Erasmus School of Economics

Bachelor Thesis in Financial Economics

CEO Compensation: Its Determinants and Impact on Firm Performance

Abstract

The following study aims to investigate the determinants of total CEO compensation and its ultimate effect on firm performance. Analysing a sample from the S&P500 over the period 2011-2018, this investigation provides a more current look at multiple theorised determinants relating to CEO, board and firm characteristics. The findings show that there are weaknesses in current corporate governance structures that have allowed CEOs to capitalise on inefficiencies through increased compensation. When isolating the effect of CEO compensation on firm performance, it was found that there is a positive relation showing that firms are efficient to a degree when it comes to aligning principal-agent interests.

Name Student: Kelder, S.G.J.

Student ID number: 498183

Supervisor: Dittmann, I.

Second Assessor: de Bliek, R.

Date: 28/2/22

Table of Contents

1. Introduction

The rising compensation packages of CEOs has been the subject of much debate in the public sphere as well as in academic literature. This is particularly true for US firms which, due to their size and influence, tend to be the topic of conversation. Between 1978 and 2020 top executives saw their realized compensation grow by 1,322% whilst S&P stock market growth reached 817%. These discrepancies are even more drastic when compared to the earnings growth of the 0.1% which was 341%, and the earnings growth of the typical worker which was a mere 18% in that same period (Mishel & Kandra, 2021). These findings will naturally bring into question what may have determined this outcome and why a firm may give out such compensation packages. To approach this question, it is first important to elaborate on the role of CEO compensation in corporate governance.

In a publicly listed firm, there is a separation of ownership and control whereby the *ownership* represents the shareholders and *control* the management of a public firm. This can also be defined as a principal-agent relation where the agents (management) acts on the behalf of the principal (shareholders). Under the assumption that both entities are utility maximisers, this principal-agent relationship has been known to lead to agency conflicts that come as a result of misaligned interests between the two parties (Jensen & Meckling, 1976). In the case of CEOs and shareholders, there is an incentive for a CEO to maximise personal wealth whereas the shareholders wish to maximise the total shareholder value. A commonly mentioned solution for reducing this misalignment is to introduce an equity component in agent compensation in addition to direct financial compensation which altogether makes up the total CEO compensation (Fama & Jensen, 1983).

It has been suggested that the inefficiencies that occur with this incentive alignment by the ownership are what could be leading to excess CEO compensation (Alves et al., 2015). To recognise where these inefficiencies may lie, it is important to identify what determinants play a role in CEO compensation and to what degree. Through this knowledge, particular corporate governance devices could be selected to construct a more efficient compensation package. From the current literature, there are several key sets of factors that have been suggested to be of influence with differing empirical support. These are: firm-specific characteristics, CEO specific characteristics, and board composition and nomination procedures (Alves et al., 2015; Hols, 2018).

As mentioned, the overarching goal of the ownership is to maximise its return to shareholders, which it achieves through the optimisation of firm performance. Therefore, it is

ultimately important to investigate the relation between CEO compensation and firm performance to recognise the efficiency of this relation and whether corporate governance can be of influence. This leads to the main research question of:

What effects do CEO background, board and firm characteristics have on CEO compensation and firm performance?

Through this investigation, several contributions will be made to the current literature. Firstly, a large proportion of the current literature in this area is based on data before the 2008 financial crisis. As this study will look to utilise the most recent data after most of the effects of the financial crisis have retracted, there could potentially be a new insight into the relation of these variables as a result of behaviour changes. Secondly, by identifying sources of inefficiencies this paper can provide a supporting role in further investigations of corporate governance controls that mitigate these inefficiencies. Lastly, this investigation will aim to highlight the overall influence of misaligned interests between the CEO and shareholders by also showing how CEO compensation impacts firm performance in recent data.

This thesis is structured as follows. The next chapter will establish the theoretical framework by means of a literature review. In the following chapter, this context will serve to develop the hypotheses which will be introduced. In chapter 4 the research methodology will be explained followed by chapter 5 where the results will be presented and analysed. Lastly, in chapter 6 there will be a conclusion that reviews these findings and their implications as well as a presentation of the limitations and suggestions for future research.

2. Literature Review

In this chapter, the theoretical framework will be established through the introduction of important relevant concepts such as the *principal-agent theory* and *managerial power theory* among others. It is through the understanding of these concepts that potential determinants can be introduced, and relations can be drawn. This will be achieved through the review of current key pieces of literature that will provide context and foundational support for this investigation.

2.1 Principal-Agent Theory

The *principal-agent theory* is a key component to the discussion surrounding CEO compensation. As already touched upon in the introduction, a principal-agent relationship exists when an agent has been enabled by a principal to enact/make decisions on their behalf. The problem that arises in this relationship is that each party has differing objectives this is also known as the *agency problem*. For example, an employee wants to maximise their earnings as much as possible whilst the employer would like to minimise costs as much as possible, creating a conflict. However, this conflict can be resolved by having the principal introduce an incentive for the worker through the utilisation of contracts that offer, for example, profit sharing (Jensen & Meckling, 1976). This alignment of interests through contractual design is known as *optimal contracting*.

Returning to the context of a firm, we see this issue commonly arise between the top executive (CEO) and the shareholders. The shareholders would encourage the pursuit of any positive NPV project whilst the CEO weighs their personal costs and benefits into their decisions as well, conflicting with the desires of the shareholders. These personal components of the CEO are linked to characteristics such as risk-aversion with CEOs tending to be more risk-averse than shareholders, coming at the cost of disproving riskier but positive NPV projects (Eisenhardt, 1989). We see that this introduces a cost to the shareholders known as an *agency cost*, and it is the role of the shareholders (principal) to minimise these costs as much as possible to maximise their utility (Jensen & Murphy, 1990).

Dalton et al. (2007) summarised the main approaches of aligning CEO interests into three categories. Firstly, is the independence of the board which is aimed at creating more objective monitoring of the CEO. Secondly is a market for corporate control which talks about an active mergers and acquisitions market that punishes inefficient CEOs. Lastly, is the equity ownership component that refers to the previously mentioned alignment of interests

through equity. The equity component also serves to introduce a more long-term perspective for the CEO who would then benefit from the company's continued success. This is as opposed to more direct financial incentives such as end-of-year bonuses which have been recognised to potentially cause CEOs to manipulate the accounting numbers and ignore long-term impacts of short-term projects (Conyon, 2006).

2.2 CEO Compensation and Corporate Governance

The principal-agent theory is not one without criticism with many academics highlighting the inefficiencies that arise as a result of weak governance structures. An important component of these criticisms is the *managerial power theory*. This theory essentially highlights the inability of directors to negotiate compensation with the CEO at arm's-length due to the power and influence the CEO can have over the board (Bebchuk & Fried, 2004). This power arises from governance structures that enable a culture that discourages directors to create conflict with the CEO. For example, it is often seen that the CEO is also the chair of the board, and as such there could be consequences for the positions of directors were they to engage in conflict with the CEO. Additionally, CEOs also tend to be a vital source of information of performance for the board thus allowing the CEO to have control of the agenda and information that is given (Jensen, 1993).

As a solution for strengthening corporate governance structures, Lee et al. (2018) find that the level of foreign directors in a board increases auditing quality. This puts the compensation of a CEO under greater scrutiny typically resulting in decreased compensation. Additionally, Chhaochharia and Grinstein (2009) find that an increased number of independent directors would strengthen corporate governance structures as they would have a more distant relation to the CEO and therefore see fewer agency conflicts. However, Crystal (1991) finds that many governance structures allow the CEO to be in control of the hiring of outside directors. Once again supporting the likelihood of a non-confrontational culture within firms. In summary, the literature would show that firms with weaker governance structures see greater agency problems which results in CEOs seeing increased compensation (Core et al., 1999).

Whilst the *managerial power theory* would at first seem adversary to the *optimal contracting theory*, the core goal of aligning the interests of the shareholders with the CEO remains. Except now it can be shown that there are additional conflicts within corporate governance structures that must be considered and identified when designing an optimal CEO

compensation package. This is supported by empirical studies which found that strong financial alignment does not fully eliminate agency costs indicating that there are additional factors at play, such as managerial power. Additionally, it was noted that while instruments such as stock options encourage risk-taking, they do not always encourage 'smart' risk-taking and thus they cannot fully ensure optimal decision making (Nyberg et al., 2010). Therefore, it is suggested that *contracting theory* does not fully hold in empirical research. Alternatively, there is empirical evidence that saw CEO compensation reduce when the percentage of ownership of the CEO was higher and when there was an internal board member with greater than 5% ownership (Lambert et al., 1993). This would go to support the initial claims of Jensen & Meckling (1976) that saw the importance of the role of equity in aligning principal-agent interests despite evidence showing this is not a flawless method of alignment.

2.3 CEO Compensation and Firm Performance

Thus far several reasons behind the lack of support of *contract theory* in empirical studies have been shown. The relation between agency costs and CEO compensation reveals that increased agency costs, which come as a result of various factors (e.g., weak corporate governance structure), increase CEO compensation whilst a reduction in agency costs sees the opposite effect. It is important to highlight the final step in this relation namely the ultimate impact on firm performance. In short, the literature would show that firms with greater agency problems see worse performance (Core et al., 1999). This is because, with greater agency problems there is, by definition, greater misalignment of shareholder and CEO interests. As shareholders are interested in optimising returns and securing the long-term success of the firm, any misalignment of this goal would detract from overall firm performance. However, there are indications in more recent literature that CEO interests and shareholder interests are more aligned than previously thought (Nyberg et al., 2010). As this study will make use of recent data, there may still be an overall positive relation between CEO compensation and firm performance. Because even though these compensation packages may not be fully efficient, they likely still largely steer the CEO in the direction the shareholders desire.

2.4 CEO Compensation and Firm Factors

The current literature has indicated several relations between CEO compensation and the characteristics of a firm. A well-established relation in the current literature is that of firm

size which has been recognised as increasing CEO compensation (Alves et al., 2015). The reasoning behind this is that when a firm is larger the CEO faces an increased level of complexity and must manage an increased number of dimensions. Therefore, as they ultimately face a more difficult task, they are compensated more to reward this increased demand for competency (Jensen & Murphy, 1990).

An additionally relevant firm factor that has shown indications of influencing CEO compensation is the financing/dividends of a firm. These factors relate to an additional source of agency problems in free cash flow (FCF), this is known as the *free cash flow problem*. FCF can be defined as the cash flow that is in excess of what is required to finance all positive NPV projects and more simplistically represents excess cash available within the firm (Jensen, 1986). Recalling that the interest of the shareholders is to maximize their return, the shareholders would prefer to see this FCF paid out to them through dividends. However, the CEO is often seen reinvesting these funds into marginal and even negative NPV projects to camouflage other underperforming projects when growth opportunities are limited. They can additionally direct these funds towards their compensation (Jensen, 1986). Therefore, the personal interest of the CEO creates inefficient allocations of funds that may limit the overall performance of the firm. A recognised control of this inefficiency in the literature is through the pay-out of dividends or increased leverage as this would limit the FCF available to the CEO (Farinha, 2003).

2.5 CEO Characteristics

The role of asymmetric information between the CEO and the shareholders is an important source of agency problems with shareholders unable to fully know the competency of their CEO before hiring them. Naturally, the shareholders would like to see the most competent CEO act on their behalf and manage the firm. Linking back to the role of firm size, it was shown that larger firms require a higher level of skill to manage due to increased complexity and shareholders are subsequently willing to pay for that. Thus, there is a relation between the level of competency of a CEO and their compensation with a more capable CEO typically seeing increased compensation (Jensen & Murphy, 1990). Therefore, indicators of competence are a crucial component for shareholders to determine what level of compensation would be appropriate and reduce this problem of information asymmetry. The most common proxy utilised in the current literature to highlight ability is education with a CEO that has completed more education indicating greater ability. This signalling of greater

ability, in turn, results in higher compensation as shareholders expect an implicit relation between education and performance (Graham, et al., 2011).

An additionally crucial indicator is that of experience. For this, there has been more variation in the current literature on what variables provide the best proxy for experience. The most utilized variables tend to be age and tenure (Alves et al., 2015). The logic behind using age is more straightforward with greater age indicating a greater potential someone has worked within a particular industry for a longer amount of time and thus gained more experience. Through this experience, they can find and process information quicker resulting in more informed decision making (Taylor, 1975). An increased tenure similarly suggests a CEO has encountered a greater number of different scenarios and thus experienced a larger variety of problems to learn from (Ryan & Wiggins, 2001).

However, the literature shows that the signalling of tenure is slightly more layered than that of age. The tenure of a CEO shows the length of time a CEO has been in their position at a firm. Thus, the longer this length of time spans the more time they have had to increase firm-specific knowledge that an outside hire could never obtain. Therefore, this knowledge would be seen as particularly valuable by the shareholders (Florackis et al., 2009). Furthermore, the current literature indicates that as tenure increases CEOs gain more power as their valuable knowledge makes them increasingly less replaceable. This would have direct consequences on the strength of corporate governance as discussed previously. Therefore, tenure does not only indicate firm-specific experience but also suggests greater power with both instances expected to increase CEO compensation (Finkelstein & Hambrick, 1989).

3. Hypothesis Development

This leads into the next section of this investigation where we will utilise the context of the current literature to develop hypotheses. The first of these hypotheses will relate to the background of a CEO, followed by board characteristics, firm characteristics and lastly performance.

3.1 CEO Background

Graham et al. (2011) suggested that the education of a CEO indicates greater ability. This is a quality that shareholders seek as they aspire to have the most competent agent act on their behalf. According to Jensen & Murphy (1990) shareholders, therefore, reward greater ability with greater compensation. Thus, the first hypothesis states:

H1: There is a positive relation between CEO education level and CEO compensation.

Furthermore, experience is another component to signalling the competency of a CEO. It was established that there are two commonly utilized proxies for experience which are age and tenure (Alves et al., 2015). It was found that as age increases, CEOs can find information quicker and make more informed decisions (Taylor, 1975). Thus, similarly to education, this would indicate a desirable quality in a CEO which the shareholders reward through greater compensation. This leads to the second hypothesis:

H2: There is a positive relation between the age of a CEO and CEO compensation.

Lastly, the tenure of a CEO reveals a more firm-specific ability of the CEO as a greater tenure would suggest greater experience in the role and thus lead to more consistent optimal decision making (Florackis et al., 2009). Additionally, a greater tenure also suggests greater CEO power as their firm-specific ability makes them less replaceable and their sphere of influence within the firm grows. As will be elaborated on further in the 'board characteristics' section, this power over the board will likely also lead to higher compensation (Finkelstein & Hambrick, 1989). Therefore, there is strong reason to see support for the following hypothesis:

H3: There is a positive relation between the tenure of a CEO and CEO compensation.

3.2 Board Characteristics

An important determinant of the compensation a CEO found in the current literature is the corporate governance structure. The *managerial power theory* represents a great threat to resolving agency conflicts through contract design. Core et al. (1999) summarised the position of the current literature best by finding that firms with weaker governance structures see greater agency problems which ultimately results in increased CEO compensation.

Jensen (1993) pointed out that the CEO is often also the chairman of the board and therefore has significant influence over the positions of directors. In this case, directors tend to not challenge the CEO on compensation to the extent they may wish to so they may maintain their positions, creating a board culture of non-confrontation. This leads to hypothesis 4 being:

H4: There is a positive relation between a CEO being the chairman of the board and CEO compensation

While having the CEO also be the chair of the board presents a valid threat to the *optimal contracting theory,* the number of foreign directors could provide a role in strengthening the corporate governance structure through increased auditing quality (Lee et al., 2018). Alternatively, it must be noted that less recent literature expressed concern that CEO power may extend to control over hiring outside directors (Crystal, 1991). However, due to the recency of the data utilised in this investigation, the expectation would be that results fall more in line with the findings of Lee et al. (2018).

H5: There is a negative relation between the percentage of foreign directors and CEO compensation

Lastly, Chhaochharia and Grinstein (2009) expressed an indication that a greater number of independent directors strengthens corporate governance structures due to their distance from the CEO. Therefore, the reduction in agency conflicts should result in lower CEO compensation. However, once again it must be considered that the reach of CEO power is not set in stone thus their influence could also reach independent directors through the hiring process (Crystal, 1991). Despite this, as more recent literature is optimistic on the role of independent directors the hypothesis will be the following:

H6: There is a negative relation between the percentage of independent directors and CEO compensation

3.3 Firm Characteristics

Moreover, the current literature provided a potentially significant source of agency problems in the form of the *free cash flow problem*. Jensen (1986) pointed out that additional free cash flow could prove detrimental to compensation optimization ultimately resulting in increased CEO compensation. However, certain firm factors such as the pay-out and leverage ratio would limit the FCF available thus reducing the potential for mismanagement of funds and limiting agency problems (Farinha, 2003). This leads to the following hypothesis:

H7: There is a significant relation between pay-out policy, financing and CEO compensation.

3.4 Firm Performance

Linking back to the *principal-agent theory,* the initial expectations of Jensen and Meckling (1976) signalled optimism over the potential that *optimal contract theory* would align the interests of the shareholders and the CEO, ultimately resulting in improved firm performance. As discussed, there are various faults in this initial line of reasoning through the identification of additional agency conflict sources (e.g., CEO as chair of the board). The key takeaway from the literature is best summarised by Core et al. (1999) who found that firms with greater agency problems see worse performance as there is, by definition, greater misalignment between the shareholders and the CEO. However, as Nyberg et al. (2010) pointed out, there is reason to believe that the criticism of *optimal contracting* is perhaps overstated with more recent data showing greater alignment between shareholder and CEO interests on average than previously thought. Therefore, when utilising recent data there is cause for optimism about the relation between CEO compensation and firm performance. This does not necessarily discard criticisms of the *optimal contracting theory,* but the current literature would suggest that despite some inefficiencies there should still be an overall positive effect between CEO compensation and firm performance. This leads to the final hypothesis being:

H8: There is a positive relation between CEO compensation and firm performance

4. Research Methodology

4.1 Data

To provide insight into various industries whilst ensuring sufficient data availability, this investigation will focus on companies from the S&P500. To make findings as relevant as possible to the current market climate, the most recent period that provided a complete dataset was chosen. Additionally, it was important to choose a period that limits the impacts of the 2008 financial crisis as this would skew collected data and not provide a representative image of the greater economic climate. This resulted in data being drawn from the period 2011-2018. Accounting for firms that did not have all the required variables available, this initially provided a dataset of 481 CEO-year observations. To provide a fully balanced panel dataset, firms that did not provide data on the full 8-year period were removed as well, resulting in a final dataset of 464 observations.

All variables for this investigation were drawn from various data vendors compiled by data platform Wharton Research Data Services (WRDS). The data regarding CEO background and compensation were drawn from ExecuComp except for CEO education which was provided by BoardEx. Variables regarding the background of a firm's board were found in the ISS database. Lastly, data concerning a firm's pay-out policy, financing, size and performance metrics were provided by Compustat.

4.2 Dependent Variables

CEO Compensation

To align CEO interests with that of shareholders a CEO has a compensation package compiled of both a direct and variable component (Jensen & Meckling, 1976). This mix of components makes it complicated for academic literature to share a consistent definition of what annual CEO compensation comprises of. The direct financial component in this investigation will be 'Total Direct Compensation' which is defined by the data source BoardEx to consist of direct salary, bonus, and the employer's pension contribution for that period. To evaluate the more variable component relating to equity, the variable 'Total Equity at Risk' is used, which is comprised of stock, options as well as any Long-Term Incentive Plan (LTIP) awards, with all valuations based on the closing stock price when the annual report is delivered. Ultimately CEO compensation[1] will be defined as the sum of 'Total

[1] Note: the terms 'CEO compensation', 'compensation' and 'earnings' will be used interchangeably, but all describe the same definition as stated here

Direct Compensation' and 'Total equity at Risk'. There is a tendency for income measurements to be right-skewed meaning that outliers can have an impact on the findings of the model. To correct this issue the natural logarithm will be utilised to ensure a more normal distribution thus providing an overall better fitting model (Alves et al., 2015).

Firm Performance

In the relevant literature, there is some discrepancy in what is used as a proxy for the performance of a firm. This investigation will utilise a market-based measure called Tobin's Q. This incorporates the future expectations of a firm, therefore providing a better indication of its long-term direction. This is as opposed to a backwards-looking accounting measure such as ROA which is more based on historical performance. Additionally, there is evidence to suggest more intangible assets will be captured using Tobin's Q, providing a more complete picture of the strategic as well as the profitable position of a firm (Bharadwaj et al., 1999). Elaborating on the specifics of Tobin's Q, the equation used in this investigation is:

$$Tobin's\ Q = \frac{Total\ Market\ Value\ of\ a\ Firm}{Total\ Asset\ Value\ of\ a\ Firm} \quad \textbf{(1)}$$

It is thus essentially a measure of the perceived market value against a firm's intrinsic value. A rating above 1 would indicate that a firm is valued more by the market than the replacement costs of its assets, and vice versa. Like the proxy for CEO compensation, there tends to be a possibility for the measure to be right-skewed and thus the natural logarithm is used to normalise this distribution.

4.3 Independent Variables

4.3.1 Firm Characteristics

Leverage Ratio

To provide an indication of a firm's financing, the debt-to-equity ratio is utilised to show leverage. This measure provides insight into the degree of debt that has been used to stimulate growth whilst also hinting at a level of risk that is associated with the firm from the perspective of the shareholder (Bhandari, 1988). A ratio higher than 1 would indicate a greater share of debt as opposed to equity and vice versa.

Pay-out Ratio & Dividend Yield

The pay-out ratio used is the percentage of net earnings that are distributed to shareholders. The dividend yield represents the ratio between the dividends paid to investors and the stock price at the time of recording. Together these variables reveal the share of income that investors receive directly from the firm, and as mentioned, give an indication of the degree to which the free cash flow problem is limited within a firm (Jensen, 1986).

4.3.2 Board Characteristics

Percentage of Foreign Directors

Obtaining the percentage of foreign directors comes with a slight complication as the S&P500 is comprised of many multinational companies and thus it is important to define when a director is considered 'foreign'. To provide the best estimate, the variable *Nationality Mix* is used, which is a ratio provided by BoardEx that shows the proportion of directors that are from different countries at the time of the annual report. With this comes the assumption that the most predominant nationality in a board is that of the 'local' directors and any nationality ranked below this is 'foreign'. The measure ranges from 0 to 1 with 0 indicating all members are of the same nationality and 1 meaning all are of different nationality.

Percentage of Independent Directors and Chair of Board

The percentage of independent directors is measured by calculating the ratio between the number of directors that have no material relationship with the firm and the total number of directors on the board. A percentage of 100% would mean all directors are independent. To indicate whether a CEO is also the chair of the board a dummy variable is used with 0 indicating they are not and 1 indicating they are.

4.3.3 CEO Background

Education

The education history of a CEO will be measured by counting the number of qualifications a CEO has. In this instance, a qualification means a diploma that is beyond high school education, for example, a CEO who has obtained 1 bachelor's and 1 master's degree will have 2 qualifications. Therefore, this measurement indicates the degree of academic development a CEO has undergone, providing the proxy for education.

Tenure and Age

Tenure is defined as the length of time (measured in years) a CEO has held their respective position at the time of the annual report, with, for example, 1.5 indicating a CEO has been in their position for 1 and a half years. Age is similarly the respective age of a CEO at the annual report date measured in years.

4.4 Control Variables

Firm Size

As mentioned, the size of a firm has been identified in current academic literature as a determinant of CEO compensation and thus is an important factor to control for to reduce any biases in the coefficients of the independent variables. There are a few methods with which to measure the size of a firm, but this investigation will utilise the natural logarithm of total assets which will also allow the variable to be more normally distributed.

ROA

Like firm size, the previous literature would indicate that the return on assets (ROA) has an established role in determining CEO compensation and is also controlled to eliminate biases. The ROA was calculated by finding the ratio between a firm's net income and total assets, essentially showing the profitability of a firm in relation to its assets.

4.5 Method

4.5.1 Multicollinearity

Upon defining the independent variables, it was first important to conduct checks for multicollinearity amongst them before setting up the final models. Because, if multicollinearity is present, the standard errors of the affected coefficients would increase and potentially lead to a failure to reject the null hypothesis (type II error). Thus, to reduce any potential biases that would influence the significance of the coefficients, it is important to conduct this check before any further model building.

The first test for multicollinearity will be via a Pearson correlation test, with any variables with a correlation of 0.8 or higher being investigated and likely removed as at this level of correlation there is an extremely high rate (over 80%) of type II errors (Grewal et al., 2004). For further verification, a Variance Inflation Factor (VIF) test will be conducted. In this test, a high score would indicate that a particular variable is highly collinear with other independent variables in the regression. Whilst there is not a consensus as to what VIF score

would definitively indicate multicollinearity, this investigation will utilise 3 as the threshold for a cut-off, providing a more cautious approach considering the sample size of the data (Thompson et al., 2017).

4.5.2 Pooled OLS Models

As the data collected is panel data, the model building begins by means of a pooled OLS multivariate regression. As pooled OLS assumes homoskedasticity, every regression will utilise White standard errors to improve the robustness of the standard errors. Additionally, as the dependent and independent variables are contemporaneous, the independent variables will be lagged by one reporting year to show the effect of compensation determinants on compensation and performance the following year. This is except for education which is time-invariant as well as age and tenure, as these are largely fixed effects and thus for these exceptions the contemporaneous values will be used. The process begins with models relating to CEO compensation. This starts with a model that checks the relevance of the control variables: firm size and ROA.

$$(CEO\ Compensation)_{i,t} = \beta_0 + \sum_j \beta_j (controls)_{i,t-1} + u_{i,t} \quad \textbf{(2)}$$

Where the betas represent the sensitivity of the specified characteristics with relation to CEO compensation and $u_{i,t}$ is the error term. Subsequently, every group of independent variables will be added model by model whereby each group represents the relevant independent variables as mentioned in the variable descriptions. For example, the 'CEO background' group is comprised of education, tenure and age. This ultimately results in the final model to investigate all the determinants of CEO compensation being:

$$\begin{aligned}(CEO\ Compensation)_{i,t} = \beta_0 + \sum_j \beta_j (controls)_{i,t-1} + \sum_k \beta_k (firm\ characteristics)_{i,t-1} \\ + \sum_l \beta_l (board\ characteristics)_{i,t-1} + \sum_m \beta_m (CEO\ background)_{i,t} + u_{i,t}\end{aligned} \quad \textbf{(3)}$$

For the final hypothesis we are purely interested in the relation between CEO compensation and firm performance. Therefore, for this model, the independent variables of equation 3 will be utilized as control variables to account for omitted variable bias as these are the theorized determinants of CEO compensation. This results in the following model:

$$(Firm\ Performance)_{i,t} = \beta_0 + \beta_1(CEO\ compensation)_{i,t-1} + \sum_j \beta_j(controls)_{i,t-1} + \sum_k \beta_k(firm\ characteristics)_{i,t-1} + \sum_l \beta_l(board\ characteristics)_{i,t-1} + \sum_m \beta_m(CEO\ background)_{i,t} + u_{i,t} \quad \textbf{(4)}$$

4.5.3 Robustness Developments

To allow for more substantiated inferences from both Equation 3 and 4, further robustness tests and developments will be undertaken.

This starts by utilising a Lagrange Multiplier test. With this test, a comparison will be made between the pooled OLS model and a random effects model. The test verifies whether the variances across entities are 0, meaning there are no panel effects, and a pooled OLS model should be preferred to a random effects model. If this null is rejected, then the opposite is true. The results of this test can be found in Table 1 in the appendix. For both models, the null is rejected meaning there are panel effects present, and a random effects model should be utilised.

After establishing the need to account for variance across entities, there is also a choice to be made between a random effects or fixed effects model. This decision can be supported utilising a Hausman test for which the null hypothesis states that there is no correlation between unique errors and the regressors of a model meaning a random effects model should be preferred. Table 2 in the appendix indicates a rejection of the null for the model of equation 4 but not equation 3. This means a random effects model is more suitable for equation 3 and a fixed effects model is better suited for equation 4. It must be noted that in fixed effects models any time-invariant variables will be eliminated as these models do not accommodate such variables (this does not apply to the random effects models).

The last robustness development to be made to the fixed/random effects models is to compare whether one-way or two-way clustering of standard errors can improve their fit and explanatory value. Thus far white standard errors have been used to correct for present heteroskedasticity however, these do not necessarily correct for autocorrelation across time. Therefore, by introducing one-way clustering the standard errors will become robust to correlation between error terms of the same entity over time. As autocorrelation within firms can be expected, one-way clustering makes sense. However, there is likely also autocorrelation within individual CEOs and thus there is motivation to introduce two-way clustering to cluster standard errors both across firms and individuals.

5. Results

5.1 Descriptive Statistics

Table 3. Descriptive Statistics

Variable	*Obs.*	*Mean*	*Std. Dev.*	*Min*	*Max*
Tobin's Q	464	2.459	1.495	.928	13.586
CEO Compensation	464	24168.407	18437.206	2521	218964
ROA	464	.073	.067	-.296	.326
Firm Size	464	4.726	.591	3.487	6.419
Leverage	464	1.817	8.938	-20.883	161.744
Payout Ratio	464	1.832	12.884	-26.896	220.164
Dividend Yield	464	1.784	1.712	0	12.415
Nationality Mix	464	.179	.197	0	.9
Chair of Board	464	.597	.491	0	1
Independent	464	.841	.084	.538	.938
Qualifications	464	1.976	.984	0	5
Tenure	464	5.239	4.822	0	24.8
Age	464	56.61	5.3	44	76

CEO compensation displayed in 1000s. Note that Tobin's Q and CEO compensation have not yet been transformed with the natural logarithm as they will be in the models

Table 3 displays the descriptive statistics of the variables used in modelling. Here we see that the sample is comprised of a total of 464 CEO-year observations from the period 2011-2018. Looking at the table there are a few notable insights that can be gathered. Firstly, it can already be inferred that the data for Tobin's Q is likely right-skewed with the minimum value being 0.928, the mean 2.459 and the maximum 13.586 showing that utilising the natural logarithm for this variable would be justified. A similar observation can be made for CEO compensation where the distance between the minimum and the mean is significantly smaller than the distance between the mean and the maximum.

Moreover, it can be seen from the nationality mix that firms are predominantly comprised of domestic directors. The mean for the 'chair of board' dummy indicates that a slight majority of the CEOs are also the chair of the board, which is a sizeable portion and in line with the observations laid out by Jensen (1993). The percentage of independent board directors appears high and with very low variation as seen by a low standard deviation of 0.084. This lack of variance is most likely the effect of regulation by the SEC as will be

elaborated on in this chapter. The mean number of qualifications reveal that the average CEO in the dataset has not pursued education beyond a master's diploma. Furthermore, the average tenure appears to be 5.2 years. There are of course exceptions highlighted by the maximum tenure where a CEO has enjoyed 24.8 years in their position. Lastly, the average age of a CEO in this dataset is 56.6 which appears appropriate when considering the career trajectory one must undergo to achieve the CEO position.

5.2 Correlation

As mentioned, multi-collinearity would have adverse effects on the significance of independent variables. Therefore, it is crucial to omit any multi-collinear variables to eliminate potential biases. This begins with a Pearson correlation test for all variables involved in modelling, which is displayed in Table 6.

As Table 6 shows, numerous variables exhibit a degree of correlation. The first deduction from this table is that no variables indicate a correlation of 0.8 or higher. Thus, as previously mentioned, it can be determined that there is no extreme likelihood of a type II error, and we can disregard concerns of multicollinearity. Additionally, whilst we cannot interpret their exact influence on each other prior to the regressions, we can discuss the associations between variables.

Firstly, the natural logarithm of Tobin's Q is significantly correlated to the control variables of firm size and ROA, signalling that their inclusion is relevant for the firm performance model. Furthermore, a negative significant relation is shown between Tobin's Q and the independence percentage as well as CEO qualifications. Lastly, there is a significant positive relation with Tobin's Q and CEO tenure.

When analysing the correlations with CEO compensation, firm size shows a significant positive relation. Unlike Tobin's Q there is no significant correlation between earnings and ROA, however, the relation remains positive. Additionally, there are significant positive relations between earnings and the chair of board dummy, independence percentage, tenure and age. Whilst not significant, it is notable that variables relating to dividends show negative relations as this is the desired effect for limiting the free cash flow problem.

There are a couple of other notable relations outside of the dependent variables. Firm size proves to be significantly positively correlated with dividend yield, nationality mix, chair dummy, independence percentage and age. This would further show that its exclusion would likely lead to omitted variable bias, again supporting its validity as a control variable.

The second test for multicollinearity described in the method was an analysis of the VIF test. In Table 4 in the appendix, the VIF scores for the variables of the CEO compensation model are shown. Here it is seen that none of the variables surpass the previously established threshold of 3 that would require their elimination from the regressions. Table 5 in the appendix shows the same information for the firm performance model. Similarly, these scores do not surpass the threshold of 3 and can all be included in the regressions. Overall, these two tests both appear to confirm that multicollinearity is not a significant issue for these variables and therefore all variables will continue to be included.

Table 6. Pearson Correlation Table for Multicollinearity

Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*	*(13)*
(1) LnQ	1.000												
(2) LnComp	0.075	1.000											
	(0.109)												
(3) ROA	0.610*	0.078	1.000										
	(0.000)	(0.095)											
(4) Firm Size	-0.638*	0.204*	-0.291*	1.000									
	(0.000)	(0.000)	(0.000)										
(5) Leverage	-0.012	0.021	-0.009	0.028	1.000								
	(0.800)	(0.649)	(0.843)	(0.541)									
(6) Payout Ratio	0.073	0.039	-0.056	-0.024	-0.013	1.000							
	(0.116)	(0.406)	(0.232)	(0.599)	(0.786)								
(7) Dividend Yield	-0.027	0.066	0.102*	0.209*	0.079	-0.027	1.000						
	(0.568)	(0.154)	(0.029)	(0.000)	(0.090)	(0.563)							
(8) Nationality Mix	0.030	0.023	0.007	0.137*	0.030	-0.040	0.235*	1.000					
	(0.517)	(0.627)	(0.879)	(0.003)	(0.513)	(0.394)	(0.000)						
(9) Chair of Board	-0.033	0.360*	-0.005	0.223*	0.096*	0.052	0.216*	0.041	1.000				
	(0.480)	(0.000)	(0.919)	(0.000)	(0.038)	(0.261)	(0.000)	(0.379)					
(10) Independent	-0.095*	0.246*	0.065	0.209*	-0.026	0.040	-0.008	0.050	0.327*	1.000			
	(0.041)	(0.000)	(0.162)	(0.000)	(0.582)	(0.389)	(0.859)	(0.282)	(0.000)				
(11) Qualifications	-0.105*	-0.008	-0.104*	0.068	0.086	-0.055	-0.025	0.048	0.034	-0.017	1.000		
	(0.023)	(0.858)	(0.025)	(0.143)	(0.063)	(0.236)	(0.588)	(0.306)	(0.468)	(0.723)			
(12) Tenure	0.119*	0.214*	-0.049	-0.084	-0.055	0.002	0.019	-0.060	0.154*	0.005	0.007	1.000	
	(0.011)	(0.000)	(0.295)	(0.070)	(0.235)	(0.970)	(0.690)	(0.200)	(0.001)	(0.908)	(0.889)		
(13) Age	0.018	0.141*	0.176*	0.226*	0.062	0.002	0.292*	-0.001	0.294*	0.049	-0.135*	0.031	1.000
	(0.694)	(0.002)	(0.000)	(0.000)	(0.181)	(0.974)	(0.000)	(0.991)	(0.000)	(0.297)	(0.004)	(0.511)	

*CEO compensation and Tobin's Q transformed with the natural logarithm. P-values shown in parentheses with *, **, ***, = significant at 10%, 5% and 1% respectively.*

5.3 Results on CEO Compensation

After addressing concerns of multicollinearity, it is then possible to develop the models. This firstly begins with pooled OLS regressions on the CEO compensation variable. As mentioned, the first model will consist of purely the control variables. In Table 7 column (1) it is shown that this model reveals a significant positive relation between the firm size variable and CEO compensation at the 1% level. Therefore, it can be said that as a firm becomes larger (in terms of total assets) it can be expected that CEO compensation increases. This is in line with the current literature which argued this relation to be present due to the increased complexity of tasks a CEO of a larger firm faces as opposed to one of a small one (Jensen & Murphy, 1990). Converse to expectations, ROA does not appear to be significantly related however, the nature of its relation (i.e., positive) to CEO compensation does follow expectation with the same line of reasoning as firm size.

Moving through the developments to the complete pooled OLS model for CEO compensation (as described by equation 3) in column (4), we see an improvement of the r-squared from 0.04 in model (1) to 0.19 in model (4). Therefore, we can infer that there is an improved explanatory value through the addition of the respective variable groups. Moreover, there are now 4 further significant variables in addition to firm size.

Starting with variables relating to the characteristics of a CEO, it can firstly be seen that there is a significant positive relation between CEO compensation and tenure at the 1% level. This is in support of hypothesis 3 in which it was expected to see this positive relation because a longer tenure would serve as a proxy for greater experience in a role as well as indicating greater CEO influence resulting in greater compensation (Finkelstein & Hambrick, 1989). It can be noted however, that the overall impact on CEO compensation is comparatively small showing only a 0.024 increase in the log compensation variable per additional year a CEO held their position on average ceteris paribus. Moving on to qualifications, we see an insignificant negative relation. It is interesting to see a negative relation here as the literature recognizes education to signal ability which should result in higher compensation (Graham et al., 2011). This negative relation could perhaps stem from the nature of the chosen variable whereby a value of 2 would already indicate a CEO has completed a bachelor's and a master's degree (the mean value as seen in Table 3) so it could be that any additional education beyond this point is not necessarily valued by firms as an indicator of ability. However, because of the fact it is an insignificant relation we can already determine that there is no support for hypothesis 1. Lastly, there is an insignificant negative

relation for the age variable. Here we similarly see the opposite of what would be expected as it was expected that age would serve as an indicator for experience and thus result in higher compensation (Florackis et al., 2009). Regardless, the insignificance of this variable means there is no support for hypothesis 2.

Continuing to the variables related to the board structure, it is firstly shown that there is a significant positive relation between CEO compensation and the chair dummy at the 1% level. Hypothesis 4 was supported by the reasoning that when a CEO is also the chair of the board, their influence on director nomination would result in favourable compensation packages as directors would have an incentive to not oppose the CEO and put their positions at risk (Bebchuk & Fried, 2003). The results seen in column (4) support this hypothesis by showing that when the CEO is also chairman of the board there is an increase to the log compensation variable of 0.300, on average, ceteris paribus. Furthermore, we see that there is a positive significant relation between the board independence percentage and compensation at the 10% level. It was found that a 1% increase in board independence results in a 0.585 increase of the log compensation variable, on average, ceteris paribus. It is notable that this variable is not significant in model (3) showing that it was possibly affected by omitted variable bias relating to CEO background variables. Ultimately its significance in model (4) would serve as evidence to oppose hypothesis 6 where it was expected that additional independent directors would reduce agency conflicts and result in lower CEO compensation (Chhaochharia & Grinstein, 2009). A possible reason for this could be the regulation enforced by the SEC that requires NYSE listed companies to have a majority independent board and a fully independent compensation committee (Hughes et al., 2021). This could mean firms in the S&P500 do not provide sufficient insight on this front as US firms do not provide significant variation in the percentage of independence (as seen in Table 3). Lastly, there is an insignificant positive relation for the nationality mix variable. For hypothesis 5 it was expected that a greater foreign proportion would mean greater auditing quality and thus lower compensation (Lee, et. al., 2018). Due to insignificance, it can be determined that there is no support for hypothesis 5 in this investigation.

Finally, hypothesis 7 expected a significant relation between pay-out policy, financing and CEO compensation. Looking at model (4), of the firm-related variables only the pay-out ratio is significant at the 5% level. The pay-out ratio is shown to have a negative relation to CEO compensation with an increase by one percentage point in the pay-out ratio resulting in a 0.002 reduction to the log compensation variable on average ceteris paribus. This is in line with the literature which highlighted that more dividends would limit the free cash flow

problem (Jensen, 1986). However, it must be noted that a coefficient of 0.002 is modest relative to other significant variables therefore the role of the pay-out ratio in determining compensation is very limited. Together with the fact that leverage and dividend yield both proved to be insignificant, there is inconclusive evidence to support hypothesis 7.

Table 7. Pooled OLS Regressions of CEO Compensation

Independent Variables	*Controls*	*Firm*	*Board*	*CEO*
	(1)	*(2)*	*(3)*	*(4)*
ROA_t-1	0.451	0.491	0.276	0.488
	(0.364)	(0.327)	(0.571)	(0.297)
FirmSize_t-1	0.201***	0.208***	0.123**	0.152***
	(0.000)	(0.000)	(0.026)	(0.005)
Leverage_t-1		-0.000	-0.001	-0.000
		(0.923)	(0.617)	(0.942)
PayOutRatio_t-1		-0.000	-0.001	-0.002**
		(0.847)	(0.276)	(0.034)
DividendYield_t-1		-0.009	-0.023	-0.027
		(0.624)	(0.145)	(0.108)
NationalityMix_t-1			0.000	0.044
			(0.999)	(0.706)
ChairofBoard_t-1			0.358***	0.300***
			(0.000)	(0.000)
Independent_t-1			0.554	0.585*
			(0.107)	(0.077)
Qualifications				-0.013
				(0.605)
Tenure				0.024***
				(0.000)
Age				-0.003
				(0.691)
Constant	8.97***	8.95***	8.71***	8.32***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	406	406	406	406
R^2	0.040	0.041	0.147	0.188
F-statistic	6.64	2.82	8.81	8.44
(*p*-value)	0.001	0.016	0.000	0.000

*Each model introduces an additional set of variables starting with controls, then firm characteristics and finalizing with the addition of CEO characteristics. All independent variables lagged by 1 year (except CEO characteristics) and regressed against the natural logarithm of CEO Compensation. Note that some observations have been dropped due to missing data. P-values shown in parentheses with *, **, ***, = significant at 10%, 5% and 1% respectively.*

To further verify these results, several robustness checks will be conducted on model (4) in Table 7. As described in the method this begins with a Lagrange Multiplier test. The outcome of this test was a rejection of the null meaning that a random effects model provides a significantly better fit than the pooled OLS model (*see Table 1 in the appendix*). Then a

Hausman test yielded an insignificant result meaning a random effects model would also be superior to a fixed effects model (*see Table 2 in the appendix*). Lastly, as a final check of robustness one-way and two-way standard error clustering is introduced. Each model described in this process is shown in Table 8.

Table 8. Robustness Development of CEO Compensation Model

Independent Variables	*RE*	*FE*	*1-Way*	*2-Way*
	(1)	*(2)*	*(3)*	*(4)*
ROA_t-1	-0.074	-0.636	-0.074	0.488
	(0.911)	(0.464)	(0.890)	(0.324)
FirmSize_t-1	0.174	0.369	0.174**	0.152*
	(0.134)	(0.681)	(0.039)	(0.058)
Leverage_t-1	0.002	0.002***	0.002	-0.000
	(0.133)	(0.009)	(0.522)	(0.945)
PayOutRatio_t-1	-0.003***	-0.005***	-0.003	-0.002**
	(0.000)	(0.000)	(0.215)	(0.033)
DividendYield_t-1	-0.003	0.016	-0.003	-0.027
	(0.917)	(0.685)	(0.914)	(0.268)
NationalityMix_t-1	0.075	0.108	0.075	0.044
	(0.756)	(0.844)	(0.728)	(0.800)
ChairofBoard_t-1	0.220***	0.179*	0.220***	0.300***
	(0.005)	(0.097)	(0.003)	(0.001)
Independent_t-1	0.420	0.033	0.420	0.585
	(0.389)	(0.959)	(0.345)	(0.307)
Qualifications	-0.012	-	-0.012	-0.013
	(0.750)		(0.751)	(0.729)
Tenure	0.033***	0.041***	0.033***	0.024***
	(0.000)	(0.000)	(0.000)	(0.004)
Age	-0.002	-0.007	-0.002	-0.003
	(0.750)	(0.278)	(0.743)	(0.762)
Constant	8.60***	8.31**	8.60***	8.32***
	(0.000)	(0.011)	(0.000)	(0.000)
Observations	406	406	406	406
R^2	0.168	0.118	0.168	0.188
F-statistic		8.39		4.06
(p-value)		0.000		0.000
$Wald\ Chi^2$	75.55		46.21	
(p-value)	0.000		0.000	

*All independent variables lagged by 1 year (except CEO characteristics) and regressed against the natural logarithm of CEO Compensation. Columns (1) and (2) display random effects and fixed effects models respectively. Column (3) displays a random effects model with standard error one-way clustering. Column (4) displays a random effects model with two-way standard error clustering firms and individuals. Note that Qualifications are excluded in FE models due to time-invariance. P-values shown in parentheses with *, **, ***, = significant at 10%, 5% and 1% respectively.*

Columns (1) and (4) of Table 8 show that introducing two-way clustering to the random effects model improves the r-squared from 0.168 to 0.188 signalling an enhanced fit. There are minimal changes in the coefficients between model (4) of Table 7 and model (4) of

Table 8 however, there are changes in the significance of certain variables as can be expected with the influence clustering has on standard errors. The increased robustness sees a reduction in the significance level of firm size which is only significant at the 10% level in the two-way clustered model rather than 1% as seen in the pooled OLS model. Additionally, the board independence percentage is now no longer significant at the 10% level meaning there is insufficient evidence to support hypothesis 6. Aside from these exceptions, the robustness checks indicate that the inferences from the remaining variables continue to hold under increased scrutiny.

5.4 Results on Firm Performance

After investigating the relations to CEO compensation, the last relation of interest that remains is how compensation impacts subsequent firm performance (as described by equation 4). Where the theorised determinants of CEO compensation are utilised as control variables to isolate the relation between compensation and performance. Table 9 displays a similar progression of models as seen for the CEO compensation models. Starting with a pooled OLS model, a significant Lagrange Multiplier indicated that a random effects model would be preferable to pooled OLS (*see Table 1 in the appendix*). This then leads into a Hausman test which also proved to be significant and thus a fixed effects model would further enhance the explanatory value of the model (*see Table 2 in the appendix*). Lastly, one-way and two-way clustering is introduced to increase the robustness of the standard errors. As can be seen in columns (1) and (5) there is an improvement in the r-squared from the pooled OLS model to the two-way clustered fixed effects model of 0.265 with the latter model indicating an r-squared of 0.890.

The final model in column (5) shows that there is a significant positive relation between the firm performance variable and the CEO compensation variable at the 1% level. The model shows that an increase in log earnings leads to an improvement of the log of Tobin's Q the following year of 0.120, on average, ceteris paribus. This is in line with the expectations of hypothesis 8 which expected a positive relation between these variables. The reasoning behind this was that compensation packages are in theory designed to incentivise improving the overarching goal of firm performance (Jensen & Murphy, 1990). Thus, verification of this relation in model (5) highlights that there are direct benefits to the current design of CEO compensation for the selected firms, the implications of which will be discussed further in the following chapter.

Table 9. Robustness Development of Firm Performance Model

Independent Variables	*Pooled OLS*	*RE*	*FE*	*1-Way*	*2-Way*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
LnComp_t-1	0.088**	0.155***	0.148***	0.147***	0.120***
	(0.010)	(0.000)	(0.000)	(0.000)	(0.001)
ROA_t-1	3.000***	1.168**	0.455	0.455	0.607
	(0.000)	(0.016)	(0.381)	(0.135)	(0.290)
FirmSize_t-1	-0.508***	-0.499***	0.130	0.130	0.170
	(0.000)	(0.000)	(0.523)	(0.308)	(0.455)
Leverage_t-1	-0.000	-0.001**	-0.001	-0.001	-0.001**
	(0.957)	(0.027)	(0.101)	(0.601)	(0.015)
PayOutRatio_t-1	0.005***	0.002**	0.000	0.000	0.000
	(0.000)	(0.014)	(0.570)	(0.767)	(0.803)
DividendYield_t-1	-0.008	0.035**	0.036*	0.036**	0.015
	(0.404)	(0.038)	(0.062)	(0.018)	(0.297)
NationalityMix_t-1	0.304***	0.546***	0.816***	0.816***	0.712***
	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
ChairofBoard_t-1	0.034	-0.014	0.021	0.021	0.065
	(0.413)	(0.724)	(0.667)	(0.614)	(0.158)
Independent_t-1	-0.439*	-0.249	-0.119	-0.119	0.070
	(0.052)	(0.434)	(0.761)	(0.675)	(0.834)
Qualifications	-0.002	-0.017	-	-	-
	(0.892)	(0.511)			
Tenure	0.006	0.005	0.002	0.002	0.009
	(0.237)	(0.411)	(0.707)	(0.603)	(0.389)
Age	0.007*	0.004	0.002	0.002	0.005
	(0.080)	(0.146)	(0.498)	(0.572)	(0.133)
Constant	2.00***	1.34***	-1.56	-1.58	-1.79
	(0.000)	(0.015)	(0.180)	(0.014)	(0.135)
Observations	406	406	406	406	406
R^2	0.625	0.546	0.017	0.017	0.890
F-statistic	72.55		3.96	7.47	4.77
(p-value)	0.000		0.000	0.000	0.000
$Wald\ Chi^2$		132.05			
(p-value)		0.000			

*All independent variables lagged by 1 year (except CEO characteristics) and regressed against the natural logarithm of Tobin's Q. Note that some observations have been dropped due to missing data. Column (1) displays a pooled OLS model with robust standard errors. Columns (2) and (3) display random effects and fixed effects models respectively. Column (4) displays a fixed effects model with standard error one-way clustering. Column (5) displays a fixed effects model with two-way standard error, clustering firms and individuals. Note that Qualifications are excluded in FE models due to time-invariance. P-values shown in parentheses with *, **, ***, = significant at 10%, 5% and 1% respectively.*

6. Conclusion

6.1 Findings

Referring back to the main research question we can now display the effects of CEO, board and firm characteristics on CEO compensation and the subsequent link to the performance of a firm by analysing the hypotheses. This will be done by first reviewing the hypotheses relating to CEO characteristics, followed by board characteristics, firm characteristics, and finally the hypothesis relating to firm performance.

Starting with hypothesis 1, there was an expectation from the current literature that education would serve as an important proxy for experience. Shareholders seek experience in their CEOs to provide assurances of competency with a more experienced CEO expected to perform more optimally (Graham et al., 2011). As a desired characteristic, shareholders would reward additional experience with increased compensation (Jensen & Murphy, 1990). However, there is no support found for hypothesis 1 as the relations in the model are not significant. It is possible that using the number of diplomas as a proxy for education played a role in this as this does not indicate the quality of education which could be a more important component shareholders consider. Therefore, this investigation may have isolated only a portion of the signalling effects of education. Hypothesis 2 similarly found no support in the analysis. Again, this variable was supposed to capture a portion of the signalling effects of experience however, the results show that age is not a key determinant of CEO earnings. Moving on to hypothesis 3, we do find significantly positive effects providing support for the hypothesis. This is likely since tenure was expected to be a determinant of earnings for two reasons. Firstly, tenure would show firm-specific experience which is a more focused and prized asset to the shareholder and likelier to be rewarded (Florackis et al., 2009). Secondly was that it provides an indication of managerial power within a firm as a greater number of firm-specific skills make the CEO less replaceable, improving their influence over the board and ultimately their compensation (Finkelstein & Hambrick, 1989). Because of this two-dimensional aspect of tenure, there was a high likelihood of its significance, which proves to be present within the dataset. However, its overall influence on compensation is not of a very high level and some variables carry more weight in the analysis.

In hypothesis 4 we see a further focus on the potential power of a CEO over the board of directors. The literature suggested that having the CEO also be the chair of the board would prove problematic as it would create a non-confrontational culture whereby directors fear repercussions of opposing the CEO (Jensen, 1993). For hypothesis 4 we do find a

significant positive relation and therefore see support of the hypothesis. From this, it can be deduced that whilst CEOs should be distanced from the decisions surrounding their compensation, there are weaknesses in corporate governance structures that still allow influencing of directors. Ultimately, these findings provide insight into the lack of control the board hold over the CEO on average. For hypothesis 5, foreign directors were supposed to strengthen the corporate governance structure due to their distance from the CEO's influence (Lee et al., 2018). As we see no significant relation in the models, no support has been found for this hypothesis and we cannot say the percentage of foreign directors influences CEO compensation for this dataset. As the last of the board characteristics hypotheses, hypothesis 6 predicted that a greater percentage of independent directors would result in decreased CEO compensation. Following the robustness checks in Table 8, it can be determined that this hypothesis similarly sees no support due to insignificant results. Perhaps, as stated by Crystal (1991), the influence of a CEO proved to be a determining factor in eliminating the function of independent directors. Additionally, this dataset may not have provided the best foundation to investigate this relation as SEC regulations have resulted in a vast majority of firms having an identical percentage of independent directors.

With hypothesis 7 we wanted to investigate the portion of the research question that was aimed at uncovering the effect of firm characteristics on CEO compensation. By doing so, we were able to determine whether the free cash flow problem could be limited through financing or pay-out ratios. In the results, we ultimately find partial support for this hypothesis through the significance of the pay-out ratio. As expected by the literature this relation is negative, highlighting that the payment of dividends does reduce the potential misdirection of funds as suggested by Farinha (2003). However, the coefficients reveal a very minor impact on CEO compensation and therefore, whilst significant, the pay-out ratio is not a large determinant of compensation. This means that when it comes to corporate governance, this investigation shows that the payment of dividends is the most impactful mechanic for reducing agency problems that result in increased CEO compensation.

Lastly, for hypothesis 8 we find a significantly positive relation meaning, taking the determinants into account, CEO compensation does have a positive effect on firm performance for this dataset. This is a key finding as it demonstrates the initial findings of Jensen and Meckling (1976) in which there was optimism for the optimal contract theory. Additionally, these findings would fall in line with the suggestions of Nyberg et al. (2010) in which it was proposed that shareholder and CEO interests tend to be more aligned in the modern market than previously thought. These findings would go to show that this is highly

likely the case and provide insight to the literature by showing that perhaps the concerns of large misalignment are overstated or outdated in the current market.

In summary, the first component of the main research question can be answered by revealing that characteristics relating to CEO background and the board have positive effects on CEO compensation. We see that there is strong evidence to support the *managerial power theory* as both the tenure and chair position of the CEO proved to have a significant positive effect on CEO compensation. By answering this component of the main research question, we can identify the weaknesses in current corporate governance structures that allow for compensation inefficiencies. Therefore, this investigation provides valuable insight to shareholders who can utilise this knowledge to introduce corrective mechanics to limit these inefficiencies. For example, CEO term limits could be introduced to negate the increasing irreplaceability of a CEO as their tenure increases. Additionally, more scrutiny could be placed on the decision to award CEOs with the board chair position. As for the portion of the main research question relating to firm characteristics, we saw that there are minor negative effects on CEO compensation due to the role of pay-out policy in limiting the free cash flow problem. Linking to the last component of the main research question, this investigation showed that despite notable inefficiencies in corporate governance structures, we do still currently see that CEO compensation has a significant positive effect on subsequent firm performance. Meaning that there is a sizeable alignment of interests between the shareholder and the CEO and that there are successes in the current designs of CEO compensation structures.

6.2 Limitations & Suggestions

Whilst conducting the investigation for this paper several limitations arose that could be focused on in further research. Firstly, an enhancement of the dataset would provide a more comprehensive overview of the chosen period as the number of observations in this investigation was limited by data that was readily accessible within a certain length of time however, with further research this may be enlarged. Secondly, is the possible inclusion of additional control variables. For example, this dataset does not include variables for the existence of compensation committees, which would certainly play a role in limiting the influence of other determinants as these should (in theory) increase scrutiny of CEO compensation. This could prove to be an interesting point of further research as these

committees could also be subject to the *managerial power theory,* so their effectiveness has the potential to vary much like the board independence ratio.

Furthermore, the usage of Tobin's Q as a measure of firm performance sees some divided opinions and for future research, it may therefore be interesting to analyse the return to shareholders instead. This would give less of an indication of market expectations but could provide more focus on the direct agency costs some determinants will have. It was also noted that SEC regulations likely played a role in the results regarding the independence of directors. Therefore, to further investigate this relation, it would perhaps be beneficial to investigate markets or datasets whereby there is a greater variance in director independence between firms. Lastly, there could be adjustments made to the proxy for education, as the number of qualifications may indicate what level of diploma a CEO has obtained but not necessarily the quality of education they received. Utilising a proxy for education quality like university rankings could further isolate the signalling effects of a CEO's education.

References

Alves, P., Couto, E. B., & Francisco, P. M. (2015). Executive pay and performance in portuguese listed companies. *Research in International Business and Finance*, *37*, 184–195.

Bhandari, L. C. (1988). Debt/Equity Ratio and Expected Common Stock Returns: Empirical Evidence. *The Journal of Finance*, 43(2), 507–528. https://doi.org/10.2307/2328473

Bharadwaj, A. S., Bharadwaj, S. G., & Konsynski, B. R. (1999). Information Technology Effects on Firm Performance as Measured by Tobin's q. *Management Science*, 45(7), 1008–1024.

Bebchuk, L. A., Fried, J. M., & National Bureau of Economic Research. (2003). Executive compensation as an agency problem (*Ser. Nber working paper series, working paper no. 9813*). National Bureau of Economic Research.

Bebchuk, L. A., & Fried, J. M. (2004). *Pay without performance : the unfulfilled promise of executive compensation*. Harvard University Press.

Conyon, M. J. (2006). Executive Compensation and Incentives. *Academy of Management Perspectives*, 20(1), 25–44.

Core, J. E., Holthausen, R. W., & Larcker, D. F. (1999). Corporate governance, chief executive officer compensation, and firm performance. *Journal of Financial Economics*, 51(3), 371–406.

Crystal, G. S. (1991). *In search of excess: the overcompensation of American executives.* W.W. Norton.

Chhaochharia, V., & Grinstein, Y. (2009). Ceo compensation and board structure. *The Journal of Finance*, *64*(1), 231–261.

Dalton, D. R., Hitt, M. A., Certo, S. T., & Dalton, C. M. (2007). 1 The Fundamental Agency Problem and Its Mitigation. *The Academy of Management Annals*, 1(1), 1–64.

Eisenhardt, K. (1989) Agency theory: An assessment and review. *Academy Management Review*, 14, 427-465.

Fama, E. F., & Jensen, M. C. (1983). Separation of Ownership and Control. *The Journal of Law and Economics*, 26(2), 301–325.

Farinha, J. (2003). Corporate Governance: A Survey of the Literature. *SSRN Electronic Journal.*

Finkelstein, S., and Hambrick, D. C. (1989) Chief executive compensation: A study of the intersection of markets and political processes. *Strategic Management Journal*, 10, 121-134.

Florackis, C., Kostakis, A., & Ozkan, A. (2009). Managerial ownership and performance. *Journal of Business Research*, 62(12), 1350–1357.

Graham, John R., Si Li, Jiaping Qiu, and National Bureau of Economic Research. 2011. *Managerial Attributes and Executive Compensation*. Cambridge, Mass.: National Bureau of Economic Research

Grewal, R., Cote, J. A., & Baumgartner, H. (2004). Multicollinearity and Measurement Error in Structural Equation Models: Implications for Theory Testing. *Marketing Science*, 23(4), 519–529.

Hols, Jeroen. (2018, June 30). *The effect of CEO background on CEO compensation and firm performance*. *Accounting & Financial Management.*

Hughes, B., Bautista, J., Dempsey, K., & Fang, N. (2021). *IPO Insights: Assembling Your Public Company Board of Directors*. Www.orrick.com. Retrieved December 21, 2021, from https://www.orrick.com/Insights/2018/06/Assembling-Your-Public-Company-Board-of-Directors

Nyberg, A. J., Fulmer, I. S., Gerhart, B., & Carpenter, M. A. (2010). Agency Theory Revisited: CEO Return and Shareholder Interest Alignment. *Academy of Management Journal*, 53(5), 1029–1049.

Jensen, M.C., Meckling, W., (1976). Theory of the firm: managerial behaviour, agency costs and capital structure. *J. Financ. Econ. 3*, 305–360.

Jensen, M.C. (1986). Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers. *The American Economic Review*, 76(2), 323–329.

Jensen, M.C., and Murphy, K. (1990) Performance pay and top management incentives. *Journal of Political Economy*, 98, 225-264.

Jensen, M. C. (1993). The Modern Industrial Revolution, Exit, and the Failure of Internal Control Systems. *The Journal of Finance*, 48(3), 831–880.

Lambert, R., Larcker, D., Weigelt, K., 1993. The structure of organizational incentives. *Administrative Science Quarterly,* 38, 438—461.

Mishel, L., & Kandra, J. (2021, August 10). CEO pay has skyrocketed 1,322% since 1978: CEOs were paid 351 times as much as a typical worker in 2020. *Economic Policy Institute*. https://www.epi.org/publication/ceo-pay-in-2020/

Ryan, H. E., and Wiggins, R. A. (2001) The influence of firm- and manager-specific characteristics on the structure of executive compensation. *Journal of Corporate Finance*, 7, 101-123.

Sang, C. L., Mooweon, R., & Jongchul, Y. (2018). Foreign monitoring and audit quality: evidence from korea. *Sustainability*, *10*(9).

Taylor, R. N. (1975). Age and experience as determinants of managerial information processing and decision making performance. *Academy of Management Journal, 18*(1), 74–81.

Thompson, C. G., Kim, R. S., Aloe, A. M., & Becker, B. J. (2017). Extracting the Variance Inflation Factor and Other Multicollinearity Diagnostics from Typical Regression Results. *Basic and Applied Social Psychology*, 39(2), 81–90.

Appendix

Table 1. Lagrangian Multiplier Tests for Random Effects

	Coef.	
	(1)	**(2)**
Chi-Square test value	114.28	229.19
P-value	0.0000	0.0000

Column (1) displays the LM test for the model for equation 3 and column (2) displays the LM test for the model for equation 4

Table 2. Hausman Tests

	Coef.	
	(1)	**(2)**
Chi-Square test value	13.47	63.98
P-value	0.1985	0.0000

Column (1) displays the Hausman test for the model for equation 3 and column (2) displays the Hausman test for the model for equation 4

Table 4. Variance Inflation Factor for CEO Compensation Model

Variable	*VIF*	*1/VIF*
Firm Size	1.373	0.728
Chair of Board	1.329	0.752
Age	1.3	0.769
ROA	1.239	0.807
Dividend Yield	1.234	0.81
Independent	1.202	0.832
Nationality Mix	1.085	0.922
Tenure	1.059	0.944
Qualifications	1.051	0.951
Leverage	1.031	0.97
Payout Ratio	1.016	0.984
Mean VIF	1.175	0

Table 5. Variance Inflation Factor for Firm Performance Model

Variable	*VIF*	*1/VIF*
Firm Size	1.421	0.704
Chair of Board	1.416	0.706
Age	1.3	0.769
LnComp	1.268	0.788
ROA	1.265	0.79
Dividend Yield	1.237	0.808
Independent	1.217	0.822
Nationality Mix	1.109	0.902
Tenure	1.085	0.922
Qualifications	1.052	0.951
Leverage	1.031	0.97
Payout Ratio	1.017	0.983
Mean VIF	1.202	0