variable is significantly and negatively correlated with board size (*BS*) and the natural logarithm value of market values of firms (*MarCap*), and positively and significantly correlated with all other remaining independent variables. Board size is positively correlated with operating profit rate and return on capital employed, whereas board independence ratio is negatively correlated with book value of assets and earnings per share. Furthermore, the book value of assets variable is positively correlated with earnings per share and market capitalization of the sample firms. Similarly, the market capitalization variable is positively correlated with return on assets whereas it is negatively correlated with debt to equity ratio, which signifies the capital structure of the sample firms.

Table 4 highlights the effects of the various independent variables on the three performance pay measures (*PPay, PPay1*, and *PPay2*). The larger board size of firms negatively affects the performance-based component of the remuneration of the CEOs. The agency cost argument can be given to support this finding. In larger boards, it can be difficult to create a common understanding regarding "What is performance-based pay?", "Why it is important?", and "What should be its criteria?". This result is supported by Fahlenbranch (2009) and Harris and Raviv (2008), who find that in larger boards agency problems are more common. Therefore, hypothesis *H1a* is rejected. On the other hand, the empirical findings show that the more independent a corporate board is, the higher the proportion of performance-based pay of the CEO. The underlying argument of this finding is that independent directors can perform their key responsibilities related to monitoring, controlling, and checking managerial actions by aligning CEOs' remuneration with the firm performance, ceteris paribus. Therefore, hypothesis *H1b* is accepted. However, the accounting performance of firms (lagged by one year) does not affect the performance pay measures. On the contrary, there is some evidence of stock market-based measures (lagged by one year) positively affecting the performance pay measures. The firms generating higher levels of annualized stock return and exposed to higher levels of systematic (market) risk witness higher levels of performance-based compensation of the CEOs. An argument that can be given to highlight this effect is that in comparison to the lagged accounting performance measures, which are based on historical data, the lagged stock market indicators for being relatively futuristic can align the performance-based pay in the total compensation of the CEO more effectively. Also, the sample firms having a higher share of debt relative to the equity give a higher proportion of performance-based compensation to their CEOs in order to curtail the potential agency costs and financial distress costs by aligning the interests of the CEOs with those of the business organizations.

Table 4. Performance-pay variables — Multivariate OLS

Variables	*Dependent variables*		
	PPay	***PPay1***	***PPay2***
(Constant)	5.367	0.165	0.078
BS	-5.702**	-0.106**	-0.223**
BInd	5.727*	0.142**	0.333*
OPR	-11.831	-0.222	-0.321
MP	0.103	0.014	0.028
BVA	3.771	0.152*	0.377*
DE	0.105**	0.033***	0.109**
ROA	10.611	0.427	0.694
ROCE	0.508 (0.077)	0.758*** (6.269)	1.907*** (6.735)
EPS	0.406	-0.007	-0.037
MarCap	-0.714	0.120**	0.186**
TQ	0.304	0.011**	0.126*
SRet	0.003	0.014*	0.015*
Beta	1.494*	1.005*	0.134*
Pseudo-R^2	0.434	0.452	0.462
Durbin-Watson test	2.051	1.987	2.117

*Note: ***, **, and * significant at $p < 0.001$, $p < 0.01$, and $p < 0.05$, respectively. Number of observations is 783.*

Table 5 highlights the effects of the lagged values of the performance-based pay measures on the accounting measures of firm performance. The effects of the performance-based compensation of the CEOs variables are observed to be favourable on the accounting performance measures of the sample firms, in general. Higher performance-based compensation provides impetus to the CEO to improve the key accounting performance indicators to earn positive reactions from investors and other stakeholders. Therefore, hypothesis *H2a* is accepted. Board independence negatively affects the accounting performance measures. On the other hand, the relative share of debt and equity in the capital structure of firms negatively and positively affect their accounting performance, respectively. Notably, the board size does not affect the accounting performance measures of the sample firms.

Table 5. Accounting measures of firm performance — Multivariate OLS

Variables	*Dependent variables*				
	OPR	***MP***	***ROA***	***ROCE***	***EPS***
(Constant)	0.089	2.042	0.011	-0.025	2.434
PPay	0.165**	0.009	0.002*	0.004**	0.082**
PPay1	0.111**	1.267	0.101***	0.113***	0.018
PPay2	0.299***	0.497	0.041***	0.079***	-1.055
BS	0.021	-0.152	-0.024	0.012	0.787
BInd	-0.185***	-0.137	-0.069**	-0.114**	-1.047
MarCap	0.079***	0.321	0.051***	0.077***	0.821***
BVA	0.599**	-0.274	0.692***	0.061	1.703**
DE	-0.287***	-0.248*	-0.033**	-0.215***	-1.93***
Pseudo-R^2	0.574	0.578	0.582	0.587	0.581
Durbin-Watson test	2.112	2.117	2.103	2.115	2.102

*Note: ***, **, and * significant at p < 0.001, p < 0.01, and p < 0.05, respectively. Number of observations is 783.*

Table 6 highlights the effects of the lagged values of performance-based pay on the firm-level stock market and hybrid (Tobin's Q) performance measures. The effect of performance-based compensation variables, in general, is favourable to the abovementioned performance measures. Therefore, hypothesis *H2b* is accepted. Similar to its effect on the accounting performance measures, board independence of firms negatively affects the stock market measures, in general, and *TQ*. Furthermore, the board size of the firms favourably affects the performance measures. The proportion of debt in the total financing of firms unfavourably affects the given firm performance measures. Similarly, accounting performance favourably affects the firm-level stock market and hybrid performance measures.

Table 6. Market and hybrid measures of firm performance — Multivariate OLS

Variables	*Dependent variables*			
	MarCap	***SRet***	***Beta***	***TQ***
(Constant)	-0.938	-7.953	0.475	2.014
PPay	-0.011	4.993*	0.018*	0.137*
PPay1	0.120**	4.481*	-0.078*	2.297
PPay2	0.138**	2.321*	-0.066	0.967*
BS	1.139***	15.912	0.433*	2.485**
BInd	-0.097*	-72.983**	-0.478	-4.076***
OPR	3.916***	1.719**	1.367**	12.29***
MP	0.012	-2.432	-0.013	0.067
ROA	10.204***	2.61**	0.135*	0.314**
BVA	0.525**	6.822	-0.087	0.228**
DE	-0.991**	-3.763***	2.079**	-2.346***
Pseudo-R^2	0.525	0.527	0.512	0.514
Durbin-Watson test	1.988	1.916	1.923	1.943

*Note: ***, **, and * significant at p < 0.001, p < 0.01, and p < 0.05, respectively. Number of observations is 783.*

In the current study PCA has been applied to check the robustness of empirical findings ascertained with the help of multivariate OLS technique. Tables 7, 8, and 9 highlight the effect of principal factors on performance pay, accounting performance and stock market (including hybrid) performance measures, respectively.

Table 7. Performance-pay variables — Principal component analysis

Variables	*Dependent variables*		
	PPay	***PPay1***	***PPay2***
(Constant)	1.223	2.011	1.139
Z_{a1}	2.724*	1.106**	2.234**
Z_{a2}	1.027*	0.623**	0.119*
Z_{a3}	-1.631***	-0.222**	-0.321***
Z_{a4}	1.113*	0.714**	0.228**
BVA	1.221*	1.112*	0.817*
Pseudo-R^2	0.239	0.227	0.356
Durbin-Watson test	2.009	2.134	2.137

*Note: ***, **, and * significant at p < 0.001, p < 0.01, and p < 0.05, respectively. Number of observations is 783. PCA includes factors: accounting performance (Z_{a1}), stock market performance (Z_{a2}), board of directors (Z_{a3}), capital structure (Z_{a4}), and natural logarithm value of book value of assets (control variable).*

As shown in Table 7, the principal components highlighting accounting and stock market variables have favourable effects on all three measures of performance-based compensation. However, the board of directors' characteristics affect the same dependent variables adversely. Furthermore, firms having a higher proportion of debt for the given proportion of equity in their financing structure give a higher share of performance-based compensation to their CEOs.

Table 8. Accounting measures of firm performance — Principal component analysis

Variables	*Dependent variables*						
	NP	***OP***	***OPR***	***MP***	***ROA***	***ROCE***	***EPS***
(Constant)	-7.919	-12.121	-0.334	5.089	-0.221	-0.019	2.009
Z_{b1}	0.423***	0.359	0.765***	0.011	0.722***	0.074**	0.655**
Z_{a2}	3.009***	0.737*	2.119***	0.497	0.069***	0.089***	-1.109
Z_{a3}	-0.895***	-0.237*	-0.112***	-0.078	-0.124*	-0.212*	-0.787*
Z_{a4}	0.113	-0.744*	-0.095***	-0.097	-0.219**	-0.324**	-1.119**
BVA	0.431***	2.088*	0.089**	0.267*	0.102***	0.098*	0.927*
Pseudo-R^2	0.212	0.364	0.274	0.318	0.282	0.287	0.281
Durbin-Watson test	2.098	1.978	2.211	2.098	2.103	2.189	2.145

*Note: ***, **, and * significant at $p < 0.001$, $p < 0.01$, and $p < 0.05$, respectively. Number of observations is 783. PCA includes factors: performance pay (Z_{b1}), stock market performance (Z_{a2}), board of directors (Z_{a3}), capital structure (Z_{a4}), and natural logarithm value of book value of assets (control variable).*

Table 8 indicates that firms providing a relatively higher proportion of performance-based pay to their CEOs experience favourable effects on their accounting performance measures, in general. Also, the firms inviting positive reactions from investors in the stock market also deliver positive outcomes measured by the accounting performance indicators. Firms having larger board sizes and higher proportions of debt for the given level of equity adversely affect the accounting performance of the sample firms. Similarly, large-sized firms experience favourable accounting performance.

Table 9. Market and hybrid measures of firm performance — Principal component analysis

Variables	*Dependent variables*			
	MarCap	***SRet***	***Beta***	***TQ***
(Constant)	-0.116	-2.234	1.097	-0.114
Z_{b1}	0.221**	1.481***	1.278**	1.097**
Z_{a1}	0.109**	1.222**	0.166	0.814**
Z_{a3}	0.291***	0.724**	0.293**	0.885**
Z_{a4}	0.097	-0.683**	-0.112*	-1.076*
BVA	0.151*	0.098**	0.175*	0.097**
Pseudo-R^2	0.221	0.227	0.223	0.229
Durbin-Watson test	2.188	2.116	1.989	1.977

*Note: ***, **, and * significant at $p < 0.001$, $p < 0.01$, and $p < 0.05$, respectively. Number of observations is 783. PCA includes factors: performance pay (Z_{b1}), stock market performance (Z_{a2}), board of directors (Z_{a3}), capital structure (Z_{a4}), and natural logarithm value of book value of assets (control variable).*

Table 9 highlights that firms providing a relatively higher proportion of performance-based pay to their CEOs witness positive effects on their stock market performance measures. Furthermore, the firms delivering positive accounting performance invite positive reactions from investors in the stock market. Firms having larger board sizes and firm size (measured by book value of assets) positively affect the stock market performance of the sample firms. Firms having a higher proportion of debt for the given level of equity negatively affect the stock market performance of the sample firms.

Overall, the findings obtained by applying robustness tests are in sync with those obtained in the baseline multivariate OLS analysis.

5. CONCLUSION

The current study aims to explore whether board of directors' characteristics affect the relative share of performance-based pay in the total compensation of CEOs and second, whether performance-based compensation of CEOs has any impact on the firm performance in the manufacturing sector in the Nordic countries (Finland, Sweden, Norway, and Denmark). Regarding the first research question of whether the board of directors' characteristics influence the relative share of performance-based pay in the total compensation of CEOs, the empirical findings, in line with the agency theory, show that the board size of the firms affects CEOs' performance pay adversely. In other words, as the board size decreases (increases), the CEOs' performance-based compensation increases (decreases). The agency cost arguments can be given to support this finding. First, in larger boards, it can be difficult to create a common understanding regarding the meaning, importance and criteria of performance-based pay. Second, CEOs have more bargaining strength when the board size is smaller and consequently, they can have more control over determining their performance-based compensation. However, the above finding is opposite to that obtained by Larmou and Vafeas (2010), who underpin that as the boards start adding more members, they become more resourceful and as a consequence they start making more appropriate and rational decisions including aligning executive remuneration to the firm performance measures; nonetheless their finding conforms that of the current study only after board size becomes bigger than optimal size.

Similarly, the empirical findings disclose that more independent boards of directors give more performance-based pay to their CEOs. In other words, board independence favourably impacts the performance-based pay of the CEO. In accordance with the agency theory view, the finding indicates that in companies where the boards consist of a higher proportion of independent directors,

the quality of monitoring, controlling and curbing the managerial discretion and entrenchment is higher (Bebchuk et al., 2010). As a consequence, the independent boards of directors can effectively align the CEOs' performance-based compensation with the financial performance of the firms as a mechanism to reduce the agency cost by raising, first, the responsibility of the CEOs to improve the firm's financial performance and second, risk of losing a significant proportion of their total compensation in case the firms that the CEOs are affiliated to deliver poor financial performance. Similarly, relatively leveraged firms provide a higher proportion of incentivized compensation to their CEOs.

In reference to the second objective whether there is any association between the firm performance and the performance-based compensation of CEOs, the findings support a clear linkage between the CEOs' performance-based compensation and firms' accounting performance. Higher performance-based compensation can motivate CEOs to improve the key accounting performance indicators to earn positive reactions from investors and other stakeholders. These findings are in agreement with those ascertained by Chowdhury et al. (2023), who highlight that as the directors receive performance-based compensation the firms start experiencing improvements in both accounting and stock market performance. Incentivizing corporate directors can result in better alignment of interests of the directors and the firms, efficient leveraging of resources and enhancement of human, and relational capital; and all of these outcomes can further impact firms' performance and decision-making positively. However, there are several other studies, for example, Core et al. (1999) and Boakye et al. (2020) who have found a negative relationship between accounting performance measures and CEO compensation. A possible argument of the abovementioned inverse relationship is that independent directors may not be able to understand the risks involved in operational, and strategic decision-making, which is generally and largely in the purview of executive directors; and due to this detachment of independent directors, many boards comprising of higher proportion of independent directors may struggle to create the optimal incentives based remuneration contracts of their CEOs. Notably, the abovementioned detachment of independent directors is more likely to be observed in technology and knowledge-based businesses having significant reliance on intangible assets.

Furthermore, the findings disclose that a higher level of performance-based pay leads to improved stock market performance measures including hybrid (Tobin's Q) performance measures. These findings suggest that in firms where the CEOs are paid more through performance-based incentives, the stock market indicators of the firms experience improvements, henceforth, implying that the CEOs can be more efficient in running firm operations and enhancing shareholder value. From an alternative perspective, it can also be argued that investors reflect more confidence which can lead to positive stock market reactions in firms that are successful in aligning the CEO compensation with the firm performance. It is noteworthy that an increased level of performance-based compensation of the CEOs increases the firms' level Beta coefficients, implying that risk-averse CEOs can expose the firms to increased levels of market risk when they receive higher proportions of incentivized compensation, ceteris paribus.

Furthermore, the board size of the firms favourably affects the stock market performance measures, whereas no significant effects are observed on the accounting performance measures. Similarly, board independence, in general, negatively affects both accounting as well as stock market performance measures. Additionally, the proportion of debt in total financing of firms unfavourably affects both accounting and stock market performance measures.

The study makes several contributions to the extant literature. First, the current study is one of the very few studies that explore the phenomenon of the multiple dynamics and linkages related to performance-based compensation of CEOs, board of directors characteristics and firm performance in the Nordic corporate settings. Second, the current study contributes to theoretical literature by analyzing both total compensation as well as performance-based compensation against the total compensation alone of the CEOs. This is an important theoretical refinement as most of the previous studies have focused on total compensation instead of the performance-based element of CEO compensation. Third, the current study makes another theoretical contribution by underpinning that when investigating the linkages between performance-based compensation and firm performance, it is important to recognize performance-based compensation not as an exogenous phenomenon since it can be affected by several characteristics of the boards of directors.

The current study is not free from limitations either. The empirical analysis has been based on the data obtained from the large-cap manufacturing firms based in the Nordic. Therefore, it is difficult to draw inferences beyond large-cap manufacturing firms and outside Nordic. Similarly, an implicit assumption of the current study is that the institutional settings of all the Nordic nations are homogeneous, which can be challenged too. The performance-based pay proxies applied in the current study can have certain limitations too, which can be addressed by applying additional proxies to check the robustness of the empirical findings.

Furthermore, it is recommended that in future research endeavours a wider range of firms belonging to different industries and sizes (small, medium and large cap) can be studied to draw more objective inferences. Similarly, the adoption of a stakeholder view by researchers in problematization and research design instead of shareholder value maximization exclusively can enrich the quality of discussion pertaining to the discipline of executive remuneration.

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