ERASMUS UNIVERSITEIT ROTTERDAM

# *IS CEO PAY OUT OF CONTROL?*

**Master Thesis**
**Financial Economics**

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As the executive compensation is a highly debatable topic, it is of high interest to investigate whether the CEO pay is out of control and whether this has a negative impact on the firm performance. Up until now, the extensive research conducted on this topic still shows mixed results. This paper is focused on US publicly held companies, for the time period from 2010 up until 2017. The empirical results led to the conclusion that executive compensation is not out of control, contrariwise, it positively affects the accounting and market performance of the company. Additionally, an externally recruited CEO is more beneficial for the firm as this leads to a boost in firm ROA. Moreover, there is enough evidence for a simultaneous causality between CEO compensation and firm performance, meaning that a higher executive reward leads to a better performance and at the same time only the better performing companies can afford to highly compensate their executives.

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# 1. Introduction

According to Hembree (2018), the average pay of the CEO has increased by 1000% since 1950s; if in the 50s a typical CEO was earning 20 times more than the average employee, nowadays he earns 361 times more than a worker. This turn of events raised more and more interest among the public opinion.

One of the biggest scandals in the US corporate world has GE's CEO in the spotlight. Jeffrey Immelt was selected as the CEO of General Electric, one of the biggest conglomerates in the world in 2000, when the company had a market value of $600 billion. Nowadays the company is being valued at around $222, while its CEO had a total compensation of $21.3 million in 2016 (Alsin, 2017). Moreover, according to Alsin (2017), in 2016, the CEOs in the United States of America had an average compensation of around $15.6 million, which is a huge amount of money and not always reasonable. This is a current problem in the financial world, which many companies are facing.

Furthermore, the peer benchmarking procedures for setting executive compensation gain more and more amplitude amongst the public opinion. One essential thing to comprehend with regards to this is that CEO skills are very much company specific and they cannot be compared to high-class sportsmen, for example, who are also making millions, yet their skills are portable, and they would have the same added value to any team they would join (Clifford, 2017). However, there are strong arguments which support the view that good CEOs can jump from industry to industry, as what is required from them are most often leadership skills (vision, a value-driven approach to business, trustworthiness, staying ahead) rather than industry specific knowledge and these skills and previous experience have to been compensated accordingly (McGrath, 2016). Therefore, the research question of this paper arises:

***"Does the peer benchmarking compensation process lead to the CEO pay to be out of control in the US?"***

Amongst academics, the topic of peer benchmarking related to executive compensation also had aroused enough curiosity, therefore this is a subject of interest for both the academic world as well as for practitioners. Peer benchmarking is the mechanism of a company choosing similar firms in terms of industry, size, performance, and calculating the level of compensation to offer to its CEO by basing it on the compensation offered by its peers (Hirst, 2011). Therefore, the main points of interest for the current research are: does the peer benchmarking drive the executive compensation up; is there

enough motivation to use this method of setting the CEO pay; are executives paid more in order to compensate them for a high-performing company?

The main results of the paper indicate that the CEO pay is not out of control, on the contrary, it has positive effects on the performance of the company. The findings suggest that peer benchmarking positively affects CEO compensation, i.e. if a company has its sales above the industry median, its CEO will be, on average, compensated with $6.8 million more. Moreover, an outside CEO is more beneficial for a firm, as he/she will have a positive effect on how the firm performs, boosting the ROA by 3.3%. Additionally, offering the executive a higher total compensation will also positively affect the accounting and market performance of the company, an increase of $1 million in total compensation leads to a 22.4% higher ROA and 20.6% higher stock return.

The paper is organized as follows: The Literature Review section will present the relevant theoretical and empirical evidence on which are the drivers of executive compensation, with the focus on peer benchmarking, CEO talent, the agency problem and the rival firm performance; as well as the derived hypotheses which are tested throughout the rest of the paper. The Data & Methodology chapter introduces the sample used in the analysis, the measures employed and how the variables were constructed, accompanied by descriptive statistics and the defined models. The following section, Results presents the obtained results of the hypotheses testing, as well as multiple explanatory tables. The Conclusion & Discussion section displays the findings of the current research and their alignment with the findings from existing literature, followed by the limitations encountered and recommendations for future research. The closing chapter is the Appendix which presents all the relevant figures and tables.

# 2. Literature Review

The pattern of how executive compensation is constructed has been an appealing topic for both academics and practitioners. However, even after long debates (what are the reasons for the high paychecks and how much the top executives should actually be receiving (Gabaix, Landier, & Sauvagnat, 2013) and the introduction of new possible drivers of executive compensation, there still is not a significant conclusive vision regarding this topic. In this section, several of the most common concepts which are believed to drag the CEO pay up are discussed. Going forward, the terms "CEO", "executive" and "manager" are used interchangeably in this paper. This chapter ends with a short summary about how the current research fits within the existing literature.

## 2.1 Peer benchmarking

One of the most researched concepts with regards to executive compensation is the benchmarking against peers. This is a common practice in many corporations when establishing the proper pay for an executive; the compensation committee takes as a basis the pay methods of comparable or peer companies, in terms of size and industry, similar accounting performance and market-to-book (M/B) ratios, as well as similar credit ratings, similar geographic or product diversity and firms in the S&P500 are more likely to choose other S&P500 peers (Bizjak, Lemmon, & Nguyen, 2011). Bizjak, Lemmon, & Nguyen (2011) argue that because the peer choice is a rather subjective decision, there are biases which come along this decision: they find that the peer firms are systematically larger than the sample firms and the firms can favor peers with higher pays. Thus, it may be that competitive benchmarking is used opportunistically, in order to inflate the CEO pay. In light of this, Holmstrom and Kaplan (2005) believe that "[…] we need more effective benchmarking not less of it" (p. 19).

Bizjak, Lemmon, & Naveen (2008) find in their S&P 500 firms sample that benchmarking is a prevalent mechanism and has a significant impact on CEO compensation. They research two distinct views with regards to benchmarking: (1) it leads to growth in executive pay which is not connected to the performance of the firm and (2) benchmarking is a pragmatic and efficacious technique used to determine the market salary needed to maintain valuable human capital. They find supporting evidence for the second view and argue that the application of competitive benchmarking is used as a retention device for CEOs. In a follow-up paper by Bizjak, Lemmon, & Nguyen (2011), the authors find that peer groups are formed in a way that biases compensation upward, particularly in firms outside the S&P 500.

In their research, Garvey & Milbourn (2003), find that executive pay is most sensitive to industry or market benchmarks when such benchmarks are drifting upwards. This is in line with the opinion that substantial facets of executive compensation are not chosen as an ex-ante efficient contracting settlement, but rather as a manner to shift wealth from shareholders to executives, ex-post. The authors argue that if external benchmarks are chosen to assess performance, these should be enforced in both up and down scenarios (Garvey & Milbourn, 2003).

Shin (2016) examines how firms establish the CEOs' pays by employing benchmarking information and addresses two distinct prospects: pay equity and managerial power. His findings suggest that peer benchmarking is more strongly used to boost CEO compensation upward and that overpaid CEOs are capable to bypass the usage of benchmarking and pay decreases as they have a greater influence over the board (Almazan & Suarez (2003) argue that CEOs gain more power with longer tenures and in many companies with weak boards the CEO can "manipulate" them at his own will) (Shin, 2016), which is aligned with the agency problem prescribed below.

Faulkender & Yang (2012) introduce the concept of benchmarking through the disclosure mechanism, imposed in 2006 as a regulatory requirement in the US (SEC votes to adopt changes to disclosure requirements concerning executive compensation and related matters (SEC, 2006)). They find that strategic peer benchmarking did not fade away after augmented disclosure. On the contrary, it enhanced at firms with low institutional ownership, low director ownership, low CEO ownership, busy, large and non-intensive monitoring boards and at firms with new CEOs (Faulkender & Yang, 2012). They question whether disclosure regulations are the proper way to repair the problems with compensation processes and argue that the disclosure approach made peer benchmarking a rightful mechanism to motivate the high levels of CEO compensation.

DiPrete, Eirich, & Pittinsky (2010) tackle the peer benchmarking problem by introducing a behavioral factor: the "status" view. They argue that firms choose their compensation peers on the basis of the question "Whom are we like?" and because they want to be associated with high-reputation companies rather than low-reputation ones, the status becomes a signal for quality and the ground for a higher compensation for its executives. Moreover, they find that the SEC imposed disclosure regulation has hurt the CEOs as now the legitimacy of their compensation schemes and the chosen peers might be called in question by the shareholders (DiPrete, Eirich, & Pittinsky, 2010).

## 2.2 CEO talent

Whilst many academics focus on researching how firms are more likely to benchmark against peers that offer superior recompenses to their CEOs, some academics present an alternating illustration: selecting greatly remunerated counterparts depicts a reward for unobserved CEO talent.

Albuquerque, De Franco, & Verdi (2012) introduce the hypothesis that firm's selection of highly paid peers and CEO pay represents compensation for CEO talent and find significant results in supporting their view. They show that the peer pay effect seizes to a great extent the necessity to compensate CEOs more for their talent, while the self-serving behavior, even though it has an explanatory power for the peer pay effect, it has a less economically significant explanation.

Moreover, Cremers & Grinstein (2013) find for their S&P 1500 sample that CEO compensation levels do not hinge on whether CEO talent is firm-specific, which is inconsistent with the talent competition argument. Their results suggest that the specific features that cause executive compensation could be driven both by outside market constraints and by internal negotiations and also that the relevance of each force varies depending on the talent pool composition that the firm confronts (Cremers & Grinstein, 2013).

Falato, Li, & Milbourn (2010) focus on the CEO talent market in their research and find robust proof that talented CEOs exhibit substantially superior turnover rates, and their nominations drive to significantly higher pay and greater firm performance; moreover, the evidence is stronger for CEOs hired from outside the firm.

## 2.3 Agency problem

Bebchuk & Fried (2003) tackle the agency problem with regards to executive compensation. They conclude that managerial authority significantly influences the set-up of executive compensation in companies with a segregation of ownership and control; they state that executive compensation should be seen as part of the agency problem itself. Their results show that because managers are concerned with their compensation schemes, their authority might steer to the adoption of compensation agreements that deliver poor or even corrupted stimulants for the firm as a whole (Bebchuk & Fried, 2003).

Harris (2009) argues that the agency problem is the driver behind the exorbitant CEO salaries and urges the academics, as well as the public debate to focus on this issue, instead of "sensationalizing" the size

of CEO compensation. The author supports the idea that the way the executive compensation packages are set-up nowadays has a negative impact on the firm performance, thus aggravating the agency problem (Harris, 2009).

Aggarwal & Samwick (1999) also support the principal-agent model and find in their sample of 1500 largest publicly traded companies in the US that the pay-performance responsiveness of CEOs is lowering in the variance of their firms' stock returns for a variety of measures of compensation.

## 2.4 Rival firm performance

Aggarwal & Samwick (1999) introduce the concept of rival firm performance and its implications for executive compensation. They show that strategic interactions between companies can justify the deficiency of comparative performance-based stimuli in which compensation decreases with opponent firm performance. Their results are empirically significant in showing a positive sensibility of compensation to rival firm performance that is rising in the extent of industry rivalry (Aggarwal & Samwick, 1999).

***Table 1.*** *Literature Overview*

| Authors & year of publication | Concept | Findings |
|---|---|---|
| **Bizjak, Lemmon, & Naveen (2008)** | Peer benchmarking | The application of competitive benchmarking is used as a retention (maintain valuable human capital) device for CEOs. |
| **Bizjak, Lemmon, & Nguyen (2011)** | Peer benchmarking | Peer groups are formed in a way that biases compensation upwards. |
| **Garvey & Milbourn (2003)** | Peer benchmarking | The industry and market benchmarks are only enforced when they are upward shifting and are beneficial for the CEOs' pays. |
| **Shin (2016)** | Peer benchmarking | Peer benchmarking is more strongly used to boost CEO compensation upwards. |
| **Faulkender & Yang (2012)** | Peer benchmarking | They question whether disclosure regulations are the proper way to repair the problems with compensation processes and argue that the disclosure approach made peer benchmarking a rightful mechanism to motivate the high levels of CEO compensation. |
| **DiPrete, Eirich, & Pittinsky (2010)** | Peer benchmarking | Companies want to be associated with high-reputation peers, this signaling quality and serving as the basis for higher compensation for their executives. |
| **Albuquerque, De Franco, & Verdi (2012)** | CEO talent | The peer pay effect seizes to a great extent the necessity to compensate CEOs more for their talent. |
| **Cremers & Grinstein (2013)** | CEO talent | Their results suggest that the specific features that cause executive compensation could be driven both by outside market constraints and by internal negotiations and also that the relevance of each force varies depending on the talent pool composition that the firm confronts. |
| **Falato, Li, & Milbourn (2010)** | CEO talent | Find robust proof that talented CEOs exhibit substantially superior turnover rates, and their nominations drive to significantly higher pay. |

| | | |
|---|---|---|
| **Bebchuk & Fried (2003)** | Agency problem | Their results show that because managers are concerned with their compensation schemes, their authority might steer to the adoption of compensation agreements that deliver poor or even corrupted stimulants for the firm as a whole. |
| **Harris (2009)** | Agency problem | Argues that the agency problem is the driver behind the exorbitant CEO salaries and the way the executive compensation packages are set-up nowadays has a negative impact on the firm performance, thus aggravating the agency problem. |
| **Aggarwal & Samwick (1999)** | Agency problem | The pay-performance responsiveness of CEOs is lowering in the variance of their firms' stock returns for a variety of measures of compensation. |
| **Aggarwal & Samwick (1999)** | Rival firm performance | They show that strategic interactions between companies can justify the deficiency of comparative performance-based stimuli in which compensation decreases with opponent firm performance. |

## 2.5 Hypotheses

The review of the existing literature on the researched topic will serve as the base for defining the hypotheses of this paper. These hypotheses will be further on used in the development of the next sections: Methodology and Results.

When reviewing previous literature, it is still inconclusive whether the peer benchmarking is used opportunistically or whether it is a good mechanism for identifying the correct and necessary amounts of CEO compensation. Bizjak, Lemmon, & Nguyen (2011) find that the peers are selected in a way that boosts the compensation upwards, this idea being supported by Garvey & Milbourn (2003) and Shin (2006) which find that the peer benchmarks are only enforced when this benefits the executive. However, Bizjak, Lemmon, & Naveen (2008) argue that the competitive benchmarking is a good mechanism for retaining valuable human capital in the firm while Faulkender & Yang (2012) support the view that the disclosure regulations made peer benchmarking a lawful way to motivate exorbitant executive compensations. Therefore, the first hypothesis is as follows:

***$H_0$1: Peer benchmarking has no effect on CEO compensation.***

Other academics focus on investigating the effect of CEO talent on their compensation schemes. Albuquerque, De Franco, & Verdi (2012), as well as Cremers & Grinstein (2013) believe that it is necessary to offer higher compensation to talented CEOs as they drift upwards the firm performance. Therefore, the second hypothesis is as follows:

***$H_0$2: Talented CEOs have no effect on firm performance.***

A third concept investigated in light of executive compensation is the agency problem. Bebchuk & Fried (2013) argue that because of the agency problem, CEOs are compensated too highly, which damages the firm performance as a whole. Harris (2009) supports this view and finds that because firm performance decreases due to exorbitant executive compensation, the agency problem is aggravating even more. Therefore, the third hypothesis is:

***$H_0$3: Higher paid CEOs have no effect on firm performance.***

## 2.6 Fit within the existing literature

As it was shown in the above paragraphs of the Literature Review, there is significant research on the topic of executive compensation and its relation to firm performance. The available literature is divided in four main categories, in relation to the executive compensation drivers. For the current paper, these drivers are all combined in order to come up with a more complex understanding of the CEO pay theme: how is it determined; who does it affect; is it a positive or negative effect and which explanatory variables have an effect on it?

The cross-sectional side of the sample are the US publicly held firms, mainly with a focus on the S&P index, the same as the other discussed papers, however, as for the time-series side, this research has its focus on a more contemporary period of time (2010-2017) than the rest, as it is believed that this will exhibit more meaningful and substantial findings for the current state of the economic and financial world.

Furthermore, a new addition to the research and which has not been encountered before with regards to this topic, is the investigation of a simultaneous causality between executive compensation and firm performance, i.e. does a higher CEO pay result in a better performing firm or is it that only companies with high performance can afford to highly reward their executives?

# 3. Data & Methodology

The goal of this section is to provide an explanation on how the sample was composed and the process behind the variable construction, followed by the summary statistics, as well as the models design and dealing with OLS Assumptions.

## 3.1 Sources

The sources for the data used in this paper is the Wharton database (WRDS), and namely the vendors Compustat and Execucomp. Compustat – Capital IQ and specifically Compustat North America is a database of US and Canadian fundamental and market information on publicly held companies. It provides Income Statement, Balance Sheet and Statement of Cash Flows items which are needed for the purpose of this research (WRDS, 2018). The Execucomp vendor provides executive compensation data collected directly from each company's annual proxies, comprising information on salary, bonus, options and stock awards, and other compensation items which are necessary in order to conduct this research (WRDS, 2018).

## 3.2 Sample

Because two different datasets are used, they had to be merged in order to have a complete data sample. Both datasets are organized as panels (the firms being the cross-sectional factor and years as the time-series factor). The first transformation needed was to drop all the observations which don't report a CEO flag, meaning that the executive whose compensation is reported is not a CEO in the company and because the focus of this research is on CEOs, those observations can be omitted. Now, in both datasets a new variable had to be created which identifies one firm and one year and using this variable it was possible to merge the two datasets. This gave a result of 14,019 observations (firm-year entries).

The goal when constructing the dataset was to have a full sample, without any missing observations, therefore all the lines having some missing values were omitted from the sample (moreover, this didn't affect the sample too much and it is always preferable to work with full samples than ones which report missing variables). Therefore, the full, clean sample used for this research has 11,941 observations.

The sample comprises companies and executives from the US and the focus is on the period 2010-2017. The distribution of companies in the S&P index is as follows:

***Table 2.*** *S&P index distribution of the 11,941 companies used in the research. The index on which a firm is listed on is downloaded from Compustat.*

| S&P Index | Frequency | Percentage |
|---|---|---|
| **Not on a major S&P Index** | 3,036 | 25.43 |
| **S&P Midcap Index** | 2,348 | 19.66 |
| **S&P Smallcap Index** | 3,485 | 29.17 |
| **S&P500** | 3,072 | 25.74 |
| **Total** | **11,941** | **100.00** |

## 3.3 Measures and Variable Construction

As the focus of this research is peer benchmarking, the peer groups had to be constructed first and the methodology of Bizjak, Lemmon, & Naveen (2008) is followed in doing so. The SIC-codes (Standard Industrial Classification) which are found in the sample are used to classify all the companies by the industry they are active in (Appendix: Table 19). After classifying every company by its industry, the next step was to calculate the sales median per year and industry. The firms are classified as being in the large (small) firm group if they have sales above (below) the median sales in the industry. The result is as follows:

***Table 3.*** *Firm group classification. The peer groups were created by industry classification and sales median per year and industry. The industries firms are active in and their sales are downloaded from Compustat.*

| Firm group | Frequency | Percentage |
|---|---|---|
| **Large** | 5,972 | 50.01 |
| **Small** | 5,969 | 49.99 |
| **Total** | **11,941** | **100.00** |

The next step was to create the compensation groups. Again, sorting by year and industry, the total compensation median was calculated, and the executives were classified as either being in the high or low compensation group if their compensation is above or below the median compensation. The result is as follows:

***Table 4.*** *Compensation group classification. The compensation groups were created by classifying the companies by industry and the compensation median in that industry. The industries firms are active in are downloaded from Compustat. The executive compensation data is downloaded from Execucomp.*

| Compensation group | Frequency | Percentage |
|---|---|---|
| **High** | 5,969 | 49.99 |
| **Low** | 5,972 | 50.01 |
| **Total** | **11,941** | **100.00** |

Regarding the CEO compensation, the Execucomp dataset reports a variable for Total Executive Compensation, called TDC2 and which is comprised of the following: Salary, Bonus, Non-Equity Incentive Plan Compensation, Value Realized from Stock Option Exercises, Grant-Date Fair Value of Stock Awards, Deferred Compensation Earning Reported as Compensation, and Other Compensation (WRDS, 2018). As it comprises all compensation variables and it does not have any missing values, it was used as given in the database without any other transformation needed.

As a measure of firm performance, the ROA (return on assets) is used. It is defined as an overall measure of profitability and following the methodology of Bizjak, Lemmon, & Nguyen (2011) it is computed by dividing the operating income after depreciation of a firm by its total assets and multiplying by 100 in order to report the value in percentages:

$$ROA = 100 * \frac{Operating\ income\ after\ depreciation}{Total\ assets}.$$

As a proxy for firm performance, the M/B (market-to-book) ratio is employed. The M/B ratio is used to assess the company value by comparing the market value of a firm to its book value and following the methodology of Bizjak, Lemmon, & Nguyen (2011) is computed as:

$$\frac{M}{B} = \frac{Market\ equity + Total\ debt + Preferred\ stock\ liquidating\ value - Deferred\ taxed\ and\ investment\ tax\ credits}{Total\ Assets},$$

where: $Market\ Equity = Stock\ Price * Shares\ Outstanding$

and $Total\ Debt = Long\ term\ debt + Short\ term\ debt$.

As all the variables were available in the dataset, it was an easy process to calculate the M/B ratio for every firm for each year.

While both ROA and M/B are accounting measures, as a robustness check, the stock return will be employed, representing a market performance measure. It is defined as the expected return that would be earned by the investor for a one-year investment in the stock (Berk & DeMarzo, 2014). The stock return is computed as:

$$Stock\ return = \frac{Stock\ price_t - Stock\ price_{t-1}}{Stock\ price_{t-1}} * 100.$$

Following the methodology proposed by Cremers & Grinstein (2013), the CEO talent is measured as a proxy for the percentage of new CEOs who are insiders, per industry. In Execucomp there are two variables which can be used for constructing this proxy: the date of an executive joining the company and the date when the executive became the CEO of the company. If these two dates coincide it can be concluded that the CEO is an "outsider", meaning he/she was brought in the company for the specific reason of becoming a CEO. However, if these two dates are not the same and the executive joined the firm at least one year before becoming CEO, then he/she is classified as an "insider". However, because the variable of when someone joined the company has a significant amount of missing values (70%), the best decision was to drop those observations and continue working with a full sample, therefore the new sample consists of 3474 observations. The result is as follows:

***Table 5.*** *Outsider/Insider CEO classification. The CEO groups were created by analysing the dates when a person joined the company and when that person became CEO. If these two coincide, the CEO receives the "outsider" flag. The dates of joining the company and becoming CEO are downloaded from Execucomp.*

| Outsider/Insider CEO | Frequency | Percentage |
|---|---|---|
| **Outsider** | 2,665 | 76.71 |
| **Insider** | 809 | 23.29 |
| **Total** | **3,474** | **100.00** |

## 3.4 Descriptive Statistics

The summary statistics for the variables used in this research are presented in Table 6 below and it is split into *Firm Characteristics* and *CEO Characteristics*. The number of observations, the mean, median, standard deviation, minimum and maximum for each variable are found in the table below.

Moreover, in Table 7 the correlation matrix of the independent variables used in the regression analysis is presented.

***Table 6.*** *Descriptive statistics on CEO (downloaded from Execucomp) and firm (downloaded from Compustat) characteristics. Total compensation includes salary, bonus, non-equity incentive plan compensation, value realized from stock option exercises, grant-date fair value of stock awards, deferred compensation earning reported as compensation, and other compensation and is expressed in thousands of dollars. CEO ownership refers to the percentage of total shares of the company he/she holds. CEO tenure is how many years the person holds the CEO position in a firm. CEO gender is a dummy variable taking value 1 if the CEO is a male and 0 otherwise. Outsider CEO is a dummy variable taking value 1 if the CEO was externally recruited and 0 otherwise. Sales refers to the total sales of firm and is expressed in millions of dollars. ROA (return on assets) is an accounting measure for firm performance and is expressed in percentages. M/B (market-to-book) is a measure for company value and is expressed in units. Stock return is a market measure for firm performance and is expressed in percentages.*

| Variable | Observations | Mean | Median | Std. Dev. | Minimum | Maximum |
|---|---|---|---|---|---|---|
| ***CEO characteristics*** | | | | | | |
| **Total compensation ($ 000s)** | 11,941 | 7,102.54 | 4,341.48 | 8,627.97 | 180.96 | 69,868.94 |
| **CEO Ownership (%)** | 11,941 | 1.95 | 0.55 | 4.57 | 0 | 62.35 |
| **CEO Tenure** | 11,941 | 7.51 | 5 | 7.23 | 0 | 61 |
| **CEO Age** | 11,941 | 56.39 | 56 | 7.15 | 28 | 96 |
| **CEO Gender (dummy)** | 11,941 | 0.97 | - | 0.18 | 0 | 1 |
| **Outsider CEO (dummy)** | 3,474 | 0.77 | - | 0.42 | 0 | 1 |
| ***Firm characteristics*** | | | | | | |
| **Sales ($ millions)** | 11,941 | 6,231.80 | 1,757.06 | 14,673.11 | 25.22 | 129,976 |
| **ROA (%)** | 11,941 | 8.34 | 8.02 | 12.41 | -314.39 | 124.68 |
| **M/B** | 11,941 | 1.79 | 1.35 | 1.57 | -0.08 | 23.42 |
| **Stock Return (%)** | 9,782 | 14.28 | 9.47 | 46.13 | -81.71 | 422.64 |

From Table 6 it can be seen that the average total compensation of a CEO is around $7 million, with the highest total compensation in the sample being almost $70 million. On average, CEOs tend to have almost 2% ownership in the firm, while the highest stake in the sample is 62%. Moreover, the average CEO tenure is 7.5 years, with the highest CEO tenure of 61 years. Regarding the age of the CEO, the average age in the sample is 56 years, with the youngest CEO being 28 years old and the oldest one 96 years old. 97% of the CEOs in the sample are male and 77% are qualified as “outsiders”. The average sales are found to be around $6.2 billion while the highest sales reported are around $130 billion. The highest ROA in the sample is almost 125% while the average value is only 8.3% and the minimum being a negative value of 315%. The largest M/B ratio found is 23, with an average of almost 1.8. The average stock return in the sample is 14%, which seems a plausible answer judging on the fact that the average annualized total return for the S&P500 index over the past 90 years is around 10% (Santoli, 2017). In

order to remove the outliers from the sample, the variables Total Compensation, Sales and Stock Return are winsorized at the 1st and 99th percentiles of the distribution. Table 22 & 23 presented in the Appendix display the split descriptive statistics for firms which are part of the "large" firm group and for those part of the "small" firm group.

***Table 7.*** *Correlation matrix of the variables of interest for the regression analysis*

| | Total compensation ($ 000s) | CEO Ownership (%) | CEO Tenure | CEO Age | CEO Gender (dummy) | Sales ($ millions) | ROA (%) | M/B | Stock Return |
|---|---|---|---|---|---|---|---|---|---|
| Total compensation ($ 000s) | 1.000 | | | | | | | | |
| CEO Ownership (%) | -0.099 | 1.000 | | | | | | | |
| CEO Tenure | 0.081 | 0.401 | 1.000 | | | | | | |
| CEO Age | 0.072 | 0.148 | 0.429 | 1.000 | | | | | |
| CEO Gender (dummy) | -0.013 | 0.020 | 0.071 | 0.038 | 1.000 | | | | |
| Sales ($ millions) | 0.349 | -0.094 | -0.081 | 0.054 | -0.059 | 1.000 | | | |
| ROA (%) | 0.153 | -0.033 | -0.001 | 0.003 | -0.028 | 0.062 | 1.000 | | |
| M/B | 0.183 | 0.040 | 0.061 | -0.047 | 0.016 | -0.050 | 0.394 | 1.000 | |
| Stock Return (%) | 0.037 | 0.004 | 0.009 | -0.016 | 0.004 | -0.008 | 0.049 | 0.147 | 1.000 |

When it comes to assessing the relation between variables (how near it is for their relationship to be linear), the correlation matrix is a simple and practical tool. The correlation is a number between -1 and +1, with zero indicating no relationship at all, +1 pointing to a perfectly positive correlation, implying that if one variable increases, the other one will go up by as much (synchronization) and -1 indicating a perfectly negative relationship, implying that if one goes up, the other one will decrease by the same amount (Stock & Watson, 2015). It can be seen in the table above that there is a weak positive correlation between CEO Tenure, CEO Age, Sales, ROA, M/B, Stock Return and the Total Compensation of a CEO. There is a weak negative correlation between CEO's Ownership in the company, his/her gender and the Total Compensation. There is a stronger positive correlation between CEO Tenure and CEO Ownership, meaning that the more years a person is a CEO, the higher his share in the company will become (coefficient is 0.401). Similarly, the older the CEO, the higher his stake in the company gets (coefficient is 0.148), but this relationship is weaker than tenure and ownership. Interesting to observe is that neither the CEO Age or CEO Tenure have any relationship with the performance of the company (ROA). Because all the correlations between the independent variables are lower than 0.5, it is possible to include these variables in the models presented below.

## 3.5 Models

In order to test the first hypothesis which is "Peer benchmarking has no effect on CEO compensation", the following models are used:

$$\textbf{Model 1.1: } Total\ Compensation = \alpha_0 + \beta_1 * Firm_{group} + \varepsilon_0$$

$$\textbf{Model 1.2: } Total\ Compensation = \alpha_0 + \beta_1 * Firm_{group} + \beta_2 * Industry + \beta_3 * CEO_{ownership} + \beta_4 * CEO_{tenure} + \beta_5 * CEO_{age} + \beta_6 * CEO_{gender} + \varepsilon_0$$

Firm_group is dummy variable which takes the value of 1 if the firm has sales above the median sales in the industry, meaning the firm is considered to be part of the "large" firm group and takes a value of 0 if the firm is part of the "small" firm group, i.e. their sales are below the median sales in the industry. By running this regression (Model 1.1), it is of interest to observe if indeed by being part of the large or small firm group in terms of sales has an impact on the total compensation the CEO of the firm receives. Moreover, a two-sample t statistic is used in order to evaluate how the means of the response variable in the two group (small and large) compare (Moore, McCabe, Alwan, & Craig, 2016). Furthermore, in order to account for Omitted Variable Bias (OVB), extra control variables are incorporated in the model: the industry in which the company is active in, CEO ownership, CEO tenure, CEO age and CEO gender (Model 1.2).

As the next hypothesis of this paper is "Talented CEOs have no impact on firm performance" and in order to test it the next models are used:

$$\textbf{Model 2.1: } ROA = \alpha_0 + \beta_1 * Outsider_{CEO} + \varepsilon_0$$

$$\textbf{Model 2.2: } ROA = \alpha_0 + \beta_1 * Outsider_{CEO} + \beta_2 * CEO_{ownership} + \beta_3 * CEO_{tenure} + \beta_4 * CEO_{age} + \beta_5 * CEO_{gender} + \varepsilon_0$$

Outsider_CEO is a dummy variable and is used as a proxy for CEO talent which takes a value of 1 if the CEO is an "outsider", meaning that he was brought in the company specifically for the position of CEO and it takes a value of 0 if the CEO is an "insider" meaning that he was working for the company for at least one year before becoming a CEO. By running Model 2.1, the main interest is to investigate whether being an outsider or an insider CEO has any impact on the performance of the company.

Similar to the process employed in testing Hypothesis I, a two-sample t-test is used, and extra control variables are included in Model 2.2 in order to make the model more complete.

For testing the third hypothesis which was formulated as "Higher executive compensation has no effect on firm performance" the next models are applied:

$$\textbf{Model 3.1: } ROA = \alpha_0 + \beta_1 * Total\ Compensation + \varepsilon_0$$

$$\textbf{Model 3.2: } ROA = \alpha_0 + \beta_1 * Total\ Compensation + \beta_2 * CEO_{ownership} + \beta_3 * CEO_{tenure} + \beta_4 * CEO_{age} + \beta_5 * CEO_{gender} + \beta_6 * Compensation_{Group} + \varepsilon_0$$

$$\textbf{Model 3.3: } Total\ Compensation = \alpha_0 + \beta_1 * ROA + \varepsilon_0$$

$$\textbf{Model 3.4: } Stock\ Return = \alpha_0 + \beta_1 * Total\ Compensation + \varepsilon_0$$

$$\textbf{Model 3.5: } Stock\ Return = \alpha_0 + \beta_1 * Total\ Compensation + \beta_2 * CEO_{ownership} + \beta_3 * CEO_{tenure} + \beta_4 * CEO_{age} + \beta_5 * CEO_{gender} + \beta_6 * Compensation_{Group} + \varepsilon_0$$

By running Model 3.1 it is of interest to see whether a higher CEO compensation has a negative effect on the way the company performs. In order to make the model more complete and account for OVB, control variables are added: CEO ownership, tenure, age, gender, and the compensation group he is part of (Model 3.2). Moreover, it is of interest to test whether the simultaneous causality between firm performance and total compensation holds, i.e. highly paid CEOs increase firm performance or high compensation can only be paid by high performing companies, therefore Model 3.3 is tested. As a robustness check, the stock return was introduced in the analysis as a market performance measure, therefore it is tested whether the high compensation has an effect on it (Model 3.4). As before, several control variables are added to the model, to account for OVB (Model 3.5).
When testing the effect of the independent variables on the dependent ones, the 5% significance level is used, and it serves as the needed amount of evidence to reject the null hypothesis.

## 3.6 OLS Assumptions

There are five assumptions which need to be taken into consideration for validly conducting hypothesis testing using the estimation technique Ordinary Least Squares (OLS) (Brooks, 2014).

1. $E(u_t) = 0$. This assumption demands a zero-average value of the errors. In case it is violated, there could be serious biases in the estimates of the slope coefficient and/or negative $R^2$. Nevertheless, this assumption is accounted for in this research by including the intercept term in all the regressions (Brooks, 2014).

2. $var(u_t) = \sigma^2 < \infty$. The homoscedasticity assumption presumes a constant variance of the error term. In case this does not hold, the errors are said to be heteroscedastic, and the OLS estimators are still unbiased but they are no longer BLUE (best linear unbiased estimators) (Brooks, 2014). In order to account for this assumption, the "robust" option is used in Stata when conducting the regressions and the software computes heteroscedasticity-robust standard errors (Stock & Watson, 2015).

3. $cov(u_i, u_j) = 0$. Assumption 3 assumes that the errors are not correlated with one another, i.e. the covariance of the disturbance terms over time is zero. In order to test this assumption, an autocorrelation test is required so the "Wooldridge test for autocorrelation in panel data" is employed. Its null hypothesis is "no first-order autocorrelation exists" and therefore, a significant test indicates the presence of serial correlation (Wiggins & Poi, 2018). In order to remove the problem of autocorrelation between the error terms in a panel setting, the "Prais-Winsten" and "Cochrane-Orcutt" regression is used in case a certain model is found to indicate autocorrelation issues. This test uses the Generalized Least-Squares (GLS) method for estimating the parameters in a linear regression model in which there is serial correlation between the error terms (StataCorp, 2018). For the current analysis no autocorrelation was detected.

4. $cov(u_t, x_t) = 0$. The independent variables have to be non-stochastic (non-random). In the case when the regressors are not correlated with the error term, the OLS estimators are consistent and unbiased, however, if the regressors and the error term of the equation are correlated, the OLS estimators will be inconsistent and the OVB problem arises, meaning that there exist independent variables with a significant impact on the dependent variables which are not included in the model (Brooks, 2014). Multiple control variables are included in the

models in order to account for OVB, however, this is still one of the biggest limitations of the OLS regression model.

5. $u_t \sim N(0, \sigma^2)$. This assumption deals with the normal distribution of the disturbance terms. It is not clear what should be done in case of non-normality of the error terms (Brooks, 2014). However, as it is considered that non-normality in financial data can also arise from certain types of heteroscedasticity, the "robust" option is used in Stata as it estimates heteroscedasticity-robust standard errors (Stock & Watson, 2015).

# 4. Results

The focus of this section is on the statistical analysis conducted in this paper.

Model 1 is the starting point of the research and it is tested for finding out whether the firm group (small or large) has an impact on the total CEO compensation. Therefore, firstly, the two-sample t-test is analyzed, and the results are found in Table 8 below. It is fundamental to perform this test for determining whether there is a significant difference between the two groups within the population, i.e. evaluating whether being part of the small or large firm group has an effect on the executive's total compensation (Moore, McCabe, Alwan, & Craig, 2016). From the reported results it can be seen that 5,980 companies are found to have sales below the median sales in the industry and 5,972 which have their sales higher than the industry median. The probability of the alternative hypothesis ($H_a$! =0) that there exists a difference between the two groups of interest is 0.000, which is lower than the alfa of 0.05 (based on a 2-tailed significance level) and it can be concluded that the mean is statistically significantly different than zero, thus, the null hypothesis of no difference in the amount of total compensation between the two groups of firms is rejected. The economic significance of this rejection is that indeed the executives are compensated in relation to the firm group their company is found in. If the focus is on investigating the one-sided alternative hypotheses, i.e. the total compensation of the firms in the large group is smaller than the one of the firms in the small group ($H_a$: diff<0), the reported probability is again 0.000 which is lower than 0.025 (one-sided 5% significance level) and the null hypothesis is rejected again, meaning that there is a statistically significant difference in determining the compensation level between the two groups.

***Table 8.*** *Two-sample t test with equal variances (Firm group). The goal of this test is to establish whether there exists a difference in total executive compensation whether the firm is found to be part of the small firm group or the large firm group. $H_0$: The two firm groups have equal means.*

| **Group** | **Observations** | **Mean** | **Std. Err.** | **Std. Dev.** | **[95% Conf. Interval]** | |
|---|---|---|---|---|---|---|
| **Small** | 5,969 | 3,712.59 | 62.34 | 4,816.44 | 3,590.38 | 3,834.80 |
| **Large** | 5,972 | 10,490.78 | 131.39 | 10,134.22 | 10,233.80 | 10,747.86 |
| **combined** | 11,941 | 7,102.54 | 78.96 | 8,627.97 | 6,947.77 | 7,257.31 |
| **diff** | | -6,778.19 | 145.23 | | -7,062.85 | -6,493.52 |
| diff= mean (0) – mean (1) | | | | | | t= -46.67 |
| $H_0$: diff=0 | | | | | degrees of freedom=11,939 | |
| $H_a$: diff<0 | | $H_a$: diff! =0 | | | Ha: diff>0 | |
| Pr(T<t) =0.000 | | Pr(\|T\|>\|t\|) =0.000 | | | Pr(T>t) =1.000 | |

When investigating the first regression estimation, it can be observed in Table 9 below that the firm group has a positive significant effect on the total compensation of CEOs. The Firm Group is a dummy variable, so it follows that if a company is part of the "large" group, then the total CEO compensation will be, on average, higher by 6,778 points ($6.78 million). This coefficient is statistically significant at the 5% significance level (p-value=0.000<0.05) so the first null hypothesis that peer benchmarking has no effect on CEO compensation can be rejected. According to the R-squared of Model 1.1, the firm group variables explains around 15% of the variation in total executive compensation.

***Table 9.*** *Linear regression: Model 1.1. The effect of firm group on total executive compensation. The dependent variable is total compensation and it comprises salary, bonus, non-equity incentive plan compensation, value realized from stock option exercises, grant-date fair value of stock awards, deferred compensation earning reported as compensation, and other compensation. The independent variable is the dummy variable "firm group" which takes value 1 if the firm is part of the large firm group, where its sales are above the industry median, and 0 otherwise.*

Number of observations=11,941

F(1, 11939)=2179.11

Prob>F=0.000

R-squared=0.1543

Root MSE=7,934.8

| **Total Compensation** | **Coefficient** | **Robust Std. Err.** | **t** | **P>\|t\|** | **[95% Conf. Interval]** | |
|---|---|---|---|---|---|---|
| **Firm Group** | 6,778.19 | 145.20 | 46.68 | 0.000 | 6,492.57 | 7,062.81 |
| **_cons** | 3,712.59 | 62.34 | 59.50 | 0.000 | 3,590.39 | 3,834.79 |

In Table 10 below, the quantile regression output for Model 1.1 is presented. A quantile regression is similar to a least-squares regression (which estimates the mean of the dependent variable), however it estimates the median of the dependent variable (StataCorp, 2018). Therefore, as a robustness check, for every model used in this paper both a linear and a quantile regression are analysed, in order to investigate whether there are significant differences in the results whenever the mean or the median are used. As it can be noticed, the coefficient of the independent variable "Firm Group" is statistically significant at the 5% significance level (p-value=0.00<0.05). It follows that if a company is part of the "large" firm group then the executive's compensation will be higher by $4.88 million at the 50% quantile. The pseudo $R^2$ can be interpreted as a goodness-of-fit of the model and the one reported in the table below is 0.1260, meaning that the independent variable explains around 12.6% of the variation in the dependent variable.

***Table 10.*** *Quantile regression: Model 1.1. The effect of firm on median total executive compensation. The dependent variable is total compensation and it comprises salary, bonus, non-equity incentive plan compensation, value realized from stock option exercises, grant-date fair value of stock awards, deferred compensation earning reported as compensation, and other compensation. The independent variable is the dummy variable "firm group" which takes value 1 if the firm is part of the large firm group, where its sales are above the industry median, and 0 otherwise.*

Number of observations=11,941

Pseudo $R^2$=0.1260

| **Total Compensation** | **Coefficient** | **Std. Err.** | **t** | **P>\|t\|** | **[95% Conf. Interval]** | |
|---|---|---|---|---|---|---|
| **Firm Group** | 4,883.00 | 100.89 | 48.40 | 0.00 | 4,685.25 | 5,080.76 |
| **_cons** | 2,402.88 | 34.19 | 70.29 | 0.00 | 2,335.87 | 2,469.89 |

In Model 1.2 multiple control variables were added. As it can be seen from the regression output presented in Table 11 below, the Firm Group is statistically significant at the 5% in this model as well. If the firm is part of the "large" sales group, CEO's compensation is higher with 6,754 units ($6.75 million). Moreover, it has been found that the industry a company is active in does not have a statistically significant effect on the total compensation of the CEO. Similarly, the age of the executive has no effect on his/her compensation (p-value=0.470>0.05). However, the control variables Ownership, Tenure and Gender have a statistically significant impact on the compensation because the reported p-values of these variables are lower than the alpha of 0.05. Because Ownership is expressed in percentages, its interpretation is as follows: if the CEO's stake in the firm increases by 1%, his total compensation will decrease by 1.62 units ($1,620). Tenure has a positive effect on the compensation, namely, every year longer the CEO stays with a company, his compensation increases by 173 points ($173,000). The gender also plays a negative role in this equation: if the CEO is a male, his total compensation is lower than that of a female by 758 units ($759,000). Looking at the $R^2$ of this model, it is observable that the variables explain 17.7% of the variation in Total Compensation. The R-squared is higher than in Model 1.1, meaning that Model 1.2 is more accurate and a better fit.

***Table 11.*** *Linear Regression: Model 1.2. The effect of firm group and control variables on total executive compensation. The dependent variable is total compensation and it comprises salary, bonus, non-equity incentive plan compensation, value realized from stock option exercises, grant-date fair value of stock awards, deferred compensation earning reported as compensation, and other compensation. The independent variables are: "firm group" which takes value 1 if the firm is part of the large firm group, where its sales are above the industry median, and 0 otherwise; the industry the company is active in; the percentage of shares the CEO holds in the company, for how many years the person holds the CEO position, the CEO's age and the dummy variable gender which takes the value of 1 if the CEO is male and 0 otherwise.*

Number of observations=11,941

F(13, 11544)=176.15

Prob>F=0.000

R-squared=0.1769

Root MSE=7,848.1

| **Total Compensation** | **Coefficient** | **Robust Std. Err.** | **t** | **P>\|t\|** | **[95% Conf. Interval]** | |
|---|---|---|---|---|---|---|
| **Firm Group** | 6,754.46 | 158.79 | 44.79 | 0.000 | 6,458.88 | 7,050.05 |
| **Industry** | | | | | | |
| **2** | -419.12 | 1,154.65 | -0.36 | 0.717 | -2,682.43 | 1,844.20 |
| **3** | -273.83 | 1,121.79 | -0.24 | 0.807 | -2,472.74 | 1,925.09 |
| **4** | 414.41 | 1,109.18 | 0.37 | 0.709 | -1,759.78 | 2,588.59 |
| **5** | 743.36 | 1,133.21 | 0.66 | 0.512 | -1,477.92 | 2,964.65 |
| **7** | 1,192.29 | 1,139.09 | 1.05 | 0.295 | -1,040.51 | 3,425.10 |
| **8** | 524.39 | 1,122.45 | 0.47 | 0.640 | -1,675.79 | 2,724.58 |
| **9** | 770.69 | 1,129.66 | 0.68 | 0.495 | -1,443.65 | 2,985.02 |
| **10** | -724.49 | 1,160.47 | -0.62 | 0.532 | -2,999.20 | 1,550.23 |
| **CEO Ownership** | -162.64 | 18.86 | -8.62 | 0.000 | -199.61 | -125.66 |
| **CEO Tenure** | 173.02 | 14.37 | 12.04 | 0.000 | 144.85 | 201.19 |
| **CEO Age** | 8.21 | 11.35 | 0.72 | 0.470 | -14.05 | 30.46 |
| **CEO Gender** | -758.08 | 357.64 | -2.12 | 0.034 | -1,459.12 | -57.04 |
| **_cons** | 2,614.59 | 1,320.46 | 1.98 | 0.048 | 26.26 | 5,202.92 |

In Table 12 below, the quantile regression output for Model 1.2 is displayed. As it can be seen from the results, the firm group, ownership, tenure, age and gender coefficients are statistically significant at the 5% significance level. It follows that if a company is part of the "large" group, it will offer its CEO a compensation higher with around $4.8 million at the 50% quantile. The ownership coefficient is negative, meaning that if the CEO owns 1% more shares in the company, his/her total compensation decreases by 1.03 units ($1,034), at median level. The CEO tenure coefficient is interpreted as: every

year longer the CEO stays with the company, results in a higher total compensation by $63,200 at the 50% quantile. Moreover, every year older the CEO gets, his/her compensation goes up by $15,360 at median level. The gender coefficient is negative, meaning that if the executive is a male, his compensation will be lower by $526,270. The independent variables explain around 13.8% of the variation in total compensation in this model (pseudo R-squared=0.1382).

***Table 12**. Quantile regression: Model 1.2. The effect of firm group and control variables on the median total executive compensation. The dependent variable is total compensation and it comprises salary, bonus, non-equity incentive plan compensation, value realized from stock option exercises, grant-date fair value of stock awards, deferred compensation earning reported as compensation, and other compensation. The independent variables are: "firm group" which takes value 1 if the firm is part of the large firm group, where its sales are above the industry median, and 0 otherwise; the industry the company is active in; the percentage of shares the CEO holds in the company, for how many years the person holds the CEO position, the CEO's age and the dummy variable gender which takes the value of 1 if the CEO is male and 0 otherwise.*

Number of observations=11,941

Pseduo $R^2$=0.1382

| **Total Compensation** | **Coefficient** | **Robust Std. Err.** | **t** | **P>\|t\|** | **[95% Conf. Interval]** | |
|---|---|---|---|---|---|---|
| **Firm Group** | 4,782.41 | 95.42 | 50.12 | 0.000 | 4,595.37 | 4,969.45 |
| **Industry** | | | | | | |
| **2** | 843.55 | 979.37 | 0.86 | 0.389 | -1,076.17 | 2,763.28 |
| **3** | 47.47 | 949.71 | 0.05 | 0.960 | -1,814.13 | 1,909.07 |
| **4** | 331.44 | 946.34 | 0.35 | 0.726 | -1,523.55 | 2,186.43 |
| **5** | 1,331.39 | 967.48 | 1.38 | 0.169 | -565.03 | 3,227.81 |
| **7** | 673.57 | 959.33 | 0.70 | 0.483 | -1,206.89 | 2,554.02 |
| **8** | 186.77 | 948.94 | 0.20 | 0.844 | -1,673.32 | 2,046.86 |
| **9** | 595.14 | 948.64 | 0.63 | 0.530 | -1,264.36 | 2,454.65 |
| **10** | 110.39 | 970.15 | 0.11 | 0.909 | -1,791.27 | 2,012.05 |
| **CEO Ownership** | -103.36 | 3.25 | -31.78 | 0.000 | -109.73 | -96.98 |
| **CEO Tenure** | 63.22 | 6.97 | 9.07 | 0.000 | 49.57 | 76.88 |
| **CEO Age** | 15.36 | 4.78 | 3.21 | 0.001 | 5.99 | 24.74 |
| **CEO Gender** | -526.27 | 152.49 | -3.45 | 0.001 | -825.20 | -227.35 |
| **_cons** | 1,545.03 | 992.25 | 1.56 | 0.119 | -399.95 | 3,490.00 |

Models 2.1 and 2.2 focus on the CEO talent and its effect on firm performance. Table 13 reports the two-sample t-test investigating whether there is a significant difference whether the CEO is an outsider or an insider for the performance of the company. The probability of the alternative hypothesis ($H_a$!=0) that there is a difference between the two groups of interest, is 0.000, which is below 0.05 (alpha based on a 2-sided significance level) and the decision is to reject the null hypothesis of no difference

in firm performance whether its CEO is an outsider or an insider. The economic significance of rejecting this null hypothesis is that the history of a CEO has an influence on the way the company performs.

***Table 13.*** *Two-sample t test with equal variances (Outsider CEO). The goal of this test is to establish whether there exists a difference in firm performance whether its CEO was recruited externally or internally. $H_0$: The two types of CEO groups have equal means.*

| **Group** | **Observations** | **Mean** | **Std. Err.** | **Std. Dev.** | **[95% Conf. Interval]** | |
|---|---|---|---|---|---|---|
| **Insider** | 809 | 6.45 | 0.51 | 14.56 | 5.44 | 7.45 |
| **Outsider** | 2,665 | 9.76 | 0.23 | 12.19 | 9.30 | 10.23 |
| **combined** | 3,474 | 8.99 | 0.22 | 12.85 | 8.56 | 9.41 |
| **diff** | | -3.32 | 0.51 | | -4.32 | -2.31 |
| diff= mean (0) – mean (1) | | | | | t= -6.47 | |
| $H_0$: diff=0 | | | | degrees of freedom=3472 | | |
| $H_a$: diff<0 | | $H_a$: diff! =0 | | | Ha: diff>0 | |
| Pr(T<t) =0.000 | | Pr(\|T\|>\|t\|) =0.000 | | | Pr(T>t) =1.000 | |

From the regression output presented in Table 14 where Model 2.1 is applied, it can be seen that indeed the dummy variable of insider/outsider CEO has a positive statistically significant effect on the ROA of the company. The Outsider CEO is a dummy variable taking the value of 1 if the CEO was brought to the company specifically for this job position and a value of 0 in the case when the CEO was previously working in that company and then offered the CEO position. It follows that if the CEO was brought from outside, the company will have a ROA higher by 3.3% than a company which hired their CEO internally. This coefficient is statistically significant at the 5% significance level (p-value=0.000<0.05) so the second null hypothesis that CEO talent has no effect on firm performance can be rejected at the 5% significance level. Judging on the R-squared of Model 2.1, 1.1% of the variation in ROA is explained by the dummy variable, however, this is a weak fit.

***Table 14.*** *Linear Regression: Model 2.1. The effect of an outsider/insider CEO on firm performance. The dependent variable is the accounting measure for firm performance ROA (return on assets). The independent variable is the dummy variable "Outsider CEO" which takes the value of 1 if the dates when the person joins the company and becomes the CEO of that company coincide and 0 otherwise.*

Number of observations=3,474

F(1, 3472)=34.69

Prob>F=0.000

R-squared=0.0119

Root MSE=12.777

| ROA (%) | Coefficient | Robust Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| **Outsider CEO** | 3.32 | 0.56 | 5.89 | 0.000 | 2.21 | 4.42 |
| **_cons** | 6.45 | 0.51 | 12.60 | 0.000 | 5.44 | 7.45 |

Table 15 below exhibits the quantile regression output of Model 2.1. The coefficient of the independent variable "Outsider CEO" is significant at the 5% significance level (p-value=0.00<0.05). Its interpretation is: If the CEO was brought to the company specifically for the CEO position, the company will have a higher return on assets by 1.34% at the 50% quantile. Judging on the pseudo R-squared which is only 0.0032, the current model is a weak fit.

***Table 15.*** *Quantile regression: Model 2.1. The effect of an outsider/insider CEO on the median firm performance. The dependent variable is the accounting measure for firm performance ROA (return on assets). The independent variable is the dummy variable "Outsider CEO" which takes the value of 1 if the dates when the person joins the company and becomes the CEO of that company coincide and 0 otherwise.*

Number of observations=3,474

Pseudo $R^2$=0.0032

| ROA (%) | Coefficient | Robust Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| **Outsider CEO** | 1.34 | 0.29 | 4.56 | 0.000 | 0.76 | 1.91 |
| **_cons** | 7.55 | 0.25 | 29.94 | 0.000 | 7.05 | 8.04 |

Model 2.2 is a follow-up of Model 2.1 including several control variables. It can be seen in Table 16 below that the dummy variable "Outsider CEO" is still significant in this model. If the executive was brought to the firm specifically for the CEO position, the accounting performance of the company will be higher by 2.9% and this coefficient is statistically significant at the 95% confidence level. Moreover, it was found that CEO's Ownership, his Tenure, and Gender have no statistically significant effect on the company's ROA. However, CEO's age was found to have a negative statistical significant effect on

this measure, i.e. when the CEO becomes older by 1 year, the company's performance goes down by 0.12%. Another finding is that the compensation groups also have a statistically significant effect on firm performance. If the CEO is part of the group which receives total compensation above the industry median, it will boost firm's performance by 4.1%. This coefficient is statistically significant at the 5% level (p-value=0.000<0.05). The R-squared of Model 2.2 is substantially higher than that of 2.1, meaning that the second model is a much better fit and the independent variables explain almost 4.2% of the ROA variation.

***Table 16.*** *Linear Regression: Model 2.2. The effect of an externally/internally recruited CEO and control variables on the accounting measure of firm performance – ROA. The dependent variable is the return on assets of a company (ROA) and the dependant variables are: the dummy variable "Outsider CEO" which takes the value of 1 if the dates when the person joins the company and becomes the CEO of that company coincide and 0 otherwise; the amount of shares an executives holds in the firm, the number of years an executive has been the CEO of a company, the CEO's age and gender (dummy variable) and the dummy variable "Compensation Group" which classifies a CEO as being part of the high group if his/her total compensation is above the industry median and being part of the low compensation group if the compensation is below the industry median.*

Number of observations=3,373

F(6, 3366)=18.18

Prob>F=0.000

R-squared=0.0417

Root MSE=12.69

| ROA (%) | Coefficient | Robust Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| **Outsider CEO** | 2.91 | 0.53 | 5.51 | 0.000 | 1.87 | 3.95 |
| **CEO Ownership (%)** | -0.08 | 0.05 | -1.65 | 0.098 | -0.17 | 0.01 |
| **CEO Tenure** | 0.03 | 0.04 | 0.68 | 0.494 | -0.05 | 0.10 |
| **CEO Age** | -0.12 | 0.04 | -2.89 | 0.004 | -0.22 | -0.04 |
| **CEO Gender** | -0.06 | 0.85 | -0.08 | 0.939 | -1.73 | 1.60 |
| **Compensation Group** | 4.10 | 0.49 | 8.34 | 0.000 | 3.14 | 5.07 |
| **_cons** | 11.85 | 2.43 | 4.88 | 0.000 | 7.09 | 16.61 |

Table 17 below displays the quantile regression output for Model 2.2. Out of the independent variables, the dummy "Outsider CEO" variable, CEO tenure and Compensation Group are statistically significant at the 5% significance level. It can be interpreted that if the CEO was externally recruited, this will result in a higher firm performance (ROA) by 1.11% at the median level. However, the tenure of the executive has a negative coefficient, meaning that every year longer the executive stays with the company, its performance will go down by 0.06% at the 50% quantile. Moreover, if the CEO is part

of the group which receives total compensation above the industry median, it will boost firm's performance by around 2.4% at the 50$^{th}$ quantile.

***Table 17.*** *Quantile regression: Model 2.2. The effect of an externally/internally recruited CEO and control variables on the median firm performance – ROA. The dependent variable is the return on assets of a company (ROA) and the dependant variables are: the dummy variable "Outsider CEO" which takes the value of 1 if the dates when the person joins the company and becomes the CEO of that company coincide and 0 otherwise; the amount of shares an executives holds in the firm, the number of years an executive has been the CEO of a company, the CEO's age and gender (dummy variable) and the dummy variable "Compensation Group" which classifies a CEO as being part of the high group if his/her total compensation is above the industry median and being part of the low compensation group if the compensation is below the industry median.*

Number of observations=3,373

Pseudo $R^2$=0.0186

| ROA (%) | Coefficient | Robust Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| **Outsider CEO** | 1.11 | 0.34 | 3.25 | 0.001 | 0.44 | 1.79 |
| **CEO Ownership (%)** | 0.06 | 0.04 | 1.51 | 0.132 | -0.02 | 0.15 |
| **CEO Tenure** | -0.06 | 0.02 | -2.68 | 0.007 | -0.1 | -0.02 |
| **CEO Age** | 0.01 | 0.02 | 0.28 | 0.780 | -0.04 | 0.05 |
| **CEO Gender** | 0.051 | 0.46 | 0.11 | 0.911 | -0.86 | 0.96 |
| **Compensation Group** | 2.36 | 0.27 | 8.63 | 0.000 | 1.82 | 2.89 |
| **_cons** | 6.39 | 1.31 | 4.89 | 0.000 | 3.83 | 8.96 |

The third hypothesis states that a higher executive compensation does not have an effect on firm performance. In order to test it, first Model 3.1 is employed. Table 18 below reports the regression output and it is found that the Total Compensation variable has a statistically significant effect on firm performance. Its coefficient can be interpreted as: if the total compensation of the CEO increases by $1 million, the ROA of the company will go up by 22.4% and this coefficient is statistically significant at the 5% significance level (p-value=0.000<0.05). Therefore, the null hypothesis that there is no effect of total compensation on ROA can be rejected. The R-squared of this model is quite low, however, Total Compensation explains around 2.4% of the ROA variance.

***Table 18.*** *Linear Regression: Model 3.1. The effect of total executive compensation on firm performance. The dependant variable is the accounting measure for firm performance – ROA. The independent variable is the total executive compensation which comprises salary, bonus, non-equity incentive plan compensation, value realized from stock option exercises, grant-date fair value of stock awards, deferred compensation earning reported as compensation, and other compensation.*

Number of observations=11,941

F(1, 11939)=353.46

Prob>F=0.000

R-squared=0.0235

Root MSE=12.265

| ROA (%) | Coefficient | Robust Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| **Total Compensation** | 0.00002204 | 0.00 | 18.80 | 0.000 | 0.00 | 0.00 |
| **_cons** | 6.77 | 0.16 | 42.91 | 0.000 | 6.46 | 7.08 |

Table 19 below displays the quantile regression output of Model 3.1. The total executive compensation coefficient is statistically significant at the 5% significance level (p-value=0.00<0.05) and its interpretation is as follows: if the total compensation increases by $1 million, the ROA of the company will go up by 16.21%. In this model, the independent variable explains around 1.8% of the variation in firm performance.

***Table 19.*** *Quantile regression: Model 3.1. The effect of total executive compensation on median firm performance. The dependant variable is the accounting measure for firm performance – ROA. The independent variable is the total executive compensation which comprises salary, bonus, non-equity incentive plan compensation, value realized from stock option exercises, grant-date fair value of stock awards, deferred compensation earning reported as compensation, and other compensation.*

Number of observations=11,941

Pseudo $R^2$=0.0182

| ROA (%) | Coefficient | Robust Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| **Total Compensation** | 0.00001621 | 0.00 | 21.64 | 0.000 | 0.00 | 0.00 |
| **_cons** | 6.85 | 0.087 | 78.49 | 0.000 | 6.68 | 7.03 |

For making the previous model more complete, extra control variables were included in the equation and the results are presented in Table 20. What is noticeable is that Total Compensation still has a positive statistically significant effect on firm performance and its coefficient is statistically significant at the 5% significance level (p-value=0.000<0.05). If an executive's total compensation increases by $1 million, the performance of the company will increase by 13.5%. CEO Ownership, Tenure, and Age are

found not to have a significant impact on ROA in this model. However, the Gender of the executive has a negative effect on ROA: if the executive is a male, then the company will perform worse by 1.29%. The Compensation Group also is statistically significant, and it has a positive effect: if the CEO is part of the group which receives total compensation above the industry median, it will boost firm's performance by 2.61%. The $R^2$ of Model 3.2 is higher than that of the previous model, meaning that this model is a better fit and the independent variables explain around 3.2% of the variation in firm performance measure.

***Table 20.*** *Linear regression: Model 3.2. The effect of total compensation and control variables on firm performance (ROA). The dependent variable is the ROA (return on assets) of a company, which is an accounting measure of firm performance. The independent variables are total executive compensation which comprises salary, bonus, non-equity incentive plan compensation, value realized from stock option exercises, grant-date fair value of stock awards, deferred compensation earning reported as compensation, and other compensation; the CEO's stake in the company; for how long he/she has occupied the CEO position of the firm; the CEO's age and gender; the compensation group the CEO belongs to: high group if his/her total compensation is above the industry median and low compensation group if the compensation is below the industry median.*

Number of observations=11,941

F(6, 11551)=50.38

Prob>F=0.000

R-squared=0.0318

Root MSE=12.272

| ROA (%) | Coefficient | Robust Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| **Total Compensation** | 0.00001351 | 0.00 | 10.87 | 0.000 | 0.00 | 0.00 |
| **CEO Ownership (%)** | -0.0019 | 0.03 | -0.08 | 0.939 | -0.05 | 0.05 |
| **CEO Tenure** | -0.0028 | 0.02 | -0.14 | 0.887 | -0.04 | 0.35 |
| **CEO Age** | -0.0222 | 0.02 | -1.18 | 0.238 | -0.06 | 0.01 |
| **CEO Gender** | -1.2881 | 0.41 | -3.16 | 0.002 | -2.09 | -0.49 |
| **Compensation Group** | 2.6057 | 0.26 | 10.19 | 0.000 | 2.10 | 3.11 |
| **_cons** | 8.571 | 1.05 | 8.15 | 0.000 | 6.51 | 10.63 |

Table 21 below displays the quantile regression output for Model 3.2. The independent variables total compensation, CEO ownership, CEO tenure and Compensation Group are statistically significant at the 5% significance level (p-values < 0.05). If an executive's total compensation increases by $1 million, the firm will have a higher ROA by 12.09% at the median level. If the executive acquires 1% more in company shares, the company will perform better by almost 0.1% at the 50$^{th}$ quantile. Contrariwise, if the executive remains with the company an extra year, the firm performance goes down with 0.03%

and if he/she stays in the company for 10 more years, the performance decreases with 3% at the 50% quantile. Additionally, if the CEO is part of the group which receives total compensation above the industry median, it will boost firm's performance by 1.46% at the median level. The pseudo R-squared of the model is 0.0234, meaning that the independent variables explain around 2.3% in the variation of the dependent variable.

***Table 21.*** *Quantile regression: Model 3.2. The effect of total compensation and control variables on median firm performance (ROA). The dependent variable is the ROA (return on assets) of a company, which is an accounting measure of firm performance. The independent variables are total executive compensation which comprises salary, bonus, non-equity incentive plan compensation, value realized from stock option exercises, grant-date fair value of stock awards, deferred compensation earning reported as compensation, and other compensation; the CEO's stake in the company; for how long he/she has occupied the CEO position of the firm; the CEO's age and gender; the compensation group the CEO belongs to: high group if his/her total compensation is above the industry median and low compensation group if the compensation is below the industry median.*

Number of observations=11,941

Pseudo $R^2$=0.0234

| ROA (%) | Coefficient | Robust Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| **Total Compensation** | 0.00001209 | 0.00 | 13.31 | 0.000 | 0.00 | 0.00 |
| **CEO Ownership (%)** | 0.09 | 0.01 | 6.55 | 0.000 | 0.06 | 0.11 |
| **CEO Tenure** | -0.03 | 0.01 | -2.80 | 0.005 | 0.06 | -0.01 |
| **CEO Age** | 0.00 | 0.01 | 0.26 | 0.798 | -0.02 | 0.02 |
| **CEO Gender** | -0.34 | 0.32 | -1.06 | 0.288 | -0.95 | 0.28 |
| **Compensation Group** | 1.46 | 0.16 | 8.95 | 0.000 | 1.14 | 1.78 |
| **_cons** | 6.58 | 0.63 | 10.37 | 0.000 | 5.34 | 7.82 |

It is of interest to investigate whether a simultaneous causality between Total Compensation and ROA exists, therefore Model 3.3 was introduced, and the output is presented in Table 22 below. The p-value of the ROA variable is lower than 0.05, indicating a statistical significance at the 5% significance level. The coefficient interpretation is: if ROA increases by 1%, the total compensation of the CEO of that firm increases by $10,065, while if it would increase by 10%, the executive's total compensation would be higher by $100,650. The firm performance measure (ROA) explains around 2.4% of the Total Compensation variation ($R^2$=0.0235).

***Table 22.*** *Linear regression: Model 3.3. The effect of firm performance (ROA) on total executive compensation. The dependent variable is total executive compensation which comprises salary, bonus, non-equity incentive plan compensation, value realized from stock option exercises, grant-date fair value of stock awards, deferred compensation earning reported as compensation, and other compensation. The independent variable is the accounting measure of firm performance – ROA.*

Number of observations=11,941

F(1, 11939)=115.88

Prob>F=0.000

R-squared=0.0235

Root MSE=8526.4

| **Total Compensation** | **Coefficient** | **Robust Std. Err.** | **t** | **P>\|t\|** | **[95% Conf. Interval]** | |
|---|---|---|---|---|---|---|
| **ROA (%)** | 1006.52 | 9.89 | 10.76 | 0.000 | 807.12 | 1250.92 |
| **_cons** | 6,214.36 | 103.93 | 59.79 | 0.000 | 6,010.63 | 6,418.09 |

Table 23 below shows the results of the quantile regression of Model 3.3. The independent variable ROA is statistically significant at the 5% significance level (p-value=0.00<0.05) and it follows that if the ROA of the company increases by 1%, the total executive compensation increases by $729 and if the performance increases by 10%, the compensation will increase by $7292 at the 50% quantile. However, following the pseudo $R^2$ of 0.0124 of this model, it follows that the ROA only explains 1.2% of the variation in total executive compensation.

***Table 23.*** *Quantile regression: Model 3.3. The effect of firm performance (ROA) on median total executive compensation. The dependent variable is total executive compensation which comprises salary, bonus, non-equity incentive plan compensation, value realized from stock option exercises, grant-date fair value of stock awards, deferred compensation earning reported as compensation, and other compensation. The independent variable is the accounting measure of firm performance – ROA.*

Number of observations=11,941

Pseudo $R^2$=0.0124

| **Total Compensation** | **Coefficient** | **Robust Std. Err.** | **t** | **P>\|t\|** | **[95% Conf. Interval]** | |
|---|---|---|---|---|---|---|
| **ROA (%)** | 72.92 | 2.14 | 34.03 | 0.000 | 68.72 | 77.13 |
| **_cons** | 3,775.98 | 47.12 | 80.13 | 0.000 | 3,683.61 | 3,868.34 |

As a robustness check for Model 3.1, the stock return was introduced as a measure of market performance, therefore Model 3.4 is investigated. From the regression output which is presented in Table 24 below, it follows that the Total Compensation variable has a positive statistically significant effect on the Stock Return. If the compensation of the CEO would go up by $100,000, the stock return

of that firm would go up by 2.06%, while if the compensation would go up by $1,000,000, the stock return would increase by 20.64%. However, the R-squared of this model is very low, it follows that the total compensation only explains 0.16% of the variation in Stock Return, therefore this cannot be seen as a representative result.

***Table 24.*** *Linear regression: Model 3.4. The effect of total executive compensation on the market measure of firm performance – Stock Return. The dependent variable is the stock return, which is a market measure of the performance of a company. The independent variable is total executive compensation which comprises salary, bonus, non-equity incentive plan compensation, value realized from stock option exercises, grant-date fair value of stock awards, deferred compensation earning reported as compensation, and other compensation.*

Number of observations=9.782

F(1, 9780)=17.83

Prob>F=0.000

R-squared=0.0016

Root MSE=46.093

| **Stock Return** | **Coefficient** | **Robust Std. Err.** | **t** | **P>\|t\|** | **[95% Conf. Interval]** | |
|---|---|---|---|---|---|---|
| **Total Compensation** | 0.00002064 | 0.00 | 4.22 | 0.000 | 0.00 | 0.00 |
| **_cons** | 12.75 | 0.64 | 19.95 | 0.000 | 11.50 | 14.00 |

Table 25 below exhibits the results of the quantile regression of Model 3.4. The total compensation variable is statistically significant at the 5% significance level and it follows that if the CEO compensation goes up by $1 million, the stock return increases by 32.58% and if the compensation increases by $100,000, the return of the stock will go up by 3.26% at the median level. However, the fit of the model is very weak, only showing a pseudo R-squared of 0.0019.

***Table 25.*** *Quantile regression: Model 3.4. The effect of total executive compensation on median of Stock Return. The dependent variable is the stock return, which is a market measure of the performance of a company. The independent variable is total executive compensation which comprises salary, bonus, non-equity incentive plan compensation, value realized from stock option exercises, grant-date fair value of stock awards, deferred compensation earning reported as compensation, and other compensation.*

Number of observations=9.782

Pseudo $R^2$=0.0019

| **Stock Return** | **Coefficient** | **Robust Std. Err.** | **t** | **P>\|t\|** | **[95% Conf. Interval]** | |
|---|---|---|---|---|---|---|
| **Total Compensation** | 0.00003258 | 0.00 | 10.92 | 0.000 | 0.00 | 0.00 |
| **_cons** | 6.85 | 0.48 | 14.16 | 0.000 | 5.90 | 7.79 |

For completing Model 3.4, extra control variables are added to the equation, for investigating their effect on Stock Return. The regression output is presented below in Table 26 and the Total Compensation variable again has a positive and statistically significant (p-value=0.002<0.05) effect on the Stock Return: if executive's total compensation increases by $100,000, the stock return will go up by 1.76% and if the compensation goes up by $1 million, there will be a boost of 17.6% in the stock return of that firm. Out of the other control variables, only the CEO Age was found to have a statistically significant effect on the return of the stock, while CEO Ownership, Tenure, Gender and the Compensation Group have no effect. If the executive gets older by 1 year, then the stock of his company will go down by 0.17%, while if he gets older by 10 years, then the stock return will decrease with almost 2%. The R-squared of this model is only 0.002, thus, the model is considered weak and no significant conclusions could be drawn from it.

***Table 26.*** *Linear regression: Model 3.5. The effect of total executive compensation and control variables on stock return. The dependent variable is the stock return, which is a market measure of the performance of a company. The independent variables are: total executive compensation which comprises salary, bonus, non-equity incentive plan compensation, value realized from stock option exercises, grant-date fair value of stock awards, deferred compensation earning reported as compensation, and other compensation; the percentage of the total shares of a firm that the CEO holds in his/her possession; for how many years the executive holds the CEO position; his/her age and gender; the compensation group the CEO belongs to: high group if his/her total compensation is above the industry median and low compensation group if the compensation is below the industry median.*

Number of observations=9,489

F(6, 9482)=2.18

Prob>F=0.0041

R-squared=0.0020

Root MSE=46.246

| Stock Return | Coefficient | Robust Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| **Total Compensation** | 0.0000176 | 0.00 | 3.07 | 0.002 | 0.00 | 0.00 |
| **CEO Ownership (%)** | 0.0763 | 0.13 | 0.58 | 0.562 | -0.18 | 0.34 |
| **CEO Tenure** | 0.0856 | 0.08 | 1.04 | 0.300 | 0.08 | 0.25 |
| **CEO Age** | -0.1680 | 0.08 | -2.08 | 0.038 | -0.32 | -0.01 |
| **CEO Gender** | 1.1509 | 2.45 | 0.47 | 0.639 | -3.66 | 5.96 |
| **Compensation Group** | 0.7681 | 1.11 | 0.69 | 0.490 | -1.41 | 2.95 |
| **_cons** | 20.3313 | 5.01 | 4.05 | 0.000 | 10.50 | 30.16 |

Table 27 below displays the quantile regression output for Model 3.5. The total executive compensation variable, CEO tenure and Compensation Group are statistically significant at the 5% significance level. It follows that, if the total executive compensation increases by $100,000, the stock return will increase by 2.1%, whereas if there's a higher compensation by $1,000,000 there will be a boost in stock return of 20.59% at the median level. Similarly, if a CEO remains with the company for one year longer, the stock will have a higher return of 0.13% at the 50$^{th}$ quantile. Moreover, if the CEO is part of the group which receives total compensation above the industry median, it will boost stock's return by 3.28% at the 50% quantile. The independent variables in this model explain 0.25% of the variation in stock return (pseudo $R^2$=0.0025).

***Table 27.*** *Quantile regression: Model 3.5. The effect of total executive compensation and control variables on median stock return. The dependent variable is the stock return, which is a market measure of the performance of a company. The independent variables are: total executive compensation which comprises salary, bonus, non-equity incentive plan compensation, value realized from stock option exercises, grant-date fair value of stock awards, deferred compensation earning reported as compensation, and other compensation; the percentage of the total shares of a firm that the CEO holds in his/her possession; for how many years the executive holds the CEO position; his/her age and gender; the compensation group the CEO belongs to: high group if his/her total compensation is above the industry median and low compensation group if the compensation is below the industry median.*

Number of observations=9,489

Pseudo $R^2$=0.0025

| Stock Return | Coefficient | Robust Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| **Total Compensation** | 0.00002059 | 0.00 | 4.80 | 0.000 | 0.00 | 0.00 |
| **CEO Ownership (%)** | -0.11 | 0.09 | -1.15 | 0.249 | -0.30 | 0.08 |
| **CEO Tenure** | 0.13 | 0.06 | 2.12 | 0.034 | 0.01 | 1.25 |
| **CEO Age** | -0.10 | 0.06 | -1.67 | 0.095 | -0.22 | 0.02 |
| **CEO Gender** | -0.82 | 2.08 | -0.40 | 0.693 | -4.89 | 3.25 |
| **Compensation Group** | 3.28 | 0.93 | 3.54 | 0.000 | 1.46 | 5.09 |
| **_cons** | 11.61 | 3.87 | 3.00 | 0.003 | 4.02 | 19.19 |

# 5. Conclusion & Discussion

The purpose of this section is to give a brief summary of the findings of this research and to present an answer to the question "Is CEO pay out of control?". For every tested hypothesis the conclusion is presented in a short paragraph and a comparison of how the current results align with the existing studies on this topic is exhibited. This section closes with the limitations of this study and how the research was affected by them and ideas for future research.

The aim of this study was to present a substantial answer to the research question "*Does the peer benchmarking compensation process lead to the CEO pay to be out of control in the US?***"**. Given the derived hypotheses and the empirical evidence, the achieved results make it possible to come up with a solid conclusion.

To summarize the results, for the first hypothesis that peer benchmarking has no effect on CEO compensation, the variable of interest "Firm Group" (see Tables 8 & 9) is statistically significant, meaning that peer benchmarking does have an effect on CEO pay. This finding is aligned with the views of multiple academics (Bizjak, Lemmon, & Naveen, 2008; Bizjak, Lemmon, & Nguyen, 2011; Shin, 2016). Bizjak, Lemmon, & Naveen (2008) find in their analysis that the CEOs that are compensated in the previous year below the peer group median, will receive compensation in the current year, on average, around $1.3 million more than their peers who were compensated below the median. The results of Bizjak, Lemmon, & Nguyen (2011) indicate that the CEO compensation is significantly determined by the use of peer group benchmarking. Shin's (2016) conclusion is that there is a significant relationship between the CEO's and peer group's pay, however, this is very much influenced by how much power the CEO holds over the board of the company.

Focusing on the second hypothesis which states that there is no effect of CEO talent on firm performance, the results indicate that there is enough statistical evidence to conclude otherwise. This is aligned with the findings of Albuquerque, DeFranco, & Verdi (2012) and Falato, Li, & Milbourn (2010). In their research, Albuquerque, DeFranco, & Verdi (2012) find that their proxies for CEO talent are positively and statistically significantly related to the accounting and stock performance of the company; they state that the CEO talent which seizes the executive's triumph in administrating complex organization and accomplishing high firm performance is rewarded according to the peer pay effect. Falato, Li, & Milbourn (2010) use the same CEO talent proxy as the one used in the current paper (Outsider/Insider CEO) and they find for their sample of 2,195 CEOs that, on average, an outside CEO is associated with a statistically significant firm performance of 2.7%.

Regarding the third hypothesis, which investigates the effect of total compensation on firm's accounting (ROA) and market (stock return) performance, there is enough evidence to conclude that the CEO pay is positively associated with ROA and Stock Return. However, this view is contrasting with the most academics investigating this topic (Bebchuk & Fried, 2003; Harris, 2009; Aggarwal & Samwick, 1999). Bebchuk & Fried (2003) tackle this subject by analyzing the "Gratuitous Goodbye Payments" concept which argues that because the CEOs are insured with nice compensation packages even if they leave/are fired from a company, they are not at all motivated to assure a high firm performance. Harris (2009) finds that the firms which pay their CEOs over 92% of the total compensation as stock options have an almost 40% probability of an accounting restatement in the next 10 years, which implicitly negatively affects the firm performance. Moreover, he concludes that the executive incentive pay can lead to a firm losing 46% of its accounting profitability in the next 1-2 years.

To summarize, there is enough evidence to conclude that peer benchmarking has a significant effect on total CEO compensation, an Outsider CEO will boost the firm performance up and a higher compensation will result in a higher accounting and market performance of the company. Therefore, the CEO pay is not out of control and it has positive effects on the way the firm performs. Indeed, the executives are highly compensated, the 90$^{th}$ percentile of the data shows compensations between $16 million up to almost $70 million, however, these amounts are shown to have a positive effect on the performance measures of the company. Looking at the peer benchmarking method of compensating executives, it has been demonstrated that this process indeed does boost the total compensation high up, by big amounts, but as a result, this also positively impacts the return on assets measure, thus, ultimately, it can be said that it is a beneficial method for calculating the amount offered as CEO pay.

There are, however, limitations to this study. The most common limitation in academic research is the omitted variables bias (OVB). There are probably many other variables which affect total executive compensation other than the peer groups, firm performance and the control variables tested, which were not included in the regression analysis.

Secondly, Wharton database has several flaws: 1) there are numerous variables which have a lot of missing data, thus making it difficult to draw substantial conclusions; if the dataset is used as it is with many missing entries, then the estimators are biased and if the missing values are omitted, the dataset becomes substantially smaller; 2) because the data needed for this analysis had to be collected from two different vendors, the process of data collection is longer and more difficult, moreover, a lot of attention and double-checking is required when merging the datasets in order to match them correctly and not lose any important information; 3) it was of high interest for this paper to include governance characteristics like board size, GIM index etc., however, the vendor which offers this information (ISS)

only has this data available up to the year 2006 and because the current sample starts in 2010, it was not possible to include these characteristics.

Another limitation is the availability of non-US data on executive compensation. Important to state is that the topic of CEO compensation is most debatable and talked to in the US, possibly because the biggest corporations in the world are US based, as well as the S&P index is the most commonly followed index in the world. However, it would be both economically and financially significant to research this topic in a different setting other than the US but unfortunately, this was not possible in the current paper because of the availability of the data.

In order to account for these limitations, further research is highly recommended. In order to account for the omitted variable bias (OVB) more control variables should be included in the research and these could cover: governance characteristics (board size, fraction of the board that is independent, GIM index), industry characteristics (the degree of competition, technological dispersion), market conditions (economic stability, market's growth rate). Moreover, extending the research in a non-US setting would bring a new light on the executive compensation topic.

# Appendix

*Table 28. Classification of SIC-codes*

| SIC-code | Industry |
|---|---|
| **0100 – 0999** | Agriculture, Forestry and Fishing |
| **1000 – 1499** | Mining |
| **1500 – 1799** | Construction |
| **1800 – 1999** | Not used |
| **2000 – 3999** | Manufacturing |
| **4000 – 4999** | Transportation, Communications, Electric, Gas and Sanitary Service |
| **5000 – 5199** | Wholesale Trade |
| **5200 – 5999** | Retail Trade |
| **6000 – 6799** | Finance, Insurance and Real Estate |
| **7000 – 8999** | Services |
| **9100 – 9729** | Public Administration |
| **9900 – 9999** | Nonclassifiable |

*Nonclassifiable companies were removed from the sample (NAICS, 2018)

*Table 29. Gender distribution*

| Gender | Frequency | Percent |
|---|---|---|
| **FEMALE** | 417 | 3.49% |
| **MALE** | 11,524 | 96.51% |
| **Total** | **11,941** | **100.00%** |

*Table 30. Industry distribution*

| Industry | Frequency | Percentage |
|---|---|---|
| **Agriculture, Forestry and Fishing** | 29 | 0.24% |
| **Mining** | 602 | 5.03% |
| **Construction** | 214 | 1.79% |
| **Manufacturing** | 5,217 | 43.59% |
| **Transportation, Communications, Electric, Gas and Sanitary Service** | 1,246 | 10.41% |
| **Wholesale Trade** | 405 | 3.38% |
| **Retail Trade** | 936 | 7.82% |
| **Finance, Insurance and Real Estate** | 1,425 | 11.91% |
| **Services** | 1,867 | 15.60% |
| **Total** | **11,941** | **100.00%** |

*Table 31. Descriptive Statistics for firms from the "large" firm group*

| Variable | Observations | Mean | Median | Std. Dev. | Minimum | Maximum |
|---|---|---|---|---|---|---|
| ***CEO characteristics*** | | | | | | |
| **Total compensation ($ 000s)** | 5,972 | 10,490.78 | 7,285.57 | 10,134.22 | 180.96 | 69,868.94 |
| **CEO Ownership (%)** | 5,972 | 1.11 | 0.29 | 3.22 | 0 | 51.99 |
| **CEO Tenure** | 5,972 | 6.93 | 5.00 | 6.69 | 0 | 59.00 |
| **CEO Age** | 5,972 | 56.77 | 57.00 | 6.59 | 28.00 | 94.00 |
| **CEO Gender (dummy)** | 5,972 | 0.97 | - | 0.18 | 0 | 1 |
| ***Firm characteristics*** | | | | | | |
| **Sales ($ millions)** | 5,972 | 11,729.16 | 4,926.89 | 19,226.88 | 654.42 | 129,976.00 |
| **ROA (%)** | 5,972 | 9.85 | 8.82 | 8.07 | -137.53 | 90.93 |
| **M/B** | 5,972 | 1.67 | 1.29 | 1.37 | 0.00 | 15.87 |
| **Stock Return (%)** | 5,972 | 12.89 | 10.05 | 39.10 | -81.71 | 422.64 |

*Table 32. Descriptive Statistics for firms from the "small" firm group*

| Variable | Observations | Mean | Median | Std. Dev. | Minimum | Maximum |
|---|---|---|---|---|---|---|
| ***CEO characteristics*** | | | | | | |
| **Total compensation ($ 000s)** | 5,969 | 3,712.59 | 2,402.88 | 48,166.437 | 180.96 | 69,868.94 |
| **CEO Ownership (%)** | 5,969 | 2.80 | 0.97 | 5.48 | 0 | 62.35 |
| **CEO Tenure** | 5,969 | 8.09 | 6.00 | 7.68 | 0 | 61.00 |
| **CEO Age** | 5,969 | 56.03 | 56.00 | 7.65 | 32.00 | 96.00 |
| **CEO Gender (dummy)** | 5,969 | 0.96 | - | 0.18 | 0 | 1 |
| ***Firm characteristics*** | | | | | | |
| **Sales ($ millions)** | 5,969 | 731.68 | 558.78 | 623.21 | 25.22 | 4,891.00 |
| **ROA (%)** | 5,969 | 6.83 | 6.99 | 15.44 | -314.39 | 124.68 |
| **M/B** | 5,969 | 1.90 | 1.40 | 1.73 | -0.08 | 23.42 |
| **Stock Return (%)** | 5,969 | 15.68 | 8.79 | 52.25 | -81.71 | 422.64 |

*Figure 1. Histogram Total Compensation*

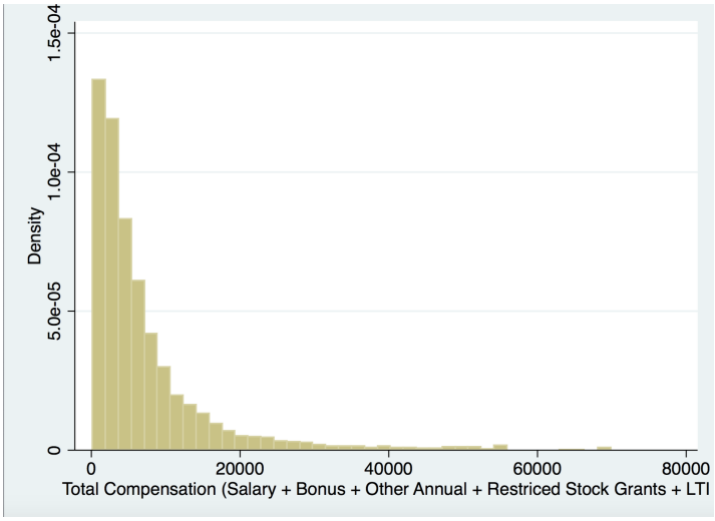



*Figure 2. Histogram CEO Ownership*

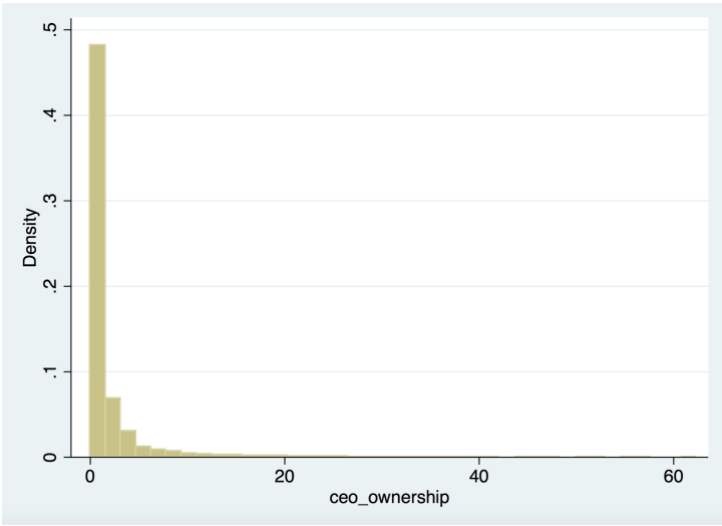



*Figure 3. Histogram CEO Tenure*

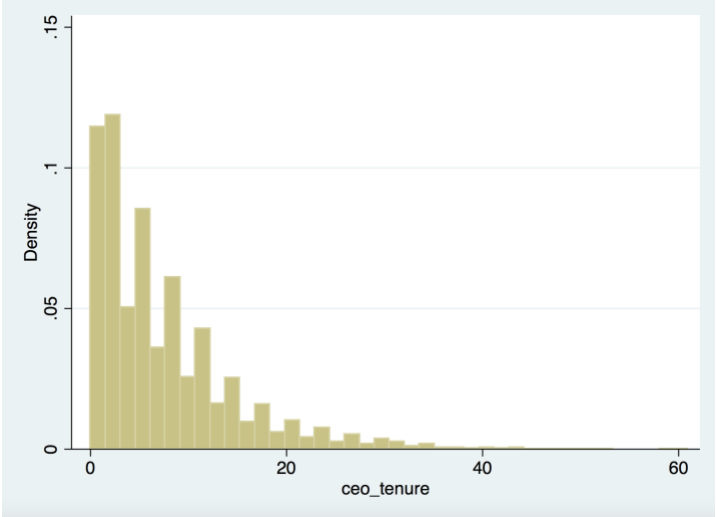


*Figure 4. Histogram CEO Age*

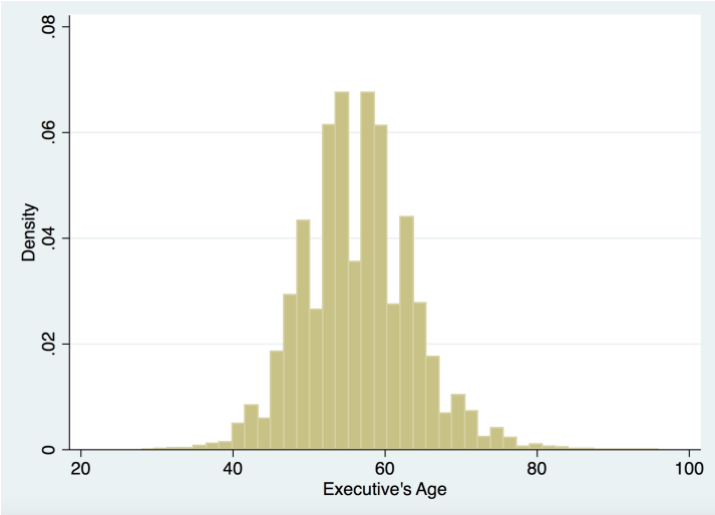



*Figure 5. Histogram Sales*

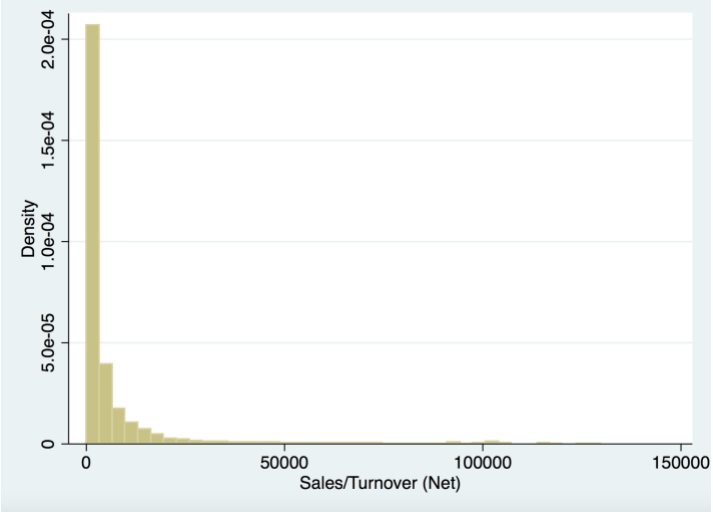



*Figure 6. Histogram ROA*

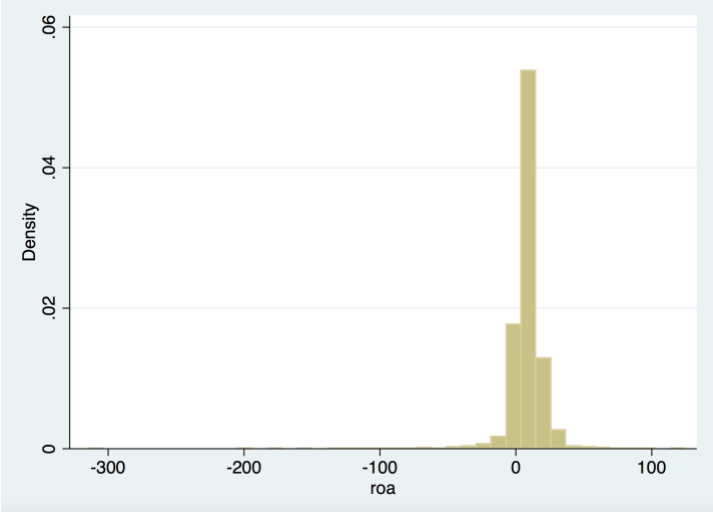


*Figure 7. Histogram M/B*

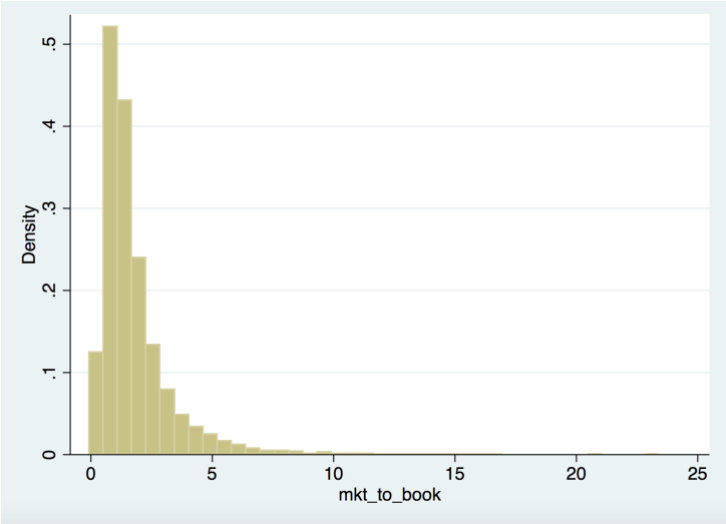
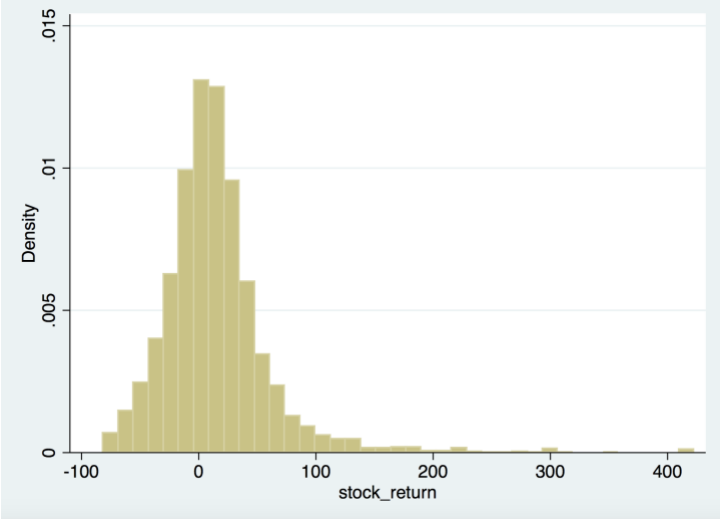



*Figure 8. Histogram Stock Return*



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