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The gender gap in CEO compensation

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Abstract
Equal treatment regarding compensation still seems to be absent even after all the (academical) attention. Besides the obvious social urgency of equal gender pay, the conflicting conclusions motivate this study to analyze CEO compensation more thoroughly with regard to gender differences. To construct a model for examining this question, I obtained datasets from the period 2009 till 2021 of the Compustat, Execucomp and Institutional Shareholder Services databases. The variables are categorized in general, CEO, government, and economic characteristics. The model analyses their effect on three definitions of compensation, specifically salary, bonus, and total compensation. After examination of the regressions, I find evidence of an increased total compensation and higher salary for female CEOs. The robust regressions also indicate higher compensation for more independent, larger, and higher performing firms. Furthermore, women tend to run firms with a higher leverage and return on equity ratio, which is based on the logistic regression. On the other hand, the probability of a firm being led by a man is higher when tenure or ownership increases. The results indicate that the equal treatment does not seem absent after all.

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1. Introduction

Since 1976 the principle of equal treatment between men and women on the labor market has been implemented (Thaler and Rosen, 1976). And although the pay difference is decreasing (Blau and Kahn, 2020), the equal treatment still seems to be absent. In the United States women earn approximately 82 cents for every dollar men earn (Bureau of Labor Statistics data, 2020). Even more shocking is the pace of convergence; in 2010 earnings of women were only 81 cents for every dollar men made. The gap also seems to appear within racial groups, educational levels, occupations and across countries for full- and part-time workers as stated by Lips (2003). Recently, research has been done specifically for executive roles. The executive gender pay gap for lower-level executives has been proven by Elkinawy and Stater (2011). They even observed a diminishing gap for CEOs over time. However, Jordan et al. (2007) disagree with the latter since they have found no such evidence in their earlier study. Besides the obvious social urgency of equal gender pay, the conflicting conclusions are one of the reasons this paper analyses CEO compensation more thoroughly using the following research question:

"Is there a gender gap in CEO compensation?"

Evaluating only CEOs enables us to abstract from different executive roles and responsibilities for the job titles due to its homogeneous character. Moreover, CEOs of large firms generally carry more responsibilities than similar smaller firms. With these increasing responsibilities, compensation increases accordingly (Smith and Watts, 1992). Thus, correcting for firm size is essential to this research. The data section elaborates on this element.

Compensation is defined by annual remuneration packages in this case made specifically for CEOs of a company. It can be categorized into salary, bonuses or total compensation which includes salary, bonus, other annual compensation, total value of restricted stock granted, total value of stock options granted using Black-Scholes.

These various definitions of compensation are analyzed on a total sample of 9,951 firm years of U.S. publicly traded companies of the S&P 1500 index for the period 2009-2021. After examination of the regressions, I find evidence of an increased total compensation and higher salary for female CEOs. This would suggest even more progress of the diminishing gap after

the study of Elkinawy and Stater (2011). The robust regressions also indicate higher compensation for more independent, larger, and higher performing firms. Furthermore, women tend to run firms with a higher leverage and return on equity ratio, which is based on the logistic regression. On the other hand, the probability of a firm being led by a man is higher when tenure or ownership increases.

The next section describes relevant previous studies regarding the topic of this study. Specifically, the relationship between CEOs and shareholders, the differences of CEO compensation between men and women and the gender differences in multiple executive levels are reviewed in the past. Section 3 discusses the data used for analyzing the research question and the methods used for the actual testing of the hypothesis is described in section 4. The findings of the analysis are presented in section 5 and concluding statements about the gender differences in CEO compensation follow in section 6. Based on the last sections, possible limitations and further research possibilities are stated in section 7.

2. Literature review

Prior literature often discusses the relationship between CEOs and shareholders. Shareholders generally set the compensation structure for CEOs in an attempt to resolve the principal-agent problem. Therefore, it is important who is seated in the supervisory board. Logically, it can be argued that if a board consists of more women, the pay is more equal for a female CEO. However, as Thomas and Wells (2010) stated, the Board Capture Theory is increasingly popular and undermines the authority of the board. The theory claims that executives such as CEOs dominate their board of directors, and therefore have considerable power to set their own pay. A possible explanation could be the dispersed ownership in public firms. These smaller shareholders might not have much say in the business, also preventing them to negotiate about compensation with the CEO (Jensen, 1989). Thus, the Board Capture Theory would suggest that a CEO would set its own pay regardless of gender ratios in the supervisory board. However, the contradicting theories of the relationship between CEOs and shareholders have yet to be examined with regard to gender.

Moreover, papers on gender differences considering specifically CEO compensation are limited by smaller proportions of female CEOs versus male CEOs. For example, the research sample of Adams et al. (2007) contains only 61 female CEOs versus 4,634 male CEOs in the years from 1992 till 2004 in the United States. They are forced to broaden their sample by including lower-level executives to obtain more reliable results. Fortunately, statistics has shown the increasing number of female CEOs in the recent years, which partly eliminates the small sample problem for female CEOs. The more advanced solution is propensity score matching as described thoroughly by Caliendo and Kopeinig (2008). It is implemented by Bugeja et al. (2012) which allowed them to analyze a more representable sample since the female and male CEOs are properly matched. However, for this paper this is not applied due to its complexity.

The most recent papers on specifically the CEO compensation which have also succeeded in using a matching procedure, have not yet found significant evidence of a relationship between CEO compensation. For example, Gupta et al. (2018) examine the theory of Hill et al. (2015) and improve their sample and methodology by using an extended period and more rigorous analyses. Their revised results disagree with the theory that women in CEO positions earn more remuneration than men. They argue that there does not exist reliable

evidence for gender pay differences. The study of Harris et al. (2019) also finds little to no significant evidence, when examining CEOs over an even larger period.

As described above, prior literature has also touched upon the relationship between gender and multiple levels of executive managers. Using this broader sample, researchers succeeded to finding significant results. For instance, Elkinawy and Stater (2011) conclude that the annual base salary of female executive managers is approximately 5 percent lower than those of male executive managers. For total compensation this observed inequality is even larger. These findings are in line with those of Adams et al. (2007). However, they extend on these views with the statement that when women reach the CEO position, they tend to earn similar compensation as men. Women do have to secure this position by better qualifications such as more work experience and stronger education.

The literature review does not provide a conclusive result regarding gender pay differences which motivates this paper to consider the following hypothesis:

H1. Female CEOs are equally compensated as male CEOs.

3. Data

Research for the review of the hypothesis focuses on the period 2009 till 2021, rather than the already examined period from 1998 to 2010 (Bugeja et al., 2012). Hence, the current social environment is better evaluated and therefore a better and more relevant understanding of the recent economic situation is accomplished. This contribution to the literature is based on information about executive compensation collected directly from each listed company's annual proxy in North America acquired from the Investor Responsibility Research Center (IRRC), Compustat Fundamentals Annual and Execucomp databases. The IRRC changed its name to Institutional Shareholder Services and covers information about directors of the S&P 1500 companies. Using the S&P 1500 is beneficial since it combines the S&P 500, the S&P MidCap 400 and the S&P SmallCap 600. Considering these different indices of varying market capitalization allows the sample to be a proper benchmark. Compustat contains fundamental and market information for over 80,000 active and inactive publicly traded companies. Execucomp is part of the Compustat dataset and covers listed companies from the S&P 1500 index. Variables which are reported in Execucomp are mainly regarding the compensation values. Observations with missing information about the used variables are eliminated from the sample. Also, when Execucomp records total compensation with value 0, the observation is also eliminated. As stated by Bugeja et al. (2012), these observations are either data errors or unusual circumstances.

The evaluated variables are categorized in the following sections: general, industry and year, governance, economic and CEO characteristics. The general section consists of variables regarding the company's code, the CEO's identification, age, gender, the date when he/she became CEO and the date when he/she retired from the position in question. Adding the time interval of employment is used to potentially exclude years with two CEOs. The recent discussions about gender identification unfortunately have not impacted the databases yet which allows the gender variable to assign only two outcomes.

Moreover, governance characteristics are examined through variables of board size, a percentage of independent directors, and a dummy which indicates if the entire compensation committee is independent. Independent board members are said to be more effective at monitoring their CEOs (Coles et al., 2008) and therefore indicating appropriate levels of compensation according to the CEO performance. With the same train of thought, the importance of including the independence of the compensation committee is justified.

However, Jensen (1993) concluded that an increase in board size reduces the effectiveness due to low accountability of individual board members and an increased probability of the CEO to capture the board.

Next for the CEO characteristics, the continuous variable regarding CEO tenure and total compensation are observed as well as dummy variables regarding the CEO's first year of service at the firm, ownership of at least five percent and the question if the CEO is also the board chairperson. As mentioned, total compensation consists of salary, bonus, other annual compensation, total value of restricted stock granted, total value of stock options granted using Black-Scholes, long-term incentive payouts and all other total compensation. The tenure of the CEO is of interest due to higher compensation for more work experience and more influence over the board. However, ambiguous results could be obtained for specialized CEOs who generally earn a lower pay premium (Custódio et al., 2013). The variable representing the CEO's first year of service also attains dubious conclusions due to contractual arrangements which could either grant them higher starting premiums or delayed premiums based on realized performance. The indicator for the chairman is a signal of greater influence on the board (Bebchuck et al., 2002). On the contrary, having a larger share of the company persuades the director to reinvest it in the company rather than paying it to themselves as remuneration.

Lastly, economic control variables are included, namely total assets, book-to-market ratio, stock return, and firm leverage. As mentioned in the introduction, due to greater responsibilities CEOs of larger firms are rewarded with higher compensation, which is why a variable of total assets is added. Book-to-market ratio is essential since greater investment opportunities are said to coincide with higher compensation. As compensation varies over firm performance, the RET is controlled for. And finally, risk has a negative relationship with compensation (Core et al. 1999), which is why the influence of firm leverage is measured.

4. Methodology

To test the hypothesis a method should be constructed. First, summary statistics show possible characteristics of the data.

Second, univariate Wilcoxon-Mann-Whitney tests are performed on all the variables sorted by gender to test whether the two independent samples have similar distributions and thus can be compared. This method is an alternative of the standard t-tests. Although, the Wilcoxon-Mann-Whitney tests are more conservative and allow for a non-parametric distribution and not pairing of observations.

Third, the pooled regressions are realized to analyze the panel data observed over the time period using the following Ordinary Least Square regression equation:

$$Comp_{it} = \beta_1\, FemCEO_{it} + \sum \beta_j\, GovernanceCharacteristics_{it}$$

$$+ \sum \beta_k\, CEOCharacteristics_{it} + \sum \beta_l\, EconomicCharacteristics_{it}$$

$$+ \sum \beta_m\, IndustryIndicators_i + \sum \beta_n\, YearIndicators_t + \varepsilon_{it}$$

The dependent compensation variable is alternatively substituted by total compensation, salary and bonus. Due to their skewed distribution CEO tenure, sales, and RET is analyzed using the natural logarithm.

When analyzing regressions, it is crucial to check for the assumptions. Heteroskedasticity needs to be controlled for through the White test. If heteroskedasticity is found, solving this could be done by running robustness checks. Next, the assumption of normally distributed errors around the zero mean is considered through plotting the regression. This method is not particularly reliable; however, the Central Limit Theorem solves the issue of non-normality accordingly. The other conditions of endogeneity and zero mean errors are both unobservable. Endogeneity is corrected by finding an instrumental variable. Nonetheless, it is highly unlikely that this can be accomplished and observing endogeneity is impossible. The occurrence of zero mean errors is not detectable and therefore not solvable due to the fixed effects of the OLS regression which consumes the mean. Also, multicollinearity could exist in the model, which is unfavorable and tested with the variance inflation factor (VIF). The rule of thumb regarding this problem states that no VIF of a

distinctive variable can exceed a value of 10 and the total VIF cannot exceed 1. Otherwise, it is probable that intercorrelation of the independent variables occurs.

Fourth, logistic regressions are run on the binary variable which indicates the gender of the CEO. The already specified control variables are analyzed and the effect on the probability of having a female CEO can be identified.

Last, some alternative specifications are reviewed such as the fixed effects, interactions of the gender of the CEO and the firm performance, and the sensitivity analysis. Controlling for industry and year effects is done through the variable for SIC codes and year indicators. The year and industry fixed effects are necessary since it is possible for a firm to enter the pooled sample multiple times (Bugeja et al., 2012) and these variables cannot vary over time. Kulich et al. (2011) concludes for a sample of executives in the UK that executive pay for males is more sensitive to performance which addresses the concern to control the interaction effect between performance and gender. And since age is a noisy proxy for work experience (Bugeja et al., 2012), this serves as a variable for the sensitivity analysis. The analysis on different values of the age variable determines how they affect compensation under a given set of assumptions.

5. Results

After implementing the methods described in the previous chapter, statistical results were conducted which are discussed in this section.

5.1 Descriptive statistics

Table 1 describes the summary statistics on the total sample separated by gender and categorized by year and industry. Mainly, an increase of female CEOs relative to the total sample is evident. This is not very shocking due to the rising awareness of more women in top executive positions. Also, overall the number of CEOs is rising each year as well, except for the years 2015 and 2020. Possible explanations could be bankrupted firms during Covid-19 or some differences in the dataset due to unreported years of termination. Table 1b shows that most of female CEOs work in industrials and male CEOs work mainly in consumer staples, industrials and utilities. The presence of the numerous female CEOs in the industrial sector is explained by the fact that this sector contains the largest number of firms in this sample. To straighten this out, the last column in Table 1b is added which represents the percentage of female CEOs versus the total number of CEOs per industry.

Table 1a Summary statistics by year

Year	Number of firms	Female CEOs	Female versus total %
2009	630	14	2.22
2010	660	16	2.42
2011	703	18	2.56
2012	723	24	3.32
2013	757	31	4.10
2014	793	34	4.29
2015	837	34	4.06
2016	897	45	5.02
2017	959	52	5.42
2018	989	56	5.66
2019	1,052	64	6.08
2020	951	54	5.68
Total	9,951	442	4.44

Table 1b Summary statistics by industry

Industry (2-digit GICS)	Number of firms	Female CEOs	Female versus total %
Energy	721	57	7.91
Materials	329	16	4.86
Industrials	1,898	102	5.37
Consumer discretionary	403	7	1.74
Consumer staples	1911	33	1.73
Health care	146	7	4.79
Financials	1,319	85	6.44
Information technology	936	19	2.03
Telecommunications	561	65	11.59
Utilities	1727	51	2.95
Total	9,951	442	4.44

This table shows a summary descriptive of the sample in 2009-2021. Table 1a is sorted by years. Table 1b is sorted by industry categorized by two-digit SIC codes.

The dependent variables and the control variables are outlined in Table 2. The last column of Table 2 represents the results of the Wilcoxon-Mann-Whitney tests. For example, as indicated by the sign of significance, the p-value of total compensation is lower than 5 percent which means the null hypothesis can be rejected. So, by definition there is significant proof that the medians for the different genders are not equal. When comparing the medians of the two subsamples, the evidence indicates that females earn more compensation on average. Noticeable is also the slightly higher salary for women. However, when considering the response variable bonus there does not seem to be a large variation between genders. Nonetheless, the larger mean indicates a higher bonus given to female CEOs. By the same reasoning, there is evidence that female CEOs run companies with more board members on their supervisory boards, higher return on equity ratios and more leverage. As for male CEOs, whenever they run a company, they more often obtain a larger share of the company's stock than their female CEO competitors or they already own a larger share. This could occur when the CEO is also the founder of the company. Furthermore, male CEOs seem to keep their position longer. For the other variables the test fails to reject the null hypothesis as the results are insignificant.

When observing only the summary statistics of the male versus female CEO firms as seen in columns 2-5, an especially large difference in the mean of total assets is found. The observed higher total assets for firms ran by female CEOs is a possible explanation for higher rewards through total compensation or salary. When comparing this variable to the size variable that is used by Bugeja et al. (2012), similar results are found. This could suggest that women run larger firms. However, further analyses should be realized before making actual statements.

Table 2 Summary statistics and Wilcoxon-Mann-Whitney tests

	Male CEO firms (N = 9,509)		Female CEO firms (N = 442)		Total CEO firms (N = 9,951)		Wilcoxon-Mann-Whitney
Variable	Mean	Median	Mean	Median	Mean	Median	Z
Total Comp	7,512.15	5,324.78	8,029.60	5,625.88	7,191.12	5,336.54	-3.03***
Salary	912.15	891.67	988.48	949.04	915,54	895.21	-4.60***
Bonus	115.72	0.00	126.47	0.00	529.09	0.00	2.54**
FemalePcnt	0.04	0.04	0.05	0.05	0.04	0.04	-6.08***
Boardsize	9.32	9.00	9.60	9.00	9.33	9.00	-2.92***
Indep%	0.57	0.50	0.55	0.00	0.57	0.50	-1.36
IndepComp Com	0.06	0.00	0.05	0.00	0.06	0.00	1.10
Tenure	16.24	15.00	13.97	12.00	16.14	15.00	5.27***
Chair	0.10	0.00	0.09	0.00	0.10	0.00	0.91
FirstYear	0.01	0.00	0.02	0.00	0.01	0.00	-1.86*
FivePcnt	0.11	0.00	0.07	0.00	0.11	0.00	3.18***
Total assets	12,737.32	3,057.50	18,938.14	3,085.27	13,012.80	3,058.00	-1.76*
BMV	0.01	0.00	0.01	0.01	0.01	0.00	-1.03
Leverage	0.80	0.52	1.13	0.70	0.81	1.07	-4.04***
RET	0.03	0.04	0.04	0.05	0.03	0.04	-3.97***

This table shows the mean and median for the firms with male, female, and total CEOs in columns 2-7. In column 8, the results of the Wilcoxon-Mann-Whitney test are presented. Total Comp presents the natural logarithm of total compensation (in thousands of dollars). Salary and Bonus is measured in thousands of dollars. FemaleCEO is a dummy variable which is 1 if the CEO is a woman and 0 otherwise. Boardsize represents the number of board members. Indep% is the percentage of independent board members. IndepCompCom is a dummy variable which is equal to 1 if the entire compensation committee

is independent and 0 otherwise. Tenure represents the number of years the CEO is in service. Chair is a dummy variable which is 1 if the CEO is also chairman of the board and 0 otherwise. FirstYear is a dummy variable which is 1 if it is the first year in function of the CEO and 0 otherwise. FivePcnt is a dummy variable which is 1 if the CEO owns five percent or more of the company's shares and 0 otherwise. Size represents the total assets of the company in question. BMV represents the book-to-market ratio of the firm and is measured by dividing total common equity and market value (in millions of dollars). Leverage is measured by dividing total liabilities and total equity (in millions of dollars). RET represents the return on equity. *** p < 0.01, ** p < 0.05, * p < 0.1

5.2 Pooled regressions

Before running the regressions, the assumptions are tested. As shown in Appendix 1 the p-values of the three White tests are all below the 5 percent critical value. This indicates the presence of heteroskedasticity. Nonetheless, the condition of normally distributed errors around the zero mean seems to hold roughly (see Appendix 2). The rule of thumb for multicollinearity does not hold due to the mean VIF which exceeds 1 (see Appendix 3). As mentioned in the method section, the other assumptions cannot be tested and therefore not solved.

To correct the detected heteroskedasticity, robustness checks are used for the pooled regressions on the dependent variables total compensation, salary and bonus. First, the OLS regression on total compensation results in a 28 percent adjusted goodness-of-fit measure (see Table 3, column 2). Thus, the control variables seem to explain the dependent variable quite well. Moreover, the variable indicating the gender of the CEO is significant and has a positive coefficient, which is consistent with the findings in Table 2. Therefore, based on this dataset it can be concluded that female CEOs receive a higher total compensation compared to male CEOs. The other variables concerning the independence of the board, the share of the CEO ownership, the size of the firm, the book-to-market measure and the return on assets are all significant findings as well. These results in combination with a positive coefficient imply an increase of total compensation (in dollars) with the size of the coefficient when adding 1 unit of the explanatory variable provided it being continuous. In case of a dummy variable, the response variable increases with the coefficient when substituting it with the indicator represented by the value 1. The other independent variables are insignificant and therefore cannot be interpreted.

When comparing the results of the first regression to the regressions on salary and bonus, coherent findings exist for the size, performance, and independence variables. Thus, changes in these affect all the dependent variables. According to prior research, the reasoning where larger and better performing companies are compensated more as well as firms with

higher rates of independence in their supervisory boards, seems a sensible conclusion from this study. Almost all the other significant results also imply logical theories supported by literature when considering the significant regressions on total compensation and salary. For instance, the negative effect of an increase of ownership causes the shareholder to reinvest the money in the company to enable accumulation of dividend. However, greater investment opportunities represented by a higher book-to-market ratio should correspond with higher CEO compensation since higher risk should be rewarded. This is contradicted by the negative coefficient presented in column 2 of Table 3.

Table 3 Robust pooled regressions (N = 9,891)

Parameter	Total Compensation	Salary	Bonus
Intercept	5.43***	-268.58***	29.88
	(0.18)	(47.14)	(67.85)
FemaleCEO	0.14***	40.48***	43.05
	(0.03)	(11.82)	(29.37)
Boardsize	0.02	12.98***	-6.28
	(0.01)	(2.55)	(4.17)
Indep%	0.89***	82.88**	-149.37**
	(0.15)	(36.90)	(58.90)
IndepCompCom	-0.03	-18.28	20.00
	(0.05)	(13.89)	(25.72)
Log(Tenure)	0.02	24.58***	-8.99
	(0.02)	(5.42)	(9.19)
Chair	-0.10*	-6.66	110.59***
	(0.05)	(14.74)	(27.76)
FirstYear	0.11	36.53	94.83
	(0.10)	(37.74)	(62.77)
FivePcnt	-0.45***	-13.31	129.72***
	(0.08)	(18.06)	(25.53)
Log(Size)	0.30***	137.66***	38.61***
	(0.02)	(4.10)	(6.44)

BMV	-5.46**	-671.11*	-185.66
	(2.47)	(344.18)	(200.42)
Leverage	-0.01*	-3.01	-6.86*
	(0.00)	(2.33)	(3.58)
Log(RET)	0.05**	28.77***	12.92*
	(0.02)	(5.21)	(6.89)
Industry indicators	Yes	Yes	Yes
Year indicators	Yes	Yes	Yes
R-squared	0.2769	0.4130	0.0318
F-value	111.69	195.25	5.22
P-value	0.00	0.00	0.00

This table presents three OLS-regressions. The first model uses the natural logarithm of total compensation (in thousands of dollars) as the dependent variable. The second model uses salary (in thousands of dollars) as dependent variable, and the third model uses bonus (in thousands of dollars) as dependent variable. FemaleCEO is a dummy variable which is 1 if the CEO is a woman and 0 otherwise. Boardsize represents the number of board members. Indep% is the percentage of independent board members. IndepCompCom is a dummy variable which is equal to 1 if the entire compensation committee is independent and 0 otherwise. Tenure represents the number of years the CEO is in service. Chair is a dummy variable which is 1 if the CEO is also chairman of the board and 0 otherwise. FirstYear is a dummy variable which is 1 if it is the first year in function of the CEO and 0 otherwise. FivePcnt is a dummy variable which is 1 if the CEO owns five percent or more of the company's shares and 0 otherwise. Size represents the total assets of the company in question. BMV represents the book-to-market ratio of the firm and is measured by dividing total common equity and market value (in millions of dollars). Leverage is measured by dividing total liabilities and total equity (in millions of dollars). RET represents the return on equity. Robust standard errors are displayed in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1

Second, the pooled regression on salary has an even higher explanatory power of approximately 41 percent (see Table 3, column 3). Furthermore, some variables have shifted between (in)significance relative to the first regression. For example, the variable representing tenure is now significant and intends higher compensation for CEOs who hold the position longer. Besides, the positive effect of an increase of board members reduces accountability and therefore leaves the option open for the CEO to capture the board (Jensen, 1993) and set its own pay. Furthermore, the variables of the ownership and the book-to-market ratio have lost their significance and can no longer be interpreted.

Third, the regression line which is returned when analyzing the bonus variable does not seem to fit the observations well due to a low R-squared. So, interpreting the results in column 4 should be done with caution. The variable considering the percentage of independent board members is significant but negative. This contradicts the theory explained in the data section. The result regarding the ownership also contradicts logic with the reversed

reasoning explained earlier. As opposed to these contradicting theories, the result of the chairman variable agrees with prior literature. As authority of the CEO over the board increases, this would impact compensation positively.

5.3 Logit regressions

Logistic regressions can be performed on the variable which indicates the gender of the CEO. Significant results are established for the variables representing tenure, ownership, leverage, and return on equity and can be found in Table 4. The negative influence observed in tenure and ownership suggests a higher probability of having a male CEO run the company when increasing these independent variables with one unit. These results are consistent with the Wilcoxon-Mann-Whitney test findings in Table 2. The positive return on equity and leverage coefficients depict that the likelihood of having a female CEO is larger. Remarkably, this is also consistent with the Wilcoxon-Mann-Whitney findings. Although, observing the low pseudo R-squared value of 1.7 percent, be wary about drawing conclusions from this regression.

Table 4 Logistic regression

FemaleCEO

Parameter	Coefficient	Z
Intercept	-2.03***	-4.28
	(0.47)	
Boardsize	0.06*	1.81
	(0.03)	
Indep%	-0.28	-1.62
	(0.17)	
IndepCompCom	0.05	0.19
	(0.25)	
Log(Tenure)	-0.33***	-4.47
	(0.07)	
Chair	0.09	0.47
	(0.18)	
FirstYear	0.02	0.06
	(0.39)	

FivePcnt	-0.38**	-1.86
	(0.20)	
Log(Size)	0.01	0.81
	(0.04)	
BMV	4.04*	1.95
	(2.07)	
Leverage	0.04**	2.02
	(0.02)	
Log(RET)	0.23***	3.02
	(0.08)	
Pseudo R-squared	0.0175	
χ^2-value	56.04	
P-value	0.00	

*This table presents a logistic regression on the dummy variable FemaleCEO. FemaleCEO is a dummy variable which is 1 if the CEO is a woman and 0 otherwise. Boardsize represents the number of board members. Indep% is the percentage of independent board members. IndepCompCom is a dummy variable which is equal to 1 if the entire compensation committee is independent and 0 otherwise. Tenure represents the number of years the CEO is in service. Chair is a dummy variable which is 1 if the CEO is also chairman of the board and 0 otherwise. FirstYear is a dummy variable which is 1 if it is the first year in function of the CEO and 0 otherwise. FivePcnt is a dummy variable which is 1 if the CEO owns five percent or more of the company's shares and 0 otherwise. Size represents the total assets of the company in question. BMV represents the book-to-market ratio of the firm and is measured by dividing total common equity and market value (in millions of dollars). Leverage is measured by dividing total liabilities and total equity (in millions of dollars). RET represents the return on equity. ROA represents the return on assets. Robust standard errors are displayed in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1*

5.4 Alternative specifications

Analyzing the interaction effect between the gender of the CEO and the performance measures do not yield significant results. Thus, this approach unfortunately does not contribute to this study.

Finally, the sensitivity of the model is tested by including the age variable in the model. As can be seen in Appendix 4, age returns a positive significant result for all three cases. However, when observing the summary statistics for age, a large variation cannot be detected.

6. Conclusion

In this study the gender difference of the compensation of CEOs is analyzed using three different definitions, specifically total compensation, salary, and bonus. To construct a model for examining this question, I obtained datasets from the period 2009 till 2021 of the Compustat, Execucomp and Institutional Shareholder Services databases. The variables are categorized in general, CEO, government, and economic characteristics.

The model is implemented when running (robust) pooled regressions and logistic regressions, which resulted in significant findings such as higher total compensation and salary for female CEOs compared to males. For these dependent variables most of the control variables agree with prior literature. The results regarding the bonus response variable are insignificant which withholds us from making statements about compensation in the shape of bonus.

According to my findings, prior literature is contradicted which found that women are compensated less through salary and variable pay (Elkinawy and Stater, 2011) or found no significant evidence of a gender pay gap (Gupta et al., 2018; Harris et al., 2019; Jordan et al., 2007). It is surprising since all the (academic) attention and attitudes towards this topic also suggests underpayment for women.

Researchers Adams et al. (2007) paint another picture and conclude that compensation for women and men is comparable when reaching the CEO position. Thus, this would mean the gender convergence rate for CEO positions is considerably higher than for the general labor market. Since the period I analyzed in this study was more recent than Adams et al. (2007), the growth might have progressed. If this is the case, my study could be in line with Adams et al. (2007).

Possible explanations of the differences in perspectives could lie in the limitations of the research. The main obstacle is the absence of a matching procedure in this study. The propensity score matching could solve the issue of the disproportionate gender sample sizes. Without it, unequal variances could arise and affect the assumptions of the regression analyses. The statistical power might diminish and therefore incorrect conclusions might be the result. In addition, it could lead to confounding variables which would create bias. However, the large sample extracted from the databases should roughly eliminate this issue. Another limitation which should be considered is the fitted regression model. Not all the variables generated significant results, which leaves room for improvements. An improvement

could also be made when controlling for firm fixed effects by clustering the standard errors by firm. This might solve the appearance of uncorrelated errors which is one of the CLRM assumptions. Moreover, a variable regarding the percentage of females on the board per firm could offer a better explanation of the changes in CEO compensation. Lastly, using a sales component instead of total assets might be more correct in hindsight due to the varying operations of the enterprises. As such they would need different quantities of equipment to maintain their business. These improvements of the model might also solve the problem of multicollinearity.

Nevertheless, the research did supply us with some surprising findings, which are supported by the descriptive statistics of the Wilcoxon-Mann-Whitney tests. When analyzing the logistic regressions, I found an increased probability of having a female CEO if the leverage ratio or the performance through return on equity grew. The higher leverage ratio would imply higher financial risk. In other words, female CEOs are more likely to seeking risk which is unexpected when reviewing other papers. For example, Faccio et al. (2016) documents female led firms with lower leverage. However, the increased performance produced by female CEOs is supported by previous work such as the paper of Jalbert et al. (2013). Moreover, the relationship between longer tenure and/or increased ownership and increased likelihood of a male CEO could be a surprising outcome with economic consequences. The first relation could be proof of the glass cliff hypothesis which states a higher turnover for females in CEO positions due to intentional allocation in poorly performing businesses (Elsaid and Ursel, 2018).

Less surprising findings resulted from comparing the various robust regressions. As stated in the result section, I find increased compensation for additional units of the independence, size and return on equity variables. This is supported by previous literature.

Such findings outside the scope of this study could be the basis for future research. However, in the scope of this research further investigating the limitations and their possible implications of improved results is desired. Adding characteristics regarding the personality of CEOs could extend the topic as well. This could specify the optimal traits of a CEO for maximizing their pay. Personality traits can also be expressed through cultural differences. Examining different countries or continents could verify speculations about this. Furthermore, involving the private sector to the sample would be an interesting new perspective of this topic. Although, examining private firms is complex due to the absence of databases regarding

those firms. Gathering information will be time consuming, but the research could have powerful implications.

My findings would concern many parties such as the media, academics, companies and especially individuals in high executive positions. A possible implication of acquiring this knowledge is the incentivization for females to aim for higher functions. Thus far, we have come a long way in establishing equal pay through total compensation or salary. However, we should be aware of overcompensation.

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Appendices

Dependent variable	Test statistic	Degrees of freedom
Total Compensation	781.81***	114
Salary	727.17***	114
Bonus	336.03***	114

This table shows the test statistics and degrees of freedom for three White tests. The first model uses the natural logarithm of total compensation (in thousands of dollars) as the dependent variable. The second model uses salary (in thousands of dollars) as dependent variable, and the third model uses bonus (in thousands of dollars) as dependent variable. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Appendix 2 Scatterplot of the residuals around the zero mean (N = 9,891)
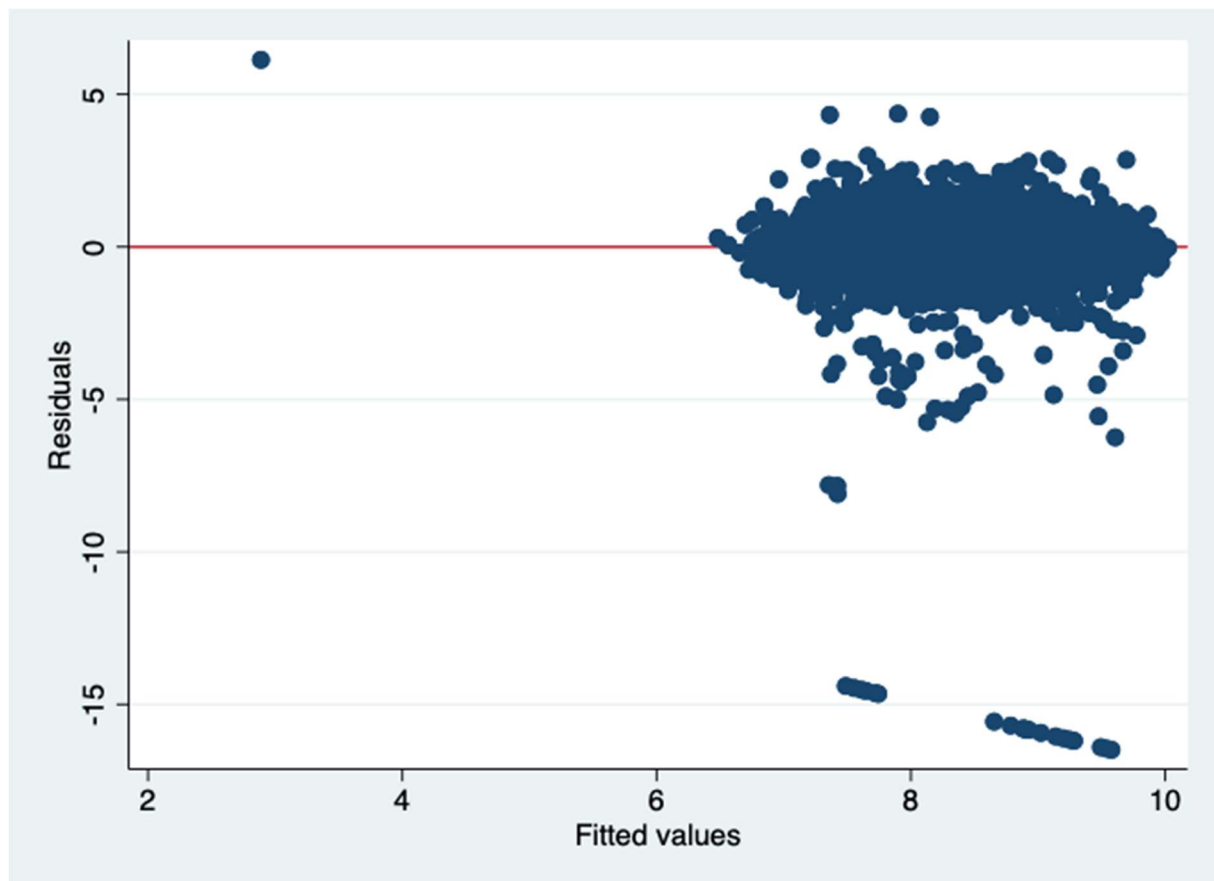
This figure shows the errorterms of all the observations. The red line represents the zero mean.

Appendix 3 Test of multicollinearity

Variable	VIF	1/VIF
Log(Size)	1.85	0.54
Boardsize	1.74	0.58
Year	1.58	0.63
Indep%	1.55	0.64
Log(Tenure)	1.21	0.83
BMW	1.18	0.85
FirstYear	1.13	0.88
IndepCompCom	1.10	0.91
Chair	1.09	0.92
FivePcnt	1.09	0.92
Log(RET)	1.08	0.93
Leverage	1.03	0.97
SIC	1.02	0.98
FemaleCEO	1.01	0.99
Mean VIF	1.26	

This table presents a test for multicollinearity. The second column shows the Variance Inflation Factor. FemaleCEO is a dummy variable which is 1 if the CEO is a woman and 0 otherwise. Boardsize represents the number of board members. Indep% is the percentage of independent board members. IndepCompCom is a dummy variable which is equal to 1 if the entire compensation committee is independent and 0 otherwise. Tenure represents the number of years the CEO is in service. Chair is a dummy variable which is 1 if the CEO is also chairman of the board and 0 otherwise. FirstYear is a dummy variable which is 1 if it is the first year in function of the CEO and 0 otherwise. FivePcnt is a dummy variable which is 1 if the CEO owns five percent or more of the company's shares and 0 otherwise. Size represents the total assets of the company in question. BMV represents the book-to-market ratio of the firm and is measured by dividing total common equity and market value (in millions of dollars). Leverage is measured by dividing total liabilities and total equity (in millions of dollars). RET represents the return on equity.

Appendix 4 Sensitivity analysis (N = 9,891)

Parameter	Total Compensation	Salary	Bonus
Intercept	5.07***	-706.36***	-188.41**
	(0.21)	(54.68)	(85.00)
FemaleCEO	0.15***	48.40***	47.07
	(0.03)	(11.97)	(29.21)
Boardsize	0.01	12.29***	-6.77
	(0.10)	(2.50)	(4.15)
Indep%	0.88***	69.78*	-154.97***
	(0.15)	(36.90)	(58.69)
IndepCompCom	-0.05	-26.42*	15.49
	(0.05)	(13.99)	(25.63)
Log(Tenure)	0.01	16.79***	-11.90
	(0.02)	(5.32)	(9.10)
Chair	-0.12**	-29.81*	99.05***
	(0.05)	(15.35)	(27.42)
FirstYear	0.10	18.67	85.85
	(0.10)	(37.33)	(63.25)
FivePcnt	-0.49***	-50.71***	111.01***
	(0.08)	(17.30)	(25.28)
Log(Size)	0.30***	135.32***	37.77***
	(0.02)	(4.05)	(6.39)
BMV	-5.48**	-700.02*	-200.23
	(2.54)	(413.17)	(208.69)
Leverage	-0.01*	-2.84	-6.77*
	(0.00)	(2.27)	(3.60)
Log(RET)	-0.05**	27.01***	12.00*
	(0.02)	(5.07)	(6.90)
Age	0.01***	8.77***	4.35***
	(0.00)	(0.79)	(0.80)
Industry indicators	Yes	Yes	Yes

Year indicators	Yes	Yes	Yes
R-squared	0.28	0.43	0.04
F-value	117.71	193.37	5.38
P-value	0.00	0.00	0.00

*This table presents three OLS-regressions used for a sensitivity analysis on Age. The first model uses the natural logarithm of total compensation (in thousands of dollars) as the dependent variable. The second model uses salary (in thousands of dollars) as dependent variable, and the third model uses bonus (in thousands of dollars) as dependent variable. Column 1 consists of the control variables. FemaleCEO is a dummy variable which is 1 if the CEO is a woman and 0 otherwise. Boardsize represents the number of board members. Indep% is the percentage of independent board members. IndepCompCom is a dummy variable which is equal to 1 if the entire compensation committee is independent and 0 otherwise. Tenure represents the number of years the CEO is in service. Chair is a dummy variable which is 1 if the CEO is also chairman of the board and 0 otherwise. FirstYear is a dummy variable which is 1 if it is the first year in function of the CEO and 0 otherwise. FivePcnt is a dummy variable which is 1 if the CEO owns five percent or more of the company's shares and 0 otherwise. Size represents the total assets of the company in question. BMV represents the book-to-market ratio of the firm and is measured by dividing total common equity and market value (in millions of dollars). Leverage is measured by dividing total liabilities and total equity (in millions of dollars). RET represents the return on equity. Age is measured in the present year. Robust standard errors are displayed in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$*