Do CEO characteristics matter? Evidence from the financial crisis of 2008 – 2009.

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ABSTRACT

In this research, there will be elaborated upon the relationship between CEO characteristics and firm performance, during the financial crisis of 2008 – 2009. To measure this, the effects of a CEO's age, tenure, duality, gender and salary composition on firm performance are investigated. The results indicate that during a financial crisis, old CEOs negatively affect firm performance. A CEO's long tenure, duality and gender do not provide evidence to be related to firm performance during such a tough period. Regarding a CEO's salary composition, results show that during a financial crisis, CEOs should be compensated with a high amount of equity compensation, but not with a (too) high amount of cash compensation.

Keywords: CEO age, CEO tenure, CEO duality, CEO gender, CEO compensation, managerial entrenchment, firm performance, financial crisis.

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1. INTRODUCTION

CEOs are often considered to be the most important people of a firm. But do they really affect the performance of a firm? Firms have CEO's with many different characteristics. For example, some firms have old CEOs, some have CEOs with a short tenure and some have female CEOs. These different characteristics might be important, as they could affect firm performance. Concerning the relationship between CEO characteristics and corresponding firm performance, some research has been done in this field over the past years.

Related research suggests that CEO characteristics may have an impact on firm performance. For example, old CEOs are more experienced (Ocasio, 1994; Garen, 1994), but at the same time, they are risk averse and conservative in their business strategies (Hambrick & Mason, 1984; Barker & Mueller, 2002). Besides, Anderson & Reeb (2003) state that founder status of a CEO matters in terms of firm performance. They find that firms perform better when family-members serve as a CEO, than when there is an outside CEO. Furthermore, Dechow & Sloan (1991) state that CEOs with a long tenure, invest less in R&D over time and they are more likely to get entrenched (Ryan & Wiggins, 2001). Next to this, CEO duality might affect firm performance as well, because of their higher efficiency or busyness (Peni, 2014; Donaldson & Davis, 1991). Moreover, female CEOs tend to be more reluctant (Khan & Vieito, 2013; Faccio, Marchica & Mura, 2016), while male CEOs are less risk avoiding (Faccio et al., 2016). In terms of CEO compensation, this differs across firms. Some CEOs have a higher cash component and some higher equity components. It is a trade-off of many thing to set this compensation optimally. This is because when CEOs are overcompensated, they will be less motivated, which subsequently hurts firm performance (Brick, Palmon & Wald, 2006). All these findings together, provide evidence that different CEO characteristics are related to firm performance positively and negatively. But how is this relationship during a financial crisis? And what kind of CEO would perform best during such a tough period?

To examine the relation between CEO characteristics and firm performance during the financial crisis, years 2008 and 2009 are chosen as the research period (Lins, Volpin & Wagner, 2013). The financial crisis was a tough period for the economic environment and many firms were hurt. The contribution of this research to the literature, is the fact that the financial crisis period is considered as a period of interest. No research has been done yet in the field of CEO characteristics and firm performance, during a financial crisis period. Outcomes of this research

should give insight in what kind of CEO should be hired or retained, during a financial crisis and how they should be compensated during such a period.

To find out whether characteristics of a CEO matter in terms of firm performance, during a financial crisis period, the following research question is developed:

Do CEO characteristics affect firm performance during the financial crisis? And if so, what kind of CEO works best?

This relationship will be examined by performing a difference-in-difference regression with year fixed effects and firm fixed effects. The results of this research are as follows. During a financial crisis, old CEOs significantly negatively affect firm performance, but CEOs with a long tenure, CEO duality and CEO gender do not have significant influence on firm performance. In terms of a CEO's compensation structure, results show that during a financial crisis, they should be compensated with a high amount of equity compensation, but not with a (too) high amount of cash compensation.

However, this research has some limitations, which should be taken into account when interpreting results. Firstly, despite of the tools used to overcome endogeneity problems, there are still unobservable factors affecting firm performance, resulting in an omitted variable bias. Therefore, results might be less informative than shown in this research. Secondly, years 2008 – 2009 are considered as the crisis period, but this period started at the end of 2007. So, to measure the relationship between CEO characteristics and firm performance during the financial crisis properly, it is recommended for further research to include a part of 2007 in the analysis as well. This might lead to different insights compared to when only years 2008 and 2009 are used. Thirdly, manufacturing firms are dominated in the sample. This implies that results, due to sample selection bias, could be less useful for firms operating in other industries next to manufacturing firms, represented in the sample.

The remainder of this thesis is organized as follows. Section 2 discusses the related literature and the hypothesis development. Section 3 describes the data collection and methodology. It gives further information about the data collected and the research design used in this paper. Section 4 analyses the empirical results. Section 5 gives a summary of this research and discusses its implications and recommendations.

2. LITERATURE REVIEW

In this section, related research and previous findings regarding the relationship between CEO characteristics (CEO age, CEO tenure, CEO gender, CEO duality and CEO compensation) and firm performance will be discussed. In subsection 2.6, the hypothesis development, which is based on the literature discussed below, will be described.

2.1 CEO age related to firm performance

There could possibly be a relationship between the age of a CEO and its firm performance. This relationship has got increasing attention over the past few years and some research has been done in this field of interest. For example, Ocasio (1994) finds that older CEOs are more experienced than younger CEOs and therefore perform better. But on the other hand, Hambrick & Mason (1984) find that older CEOs may be more conservative and less risk-taking, leading to lower performance.

Corresponding to the findings of Hambrick & Mason (1984), Barker & Mueller (2002) look at CEO characteristics and their relationship with R&D spending and find that older CEOs tend to be more conservative. Moreover, they seem to be more risk averse and follow lower-growth strategies, resulting in worse firm performance. Hambrick & Mason (1984) find several reasons for this conservative behavior and state that they are less able to come up with new ideas and are less willing to learn about new behaviors, which hurts firm performance. Additionally, Dechow & Sloan (1991) find that older CEOs who are closer to retirement, decrease firm performance by reducing R&D expenses, as they do not benefit in terms of compensation from these expenditures right away. Next to this, Gibbons & Murphy (1992) look at the optimal incentive contracts and find that career concerns are stronger when an employee is further from retirement, resulting in a lower performance at a higher age. Due to the findings of Hambrick & Mason (1984), Barker & Mueller (2002), Dechow & Sloan (1991) and Gibbons & Murphy (1992), it could be that firms with old CEOs perform worse during the financial crisis, compared to firms with younger CEOs, as they behave too conservative and have other career concerns.

On the other hand, Ocasio (1994) does research in the field of CEO succession and firm performance during tough periods. He finds that, among other things, the age of a CEO has a significant positive impact on the return on assets and on the hazard rate of CEO succession. This could be because of the fact that these older CEOs have more experience and therefore

better handle such periods. The financial crisis of 2008-2009 can be considered "tough" as well. Hence, it could be that older, more experienced CEOs could have achieved more during this financial crisis. Besides, Garen (1994) looks at age in terms of how close CEOs are to retirement. He finds that the older the CEOs and the closer he is to retirement, the better he performs, due to a short horizon view on the company. Next to this, Lausten (2002) states as well that the age of a CEO has an impact on a companies' turnover rate. He examines the effect of age on CEO turnover of Danish firms and finds that younger CEOs have a higher turnover rate than older CEOs. This as younger CEOs are more sensitive to the threat of turnover and older CEOs have more experience and a longer tenure, resulting in a lower turnover. Their result suggests that older CEOs perform better as well. This corresponds with the fact that older CEOs could be more experienced and therefore especially during a tough period show better firm performance (Ocasio, 1994).

2.2 CEO tenure related to firm performance

A paper of Simsek (2007) describes the indirect relationship between CEO tenure and firm performance. Simsek (2007) argues that CEO job tenure indirectly influences firm performance, because CEOs directly influence top management team's decisions, affecting firm performance. In the field of risk-taking, De Jonghe, Disli & Schoors (2012) examine the relationship between corporate governance mechanisms and the risk/return efficiency from banks in Turkey pre -and post-crisis. They find that the risk/return efficiency of capital market transactions is worse for banks whose CEOs have a longer tenure. They suggest that these CEOs need additional trainings in order to adjust quickly to changes in the environment.

Dechow & Sloan (1991) do research in the field of innovation and firm performance and find that when CEO tenure increases, R&D expenditures decrease, leading to less innovation and therefore worse firm performance. Furthermore, Ryan & Wiggins (2001) state that CEOs with a long tenure have a higher probability of being entrenched and thus, they are more likely to follow their own personal beliefs. They prove this by stating that CEOs with longer tenures require less equity payments than CEOs with low tenures (newer CEOs). This is because CEOs with a long tenure have more accumulated stock than newer CEOs and therefore, they require less equity-based compensation than newer ones. They argue that this form of entrenchment has a negative effect on firm performance. These findings suggest that during a financial crisis, a long tenure has a negative impact on firm performance as well, because R&D and innovation

are important tools to increase firm performance (Makkonen, Pohjola, Olkkonen, & Koponen, 2014).

Wu, Levitas & Priem (2005) investigate whether CEO tenure affects innovative decisions and find a U-shaped relationship, meaning that a CEO is able to react best to changes in the technological environment at half of his tenure. Hambrick & Fukutomi (1991) obtain somehow identical results. They investigate five different seasons over a CEO's tenure in total and find a U-shaped relationship between performance and a CEO's tenure as well. They state that CEOs with extremely long tenures or extremely short tenures could hurt firm performance and call this "curvilinear" performance.

However, there is some evidence that CEOs with a longer tenure, positively affect firm performance. For example, Gibbons & Murphy (1992) state that executives with different ages, but same years of tenure have different views on career concerns and reputation of the firm. This leads to the fact that CEOs with the same amount of tenure have different effects on firm performance, due to their differences in age. Bhagat & Bolton (2008) find a way to deal with this problem. They argue that tenure should be divided by age and then measure the executive's quality. In their opinion, CEOs with a longer tenure affect firm performance in a different way than older CEOs with a longer tenure. They find that the higher the quality the better the firm performance. This finding corresponds to the paper of Baysinger & Hoskisson (1990). They investigate the relationship between the composition of board of directors and the strategic choices they make. They argue that an increasing tenure improves firm performance, because they have more firm-specific knowledge and hence are better in providing the firm the valuable resources it needs.

2.3 CEO duality related to firm performance

Over the past years, the busyness of directors attracted more attention. Cashman, Gillan & Jun (2012) study the effect of busy directors on firm performance of Indian firms. They argue that a so-called "busy board" is negatively related to firm performance. This could be due to the fact that they are ineffective, as they should spread their attention over too many boards. However, in contrast with findings of Cashman et al. (2012), Di Pietra, Grambovas, Raonic & Riccaboni (2008) investigate Italian firms and find contradictory results. They analyze the effects of busy directors on a firm's market performance in Italy and find a significant positive relationship between these two. They state that this is due to the fact that these "busy" directors are well

connected with social, corporate and political links and do their business in a more efficient way, resulting in better firm performance.

CEOs can be "busy" as well. Peni (2014) considers CEOs being a CEO and a chairperson at the same time, as busy. According to Peni (2014), CEO duality can negatively affect firm performance in a way that not only the busyness plays a role, but a CEO can also get entrenched. This means that a bad CEO is less likely to be fired by the board when he or she is a chairperson of the board as well. This results in agency problems and subsequently in worse firm performance. In contrary to this, Kim, Al-Shammari, Kim & Lee (2009) investigate the relation between CEO duality and corporate diversification. They find that a CEO's duality is positively related to firm performance. This is because, according to them, CEO duality increases diversification of the firm into industries it is is less familiar with. However, according to Mitton (2002), during the financial crisis, this diversification could hurt firm performance instead. He investigates the East-Asian crisis and states that highly diversified firms lose more value during a crisis, than less diversified firms. On the other hand, Baliga, Moyer & Rao (1996) investigate the relationship between CEO duality and firm performance and only find weak evidence for this relationship in the long run.

Next to this, Peng, Zhang & Li (2007) examine the relationship between CEO duality and firm performance in China. They do this by looking into the agency theory and the stewardship theory. The agency theory suggests that CEO duality, due to entrenchment, affects firm performance in a negative way. However, the stewardship theory suggests that CEO duality, due to the fact that there should not be reported to more than one boss in a firm, affects firm performance in a positive way. Peng et al. (2007) find evidence for the stewardship theory, implying that CEO duality causes more efficiency. Corresponding to the research of Peng et al. (2007), Donaldson & Davis (1991) argue that the stewardship theory suggests that shareholder interests are maximized by the shared incumbency of the role of a chairman and CEO together, leading to better firm performance.

2.4 CEO gender related to firm performance

Gender-based differences may have an impact on a person's success at work (Peni, 2014). Khan & Vieito (2013), examine the relationship between the CEO gender, firm performance and firm risk of U.S. firms, during years 1992-2004. They find that a firm's risk level is smaller when the CEO is a male and that women are more risk-averse than man. However, in the field of firm

performance, Khan & Vieito (2013) state that firms managed by female CEOs perform better than firms managed by male CEOs. This could be due to the fact that females who get into a CEO position in the firm, overall communicate better (Dallas, 2001) and have a higher level of education (Smith, Smith & Verner, 2006) compared to male CEOs.

However, Faccio et al. (2016), examine the relationship between CEO gender, risk-taking and capital allocation and find a decrease in performance when firms have a female CEO. They find that the behavior of female CEOs is more risk-avoiding. This leads to distortion in the allocation of capital and subsequently results in a decrease of firm performance. Next to this, according to Lome, Heggeseth & Moen (2016), during a financial crisis, R&D expenditures are a very important tool to increase firm performance (Makkonen et al., 2014). Therefore, risk-averse behavior of female CEOs might negatively affect firm performance. The paper of Kolev (2012) shows similar results. He investigates the effect of CEO gender on shareholder returns and finds that female CEOs underperform male CEOs by 0.35% returns per month. This is due to the fact that price reactions are more negative when a female CEO is hired, because shareholders underestimate the quality of their managerial skills (Lee & James, 2007).

On the other hand, Wolfers (2006) investigates the effect of gender differences on stock return at S&P1500 firms and finds no systematical differences in stock return. This finding corresponds to the paper of Lam, McGuinness & Vieito (2012). They examine the effect of CEO gender on compensation and firm performance of Chinese firms and do not find a relationship either.

2.5 CEO compensation related to firm performance

During the last decades, the composition of CEO compensation has changed. Mishel & Schieder (2018) state that, compared to the salary of coworkers, CEOs earned a lot more over time. They argue that this is due to the fact that nowadays, the share of equity compensation is higher than the share of cash compensation in terms of total CEO compensation.

Ozkan (2011) investigates this relationship in the U.K. during years 1999 – 2005 and only finds cash compensation to be significantly positively affecting firm performance. However, Bruce, Skovoroda, Fattorusso & Buck (2007) state that CEOs with a high amount of cash compensation are more likely to have a short-term view on the company, because of the possible bonuses. Subsequently, they make (financing) decisions based on this, which might negatively

affect firm performance as well. Furthermore, Mehran (1995) finds a significant relationship between equity compensation and firm performance as well. He does research into the relationship between compensation and firm performance during years 1979 – 1980 and finds that firm performance is positively related to the amount of equity compensation compared to total compensation. Besides, he states that firm performance is positively related to the percentage of equity held. According to Mehran (1995), this is because of the fact that CEOs with high equity compensation make effective value-maximizing decisions for the long run. Therefore, firm performance might be better managed by these CEOs during a financial crisis. Bhagat & Romano (2009) find similar results. They state that executives should be compensated with restricted stock, a form of equity compensation, because this gives them incentives to increase long-term firm performance. Nevertheless, in contrary to all these findings, Yang, Dolar & Mo (2014) do research into the relationship between firm performance and compensation during the recent U.S. financial crisis as well and find that incentive-based contracts were not effective enough to burst firm performance during this period.

On the contrary, Brick et al. (2006) find that compensation has a positive effect until a certain level. Regarding the issue of overcompensation, Brick et al. (2006) examine the relationship between excessive compensation and its effect on firm performance of S&P500 firms. They find that excessive CEO compensation significantly causes poor firm performance. Next to this, Core, Holthausen & Larcker (1999) find that excessive compensation is related to poor stock return performance. Moreover, they find that firms where CEOs receive higher amounts of compensation, have greater agency problems. Additionally, according to Matolcsy & Wright (2011), compensation should be in line with firm characteristics. They investigate the relationship between the amount of compensation, firm characteristics and firm performance. They find that firms whose CEOs receive compensation that is inconsistent with firm characteristics, perform worse compared to firms whose CEO's compensation is in line with their firms' characteristics.

Summary related literature findings

Due to mixed findings of related literature in the field of CEO characteristics and firm performance, all findings are summarized per paper in the following panels as follows. A "+" indicates a positive relationship found, "-" indicates a negative relationship found and "o" indicates no relationship found.

Panel A: CEO age

Paper	Sample	Result
Ocasio (1994)	U.S.	+
Hambrick & Mason (1984)	U.S.	-
Barker & Mueller (2002)	U.S.	-
Dechow & Sloan (1991)	U.S.	-
Gibbons & Murphy (1992)	U.S.	-
Garen (1994)	U.S.	+
Lausten (2002)	Denmark	+

Panel B: CEO tenure

Paper	Sample	Result
Simsek (2007)	U.S.	+/-
De Jonghe et al. (2012)	Turkey	-
Dechow & Sloan (1991)	U.S.	-
Ryan & Wiggins (2001)	U.S.	-
Makkonen et al. (2014)	Finland	-
Wu et al. (2005)	U.S.	-
Hambrick & Fuktomi (1991)	U.S.	-
Gibbons & Murphy (1992)	U.S.	+
Bhagat & Bolton (2008)	U.S.	+
Baysinger & Hoskisson (1990)	U.S.	+

Panel C: CEO duality

Paper	Sample	Result
Cashman et al. (2012)	India	-
Di Pietra et al. (2008)	Italy	+
Peni (2014)	U.S.	-
Kim et al. (2009)	U.S.	+
Mitton (2002)	East Asia	-
Baliga et al. (1996)	U.S.	o
Peng et al. (2007)	China	+
Donaldson & Davis (1991)	U.S.	+

Panel D: CEO gender

Paper	Sample	Result
Khan & Vieito	U.S.	-
Bartlett & Miller (1985)	U.S.	-
Dallas (2001)	U.S.	-
Smith et al. (2006)	Denmark	-
Faccio et al. (2016)	U.S.	+
Kolev (2012)	U.S.	+
Wolfers (2006)	U.S.	o
Lam et al. (2012)	China	o

Panel E: CEO cash compensation

Paper	Sample	Result
Ozkan (2011)	U.K.	+
Yang et al. (2014)	U.S.	o
Brick et al. (2006)	U.S.	-
Core et al. (1999)	U.S.	-
Matolcsy & Wright (2011)	Australia	-

Panel F: CEO equity compensation

Paper	Sample	Result
Mehran (1995)	U.S.	+
Yang et al. (2014)	U.S.	o
Brick et al. (2006)	U.S.	-
Core et al. (1999)	U.S.	-
Matolcsy & Wright (2011)	Australia	-

2.6 Hypotheses development

In this research, six hypotheses are developed, related to the discussed literature in subsections 2.2 – 2.5.

There are mixed findings about the relationship between firm performance and the age of a CEO. However, due to the findings of Hambrick & Mason (1984), Barker & Mueller (2002), Dechow & Sloan (1991) and Gibbons & Murphy (1992), it could be that firms with older CEOs perform worse during the financial crisis, due to their conservative behavior and different career concerns, compared to younger CEOs. So, based on these findings, the first hypothesis is as follows:

- *H1: Old CEOs negatively affect firm performance during the financial crisis.*

According to De Jonghe et al. (2012), a longer tenure negatively affected firm performance during the Turkish financial crisis. They find that the risk/return efficiency of capital market

transactions is worse for banks where CEOs have a long tenure. Besides, Ryan & Wiggins (2001) state that CEOs have a higher probability of being entrenched and thus are more likely to follow their own personal beliefs when having a longer tenure. Hence, the seconds hypothesis is developed as follows:

- *H2: CEOs who have a long tenure, negatively affect firm performance during the financial crisis.*

When examining the relationship between CEO duality and firm performance during the financial crisis, Kim et al. (2009) state that CEOs, being chairman at the same time, diversify more in unrelated industries. However, Mitton (2002) finds that CEOs who diversify more during a crisis, hurt firm performance. These findings lead to the third hypothesis:

- *H3: There is a negative relationship between CEO duality and firm performance during the financial crisis.*

When studying related literature about whether a female or a male CEO is better for firm performance during the financial crisis, mixed findings are obtained. Khan & Vieito (2013) find that firms with female CEOs perform better, because they have a good social network (Dallas, 2001) and they are better communicators (Bartlett & Miller, 1985) than male CEOs. However, due to the fact that Faccio et al. (2016) state that women are more risk averse and due to the fact that Lome et al. (2016) state that it is very important to take some risk during the financial crisis, male CEOs are expected to perform better during a financial crisis. This leads to the fourth hypothesis:

- *H4: Male CEOs positively affect firm performance during the financial crisis.*

When determining whether a CEO should be given higher cash or equity compensation, mixed findings are observed when studying related literature. However, all literature states that increasing CEO compensation is good, but until a certain level (Core et al., 1999; Brick et al., 2006). When a CEO's compensation is inconsistent with firm characteristics, firm performance might be hurt (Matolcsy & Wright, 2011). So, a high cash compensation might affect firm performance negatively, because CEOs are more likely to focus on the short-term, due to possible bonuses and make financing decisions based on this (Bruce et al., 2007). However,

regarding equity compensation, Mehran (1995) states that the more equity the CEO holds, the higher the firm performance, because they focus more on long-term firm performance (Bhagat & Romano, 2009). This causes that interests of the CEO and shareholders are more aligned (Nyberg, Fulmer, Gerhart & Carpenter, 2010). When considering these findings, the fifth and sixth hypothesis are developed as follows:

- *H5: High cash compensation of a CEO negatively affects firm performance during the financial crisis.*
- *H6: High equity compensation of a CEO positively affects firm performance during the financial crisis.*

3. DATA & METHODLOGY

In the first part, the data collection will be described, followed by the general methodology and assumptions made in this research. Subsequently, the specific methodology per CEO characteristic and its relationship with firm performance during the financial crisis, will be discussed. Eventually, the last subsection highlights the endogeneity problem.

3.1 Data collection

This subsection describes the data collection of the sample. In this part will be discussed which databases are downloaded from the WRDS database and summary statistics of the sample are presented.

To gather information about the CEO characteristics, the entire North American WRDS Execucomp database is downloaded. Only observations the for years 2004, 2006, 2007, 2008 and 2009 are kept and all duplicates of a firm's observations in the same year are dropped. Besides, to obtain information about the firm characteristics, the entire North American database of WRDS Compustat is downloaded. Again, only observations the for years 2004, 2006, 2007, 2008 and 2009 are kept and duplicates of a firm's observations in the same year are dropped. Regarding the information about the stock returns per firm, data is obtained from CRSP. Moreover, to acquire information about a firm's protection mechanisms, the entire database of WRDS ISS directors and ISS governance for years 2007-2009 are downloaded. For years 2004 and 2006, the WRDS ISS directors legacy and ISS governance legacy are downloaded from the WRDS database. Data retrieved from CRSP is merged with Compustat based on permno and gvkey. Data retrieved from Execucomp, Compustat, ISS directors, ISS directors legacy, ISS governance and ISS governance legacy is merged on ticker and fiscal year. Ticker is used as the matching variable, because it is a unique company identifier.

The sample used in the empirical analysis consists of firms trading on the S&P1500 Index. After excluding financial firms (SIC Codes 6000-6999) from the dataset, the merged database consists of an unbalanced panel dataset of 1226 firms and 4665 firm-year observations for years 2004, 2006, 2007, 2008 and 2009.

The descriptive statistics of the sample are presented in table I below.

Table I

Descriptive statistics sample

This table represents the descriptive statistics for the panel dataset covering years 2004, 2006, 2007, 2008 and 2009. The descriptions of the variables can be found in table BI in Appendix B.

Variable	Obs	Mean	Std Dev	Min	Median	Max
CEO characteristics						
CEO age	4603	55.704	6.938	37	56	93
CEO tenure	4665	7.486	7.175	0	5	58
CEO gender	4665	0.979	.144	0	1	1
CEO chairman	4665	0.213	.378	0	0	1
Equity-based compensation (in thousands)	4648	4349.464	6111.184	0	2514.767	129126.4
Cash-based compensation (in thousands)	4646	1242.714	2231.566	0	900	77926
Firm protection mechanisms						
Poison pill	4665	0.432	0.495	0	0	1
Golden parachute	4665	0.72	0.449	0	1	1
Dual class structure	4665	0.0825	.2751992	0	0	1
Firm characteristics						
Return on assets (%)	4665	0.0533	0.0624	-0.103	0.0548	.163
Return on equity (%)	4665	0.0856	0.149	-0.288	0.0856	.38
Stockreturn (%)	3435	0.046	0.4831	-0.728	-0.0126	1.304
Tobin's Q (%)	4659	1.297	0.859	0.299	1.053	3.423
Debt/assets (%)	4665	0.502	0.201	0.086	0.513	.988
R&D/assets (%)	3856	0.0281	0.047	0	0.0061	.159
Firmsize	4665	7.628	1.539	1.891	7.522	12.96
Boardsize	4665	9.138	2.181	3	9	18

Table I indicates that the average age of CEOs in the sample is 55 and that they are in this role for 7 years on average. Besides, it shows that most of the CEOs in the dataset are male and on average 21% of the CEOs are chairman as well. Moreover, it can be observed that the equity-based compensation component is higher than the cash-based compensation component. This finding matches with Bryan, Hwang & Lilien (2000), who state that equity-based compensation, compared to total compensation, increased heavily over time. Furthermore, more than half of the firms seem to have the golden parachute as a protection mechanism.

Next to this, by the usage of two-digit industry SIC codes, table II below shows how firms included in the sample are distributed over different industries. Table II indicates that manufacturing firms dominate the sample with 597 firms, while construction firms are underrepresented with 32 firms. Due to this, results could contain a sample selection bias, implying that the insights this research gives, are more representative to manufacturing companies and less to construction companies. There will be further elaborated upon this problem in subsection 5.2.

Table II

Distribution of SIC codes

This table represents the distribution of firms included in the sample, among different industries.

Range of SIC codes	Division	Count
1000-1499	Mining	72
1500-1799	Construction	32
2000-3999	Manufacturing	597
4000-4999	Transportation, Communications, Electric, Gas and Sanitary service	141
5000-5199	Wholesale Trade	62
5200-5999	Retail Trade	126
7000-8999	Services	193
9900-9999	Nonclassifiable	5

3.2 Methodology

This subsection covers the methodology of this research. There will be further elaborated upon the regression model used when examining the relationship between CEO characteristics and firm performance. Afterwards, the creation of the variables included in the analysis and the assumptions made when performing the regressions, will be discussed.

3.2.1 Difference-in-difference model

Previous studies indicate that there are several methods to examine the relationship between CEO characteristics and firm performance. In this study the relationship will be evaluated during the financial crisis, covering years 2008 and 2009 (Lins et al., 2013). It will be tested in a difference-in-difference (DiD) design. A difference-in-difference research design (DiD) is applied when estimating causal effects and when shocks to the economic environment occur (Lechner, 2011). Moreover, year fixed effects and firm fixed effects are added to the regression model (Lins et al., 2013; Torres-Reyna, 2007).

Based on the model of Wooldridge (2007), the standard difference-in-difference model used in this research, is the following:

$$Y = \beta_0 + \beta_1 dC + \delta_0 dT + \delta_1 dC * dT + B_2 X_{it} + B_3 Z_{it} + \varepsilon_{it} \qquad (1)$$

Y stands for the dependent variables. The time-period dummy, dC, is a variable that indicates the crisis period. It takes a value of 1 for years 2008 or 2009 and 0 otherwise (Lins et al., 2013). dT is a dummy variable for the treatment group and captures the possible differences between the control -and treatment-groups (Wooldridge, 2007). The coefficient of interest, δ_1, multiplies

the interaction term $dC * dT$. It captures the interaction effect between the time -and treatment-dummy and estimates the effect of the treatment group on firm performance, during the financial crisis of 2008 and 2009 (Wooldridge, 2007). X_{it} is a vector of CEO-specific characteristic variables and Z_{it} is a vector of firm-specific control variables. ε_{it} stands for the standard error term and is clustered at firm level to correct for heteroskedasticity and autocorrelation. When clustering standard errors at firm level, observations may be correlated within each firm, but must be independent across firms (Thompson, 2011).

3.2.2 Variable descriptions

In this subsection will be further elaborated upon the description and creation of the dependent variables, independent variables and control variables included in the difference-in-difference regression analysis. Table BI in Appendix B provides further information regarding the variables included in the analysis.

Dependent variables

The variables $ROA, ROE, Tobin's\ Q$ and $stockreturn$ will be included in the regressions as the dependent variables. They are derived as follows. ROA is calculated as net income divided by assets (Mehran, 1995). ROE is calculated as net income divided by stockholder's equity (Brown & Caylor, 2009). Q is measured as the total market value of the firm, divided by the firm's value of assets (Mehran, 1995). $stockreturn$ is calculated as the stock price in year t plus dividend in year t minus the stock price in year $t-1$, divided by the stock price in year $t-1$. Taking into account that ROA, ROE, Q and $stockreturn$ have outliers in their data, ROA, ROE, Q are winsorized at 95% and $stockreturn$ is winsorized at 99%.

Independent variables

In this subsection, the definition of different CEO characteristics will be described. The CEO characteristics are considered as the independent variables in the regressions. However, it is important to notice first, that when performing a difference-in-difference analysis, a CEO can either be in the control group or in the treatment group. To determine whether a CEO, with its different characteristics, is in the control or treatment group, 2007 is chosen as the reference year. So, for example, to define whether a CEO is considered old throughout the sample period and therefore will be placed in the treatment group, his age in the year 2007 is observed. When his age is 64 or higher in 2007, then this CEO will be considered old for all years in the sample

period and is placed in the treatment group. This is done for all other CEO characteristics as well when determining whether they are in the control group or treatment group. There will be further elaborated upon the assumption of choosing 2007 as the reference year, in subsection 3.2.3.

The variables regarding CEO characteristics are as follows. The dummy variable ceo_{old} is generated and contains a value of 1 when CEOs are 64 or older. This is because at the age of 64, CEOs reach the age of retirement (Puffer & Weintrop, 1991). Table AI in Appendix A shows that firms with old CEOs have a higher ROA, a lower debt/assets ratio, smaller firm sizes and smaller board sizes. Besides, the dummy variable $ceo_{longtenure}$ is generated and measures whether a CEO is in this role at the same firm for 10 years or longer (1), or not (0) (Hermalin & Weisbach, 1991). In table AII in Appendix A can be observed that firms with CEOs with a long tenure have a higher Tobin's Q, but lower debt/assets ratios, smaller firm sizes and smaller board sizes. Next to this, $ceo_{chairman}$ is created, to measure a CEO's busyness efficiency and entrenchment (Peni, 2014; Peng et al., 2007). This variable takes 1 when a CEO is chairman as well and 0 when not. Table AIII in Appendix A can be observed that firms with CEO duality have higher ROA, ROE, bigger firm sizes and bigger board sizes, but lower R&D/assets ratios. Moreover, the dummy variable ceo_{gender} is acquired and takes a value of 1 when the CEO is a male and 0 when the CEO is a female. In table AIV in Appendix A can be observed that firms with male CEOs have a lower Tobin's Q, but higher debt/assets ratios and R&D/assets ratios. Also, they serve bigger firms with bigger board sizes. However, only 110 observations for female CEOs are included in the sample, which might lead to a bias in the results. There will be further elaborated upon this problem in subsection 5.2.

The variables regarding a CEO's salary composition are $CEO_{highcash}$ and $CEO_{highequity}$. To examine the effects of these on firm performance, the variables $CEO_{cashcompensation}$ and $CEO_{equitycompensation}$ are generated. $CEO_{cashcompensation}$ is the logarithm of the sum of the salary and bonus of a CEO in a certain year. $CEO_{equitycompensation}$ is the logarithm of the sum of stock and option grants, restricted stock options and long-term incentive plans (LTI) of a CEO in a certain year. From the variables $CEO_{cashcompensation}$ and $CEO_{equitycompensation}$, the dummy variables $CEO_{highcash}$ and $CEO_{highequity}$ are obtained. These variables take a value of 1 when a CEO's cash or equity compensation, divided by total compensation, is higher than the median of the sample (Matolcsy & Wright, 2011). In table AV in Appendix A can be observed

that firms with a high CEO cash compensation have a lower ROA, ROE and debt/assets ratio and. Moreover, these CEOs serve smaller firms with smaller boards. Table AVI in Appendix A shows that firms with a high CEO equity compensation have higher firm performance, e.g. higher ROA, ROE and stock return. Besides, these firms have higher debt/assets ratios, bigger firm sizes and bigger board sizes.

Control variables

In this subsection, the firm-specific control variables $debtassets$, $rdassets$, $firmsize$, $boardsize$, $dualclass$, $poison\ pil$ and $golden\ arachute$ will be discussed. The first control variable is $debtassets$ and is calculated as the company's total debt, divided by the total assets (Salim & Yadav, 2012). The variable $rdassets$ is calculated as the company's total R&D expenses, divided by total assets (Lin, Lee & Hung, 2006). The variable $firmsize$ is calculated as the logarithm of the company's sales (Bain, 1951; Lee, 2009). Controlling for outliers, the variable $debtassets$ is winsorized at 99% and $rdassets$ is winsorized at 95%. Additionally, to observe a company's size of the board, the variable $boardsize$ is generated from this database as well (Guest, 2009; Eisenberg, Sundgren & Wells, 1998; Mak & Kusnadi, 2005). The protection mechanisms, $dualclass$, $poison\ pill$ and $goldenparachute$ are considered as dummy variables and take a value of 1 when there is a dual class structure, a poison pill or a golden parachute available in the firm and 0 when not (Brown & Caylor, 2009).

However, based on the correlation matrix, presented in table BII in Appendix B, will be decided whether to leave out variables in the regression, or not. When the correlation between variables is higher than 0.5, one will be left out of the analysis. Due to a high correlation of 0.53 between $poison\ pill$ and $goldenparachute$ and too few observations of the variable $dualclass$, $goldenparachute$ and $dualclass$ will not be inlcluded in the regression Moreover, the variable $boardsize$ will not be included either, due to a high correlation of 0.6 with $firmsize$.

3.2.3 Assumptions

In this subsection, several assumptions made when performing the difference-in-difference regression analysis, will be discussed.

Control -and treatment-group

When performing a difference-in-difference regression analysis, some assumptions are made. Considering all the independent variables of interest (ceo_{old}, $ceo_{longtenure}$, $ceo_{chairman}$, ceo_{gender}, $ceo_{highcash}$ and $ceo_{highequity}$), it is assumed that there are no changes in the values of these dummy's over the sample period, within companies. This is because, when performing a difference-in-difference analysis, a CEO could either be in the control group or the treatment group.

Therefore, the assumption is made that the values of the pre-treatment year, 2007, are considered as the reference values for values of other years. The pre-treatment year is chosen because it is the year before the financial crisis, making it the most representative year to make a distinction between control -and treatment-groups. Moreover, it is in the middle of the sample period. So, to place these firms either in the treatment group or in the control group, the values of CEO characteristics of this year are applied to the values of CEO characteristics for other years of certain firms. For example, if a CEO is 62 in 2004 and 65 in 2007, then he is considered old throughout the whole sample period covering years 2004 – 2009, because he is considered "old" in 2007, the reference year. This leads to the fact that for all years for this specific firm, a dummy value of 1 is applied to the variable ceo_{old}. This is because of the fact that a CEO only can be either in the treatment -or control-group during the sample period. This method is applied as well to the variables $ceo_{longtenure}$, $ceo_{chairman}$ and ceo_{gender}. When a CEO is considered having a long tenure, being a male, or being a chairman, in 2007, then he is treated like this for the whole period (2004 – 2009). Considering the salary components, $ceo_{highcash}$ and $ceo_{highequity}$, the same method is applied and it is examined whether a CEO has been earning a higher cash -or equity compensation than the median or not in 2007. If this is the case, then he will be treated as a CEO with a high cash compensation or a high equity compensation for the whole period (2004 – 2009).

Next to this, over the sample period, it can occur that CEOs are replaced, and this should be taken into account. This can cause problems in the analysis, as a CEO who was considered old until 2006, could now be considered young over the rest of the period, when he is replaced by a young one. In this way, it could be that a firms' CEO is in the treatment group for some years and in the control group for some years, leading to a problem in the difference-in-difference

analysis. But taking 2007 as the reference year, where all values of the characteristics for other years depend on, could solve this problem. This is because still the assumption is made that 2007 is the reference year and the value of this year will point out if the firm's CEO is in the control or treatment group. Besides, CEOs who leave, still have influence over firm performance for a certain period, as this does not change rapidly from one day to another (Murphy & Zimmerman, 1993).

Concluding, taking the pre-treatment year, 2007, as a reference year, can deal with CEOs both being in control -and treatment-groups and CEO replacements throughout the sample period.

Parallel trend assumption

Another assumption that should be made when performing a difference-in-difference analysis, is the parallel trend assumption. This assumption implies that the difference between the treatment -and control-group, are constant over time, when no treatment is involved (Oosterbeek, Van Praag & Ijsselstein, A., 2010). When this assumption is violated, a biased estimation of the causal effect can arise (Oosterbeek et al., 2010). So, to test this, the developments of the firm performance measures over time, related to the control -and treatment-groups, should be examined. The assumption for parallel trends holds when lines follow the same direction. When lines go in different directions during the sample period, then the assumption for parallel trends is violated. However, in this research, the treatment is involved either way, because the treatment is a time-sensitive treatment. But still, it is investigated whether this assumption holds, because treatment -and control-groups may not differ in their performances, when estimating the treatment effect.

Figures 1 and 2 below, show an example of meeting and violating the parallel trend assumption. Figure 1 shows how the lines should look like when the parallel trend assumption is met. Figure 2 shows how a violation of the parallel trend assumption looks like. These figures present the parallel trends over time of the variable ceo_{old} for performance measures $Tobin's\ Q$ and ROE. To determine whether the assumption is met or violated, it is observed whether differences between control -and treatment-groups are constant over the sample period. Figure 1 shows that this assumption is met, because lines follow the same directions. However, figure 2 shows that for the performance measure ROE, lines follow different directions from 2008 on, so the parallel trend assumption for ROE is not met.

This test for parallel trends is done 24 times; for all firm performance measures (4x) and the corresponding CEO characteristics (6x). When observing the whole sample period, the parallel trend assumption holds for all CEO characteristics and performance measures $ROA, Tobin's\ Q$, and $stockreturn$, because all 18 graphs look like figure 1. However, for all CEO characteristics in relation with ROE, the parallel trend assumption does not hold, because all 6 graphs look like figure 2. But regardless of the fact that this condition is not met for the regressions of CEO characteristics on ROE, a difference-in-difference analysis is still performed. So, when interpreting results of all regressions, the assumption is made that this parallel trend assumption is met. Nonetheless, empirical results can be biased for regressions with ROE and CEO characteristics, as stated earlier. So, this still should be taken into account when analyzing the results in section 4. There will be further elaborated upon this violation of parallel trends for ROE in subsection 5.2.

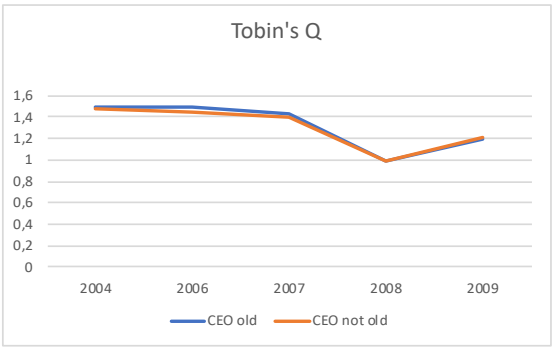

Figure 1: Parallel trend assumption is met

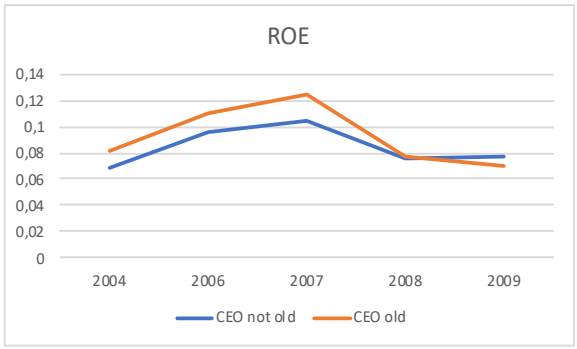

Figure 2: Parallel trend assumption is violated

Fixed effects model

To determine whether a fixed effects or a random effects model is applied to the regression, a Hausman test is performed. When performing this Hausman test, it turns out that the null hypothesis for a random effects model is rejected, implying that a fixed effects model is added to the regression. To control for the influence of aggregate time series trends and systematic differences in performances across different firms, year fixed effects and firm fixed effects are added to the regression model (Torres-Reyna, 2007). Fixed effects take care of the fact that unobservable factors, simultaneously affecting CEO characteristics and firm performance, are time-invariant and firm-invariant (Lins et al., 2013; Torres-Reyna, 2007). However, firm fixed effects are used instead of industry fixed effects. This is because when including firm-fixed effects, there is taken care of the industry variances already as well, because these are constant within firms and therefore, perfectly collinear (Bell & Jones, 2015). Hence, by including fixed

effects in the regression model, the net effect of the CEO characteristics on firm performance can be measured more accurate.

3.3 CEO characteristics and firm performance

In this subsection will be further elaborated upon the specific models used, to examine the relationship between the different CEO characteristics and firm performance during the financial crisis.

3.3.1 CEO age and firm performance

To answer hypothesis 1, it is examined whether older CEOs affect firm performance negatively during the financial crisis. To observe this relationship, the following difference-in-difference regression with year fixed effects and firm fixed effects is performed:

$$Y = \beta_0 + \beta_1 D^{crisis} + \delta_0 D^{ceo_{old}} + \delta_1 D^{crisis * ceo_{old}} + B_2 X_{it} + B_3 Z_{it} + \varepsilon_{it} \qquad (2)$$

Y stands for the firm performance measures ROA, ROE, $Tobin's\ Q$ and $stockreturn$, implying that this regression is performed four times. D^{crisis} is a dummy variable, which takes a value of 1 for the financial crisis period and 0 when not. $D^{ceo_{old}}$ is a dummy variable, which takes a value of 1 when a CEO is considered old and 0 when not. The coefficient of interest, δ_1, measures the interaction term $crisis * ceo_{old}$ and captures the effect of older CEOs on firm performance, during the financial crisis. X_{it} is a vector of CEO-specific control variables: ceo_{tenure}, $ceo_{chairman}$, ceo_{gender}, $ceo_{cashcompensation}$ and $ceo_{equitycompensation}$. Z_{it} is a vector of firm-specific control variables: $debtassets$, $rdassets$, $firmsize$ and $poison\ pill$. ε_{it} stands for the standard error term and is clustered at firm level to correct for heteroskedasticity and autocorrelation.

3.3.2 CEO tenure and firm performance

To answer hypothesis 2, which is about whether CEOs with a long tenure negatively affect firm performance, a difference-in-difference analysis with year fixed effects and firm fixed effects is performed:

$$Y = \beta_0 + \beta_1 D^{crisis} + \delta_0 D^{ceo_{longtenure}} + \delta_1 D^{crisis * ceo_{longtenure}} + B_2 X_{it} + B_3 Z_{it} + \varepsilon_{it} \qquad (3)$$

Y stands for the firm performance measures ROA, ROE, $Tobin's\ Q$ and $stockreturn$, implying that the regression is performed four times. D^{crisis} is a dummy variable, which takes a value of 1 for the financial crisis period and 0 when not. $D^{ceo_{longternure}}$ is a dummy variable, which takes a value of 1 when a CEO is considered having a long tenure 0 when not. The coefficient of interest, δ_1, measures the interaction term $crisis * ceo_{longtenure}$ and captures the effect of CEO with a long tenure on firm performance, during the financial crisis. X_{it} is a vector of CEO-specific control variables: ceo_{age}, $ceo_{chairman}$, ceo_{gender}, $ceo_{cashcompensation}$ and $ceo_{equitycompensation}$. Z_{it} is a vector of firm-specific control variables: $debtassets$, $rdassets, firmsize$ and $poison\ pill$. ε_{it} stands for the standard error term and is clustered at firm level to correct for heteroskedasticity and autocorrelation.

3.3.3 CEO duality and firm performance

To answer hypothesis 3, where is examined whether CEO duality affects firm performance in a negative way during year the financial crisis, a difference-in-difference analysis with year fixed effects and firm fixed effects is performed as follows:

$$Y = \beta_0 + \beta_1 D^{crisis} + \delta_0 D^{ceo_{chairman}} + \delta_1 D^{crisis * ceo_{chairman}} + B_2 X_{it} + B_3 Z_{it} + \varepsilon_{it} \qquad (4)$$

Y stands for the firm performance measures ROA, ROE, $Tobin's\ Q$ and $stockreturn$, implying that the regression is performed four times. D^{crisis} is a dummy variable, which takes a value of 1 for the financial crisis period and 0 when not. $D^{ceo_{chairman}}$ is a dummy variable, which takes a value of 1 when a CEO is chairman as well and 0 when not. The coefficient of interest, δ_1, measures the interaction term $crisis * ceo_{chairman}$ and captures the effect of CEO duality on firm performance, during the financial crisis. X_{it} is a vector of CEO-specific control variables: ceo_{age}, ceo_{tenure}, ceo_{gender}, $ceo_{cashcompensation}$ and $ceo_{equitycompensation}$. Z_{it} is a vector of firm-specific control variables: $debtassets$, $rdassets, firmsize$ and $poison\ pill$. ε_{it} stands for the standard error term and is clustered at firm level to correct for heteroskedasticity and autocorrelation.

3.3.4 CEO gender and firm performance

To answer hypothesis 4, where is examined whether male CEOs have a positive impact on firm performance during the financial crisis, the following difference-in-difference regression with year fixed effects and firm fixed effects is performed:

$$Y = \beta_0 + \beta_1 D^{crisis} + \delta_0 D^{ceo_{gender}} + \delta_1 D^{crisis*ceo_{gender}} + B_2 X_{it} + B_3 Z_{it} + \varepsilon_{it} \quad (5)$$

Y stands for the firm performance measures ROA, ROE, $Tobin's\ Q$ and $stockreturn$, implying that the regression is performed four times. D^{crisis} is a dummy variable, which takes a value of 1 for the financial crisis period and 0 when not. $D^{ceo_{gender}}$ is a dummy variable, which takes a value of 1 when a CEO is a male and 0 when it is a female. The coefficient of interest, δ_1, measures the interaction term $crisis * ceo_{gender}$ and captures the effect of male CEOs on firm performance, during the financial crisis. The regressions are performed with a fixed effects model. X_{it} is a vector of CEO-specific control variables: ceo_{age}, ceo_{tenure}, $ceo_{chairman}$, $ceo_{cashcompensation}$ and $ceo_{equitycompensation}$. Z_{it} is a vector of firm-specific control variables: $debtassets$, $rdassets$, $firmsize$ and $poison\ pill$. ε_{it} stands for the standard error term and is clustered at firm level to correct for heteroskedasticity and autocorrelation.

3.3.5 CEO compensation and firm performance

To answer hypothesis 5 & 6, there is looked further into the components of total CEO compensation. Total CEO compensation consists of two components: cash compensation and equity compensation. There is investigated whether high CEO cash compensation during the financial crisis, negatively affects firm performance and whether high CEO equity compensation positively affects performance during the financial crisis.

To answer hypothesis 5, where is examined whether a high CEO cash compensation has a negative effect on firm performance during the financial crisis, the following regression with year fixed effects and firm fixed effects is performed:

$$Y = \beta_0 + \beta_1 D^{crisis} + \delta_0 D^{ceo_{highcash}} + \delta_1 D^{crisis*ceo_{highcash}} + B_2 X_{it} + B_3 Z_{it} + \varepsilon_{it} \quad (6)$$

Y stands for the firm performance measures ROA, ROE, $Tobin's\ Q$ and $stockreturn$, implying that the regression is performed four times. D^{crisis} is a dummy variable, which takes a value of 1 for the financial crisis period and 0 when not. $D^{ceo_{highcash}}$ is a dummy variable and takes a value of 1 when a CEO earns more cash compensation than the median of the sample. The coefficient of interest, δ_1, measures the interaction term $crisis * ceo_{highcash}$ and captures the effect of high CEO cash compensation on firm performance, during the financial crisis. X_{it}

is a vector of CEO-specific characteristic variables (ceo_{age}, ceo_{tenure}, $ceo_{chairman}$, ceo_{gender} and $ceo_{equitycompensation}$). Z_{it} is a vector of firm-specific control variables: $debtassets$, $rdassets$, $firmsize$ and $poison\ pill$. ε_{it} stands for the standard error term and is clustered at firm level to correct for heteroskedasticity and autocorrelation.

To answer hypothesis 6, where is examined whether a high CEO equity compensation has a positive effect on firm performance during the financial crisis, the following regression with year fixed effects and firm fixed effects is performed:

$$Y = \beta_0 + \beta_1 D^{crisis} + \delta_0 D^{ceo_{highequity}} + \delta_1 D^{crisis * ceo_{highequity}} + B_2 X_{it} + B_3 Z_{it} + \varepsilon_{it} \quad (7)$$

Y stands for the firm performance measures ROA, ROE, $Tobin's\ Q$ and $stockreturn$, implying that the regression is performed four times. D^{crisis} is a dummy variable, which takes a value of 1 for the financial crisis period and 0 when not. $D^{ceo_{highequity}}$ is a dummy variable and takes a value of 1 when a CEO earns more equity compensation than the median of the sample. The coefficient of interest, δ_1, measures the interaction term $crisis * ceo_{highequity}$ and captures the effect of high CEO equity compensation on firm performance, during the financial crisis. X_{it} is a vector of CEO-specific characteristic variables (ceo_{age}, ceo_{tenure}, $ceo_{chairman}$, ceo_{gender} and $ceo_{cashcompensation}$). Z_{it} is a vector of firm-specific control variables: $debtassets$, $rdassets$, $firmsize$ and $poison\ pill$. ε_{it} stands for the standard error term and is clustered at firm level to correct for heteroskedasticity and autocorrelation.

3.4 The endogeneity problem

There is a lot of endogeneity when studying the relationship between CEO characteristics and firm performance during the financial crisis. This implies that many other factors could possibly affect the performance of a firm. To take care of this endogeneity problem properly, some tools are applied to overcome this problem.

Endogeneity concerns can be solved depending on the nature of the intervention (Lechner, 2011). Often and in this research as well, there are still many other factors affecting firm performance, next to the variables already included in the regression. Therefore, a bias can arise because some other factors affecting firm performance, are not included as variables in the regression yet. This is called omitted variable bias. In this research, this is the case as well as

the R-squared values are not high enough to imply that all the variables affecting firm performance are captured. However, the usage of fixed effects in a regression model causes that the endogeneity problem, as a result of the omitted variable bias, is partly solved. This is because year fixed effects and firm fixed effects take care of the fact that unobservable factors, simultaneously affecting the CEO characteristics and firm performance, are time-invariant and firm-invariant (Lins et al.,2013; Torres-Reyna, 2007).

Another tool that is applied to overcome this endogeneity problem, is the usage of a difference-in-difference research design. Lechner (2011) states that a difference-in-difference analysis is often used in the medical industry, in order to see the effect of a medicine, or to evaluate the effects of political decisions. However, with political decisions, individuals can anticipate to these before the official implementation of the law and therefore they might change their behavior upfront. This leads to the fact that the effect of this law cannot be measured accurately (Lechner, 2011). A financial crisis can be considered different compared to a political change, as individuals cannot anticipate on this event, because it comes quite unexpected. This results in a greater shock to the whole environment. Therefore, the effect of CEO characteristics on firm performance can be measured more accurately in this research, as the nature of this financial shock is exogenous (Urbanos-Garrido & Lopez-Valcarcel, 2015; Lins et al., 2013).

Due to the fact that the financial crisis is considered as an exogenous shock to the unanticipated (economic) environment, the endogeneity problem can be partly handled (Roberts & Whited, 2013; Lins et al., 2013). It can be partly handled, because there still might be an omitted variable bias in the results, as stated earlier in this subsection. However, the research design of this research corresponds to the research design of Lins et al. (2013). They state that the unanticipated and exogenous nature of a financial shock, abruptly influences the market, while blockholder control stays the same in the short time. This is just the case in this research, but instead of blockholder control, it is assumed that CEO characteristics stay the same over this short time period. Due to this, the effect of CEO characteristics on firm performance during the financial crisis, can be observed more directly.

4. RESULTS

In this section, the empirical results, as an outcome of the methodology described in section 3, will be discussed. There will be further elaborated upon the hypotheses developed in subsection 2.6 and these hypotheses will be either accepted or rejected.

4.1 CEO age and firm performance

Hypothesis 1, developed in subsection 2.6, states that CEOs who are 64 or older (old CEOs) negatively affect firm performance during the financial crisis. In this subsection results regarding this relationship will be discussed.

In table III below, results can be found regarding the relationship between old CEOs and firm performance. 1230 firms and 4665 observations are analyzed for the performance measures ROA, ROE and Q. Regarding $stockreturn$, 1076 firms and 3535 observations are analyzed, as there are fewer observations represented in the data. Next to this, year fixed effects and firm fixed effects are added to the regression and standard errors are clustered at firm level.

The variable ceo_{old} in table III suggests that old CEOs significantly negatively affect ROE and Q. Results are significant on significance levels of 1% and 10% respectively. So, over the whole sample period, covering years 2004 – 2009, old CEOs have a significant negative influence on firm performance. When looking at the financial crisis period in particular, covering only years 2008 – 2009, it can be observed that old CEOs have a significant negative influence on firm performance as well. The interaction term $crisis * ceo_{old}$, indicates that ROA and ROE are significantly negatively affected by old CEOs during a financial crisis, both at significant levels of 10%. So, hypothesis 1 is accepted. Old CEOs affect firm performance negatively during the financial crisis.

The results from this research the financial crisis period, correspond to findings of Hambrick & Mason (1984), Barker & Mueller (2002), Dechow & Sloan (1991) and Gibbons & Murphy (1992). Reasons for results presented in this research are as follows. It could be that the negative relationship found in this research, is due to the fact that old CEOs are too conservative (Hambrick & Mason, 1984). In periods of financial crises, it could be very important to come up with innovative ideas and learn new strategies. Moreover, this negative relationship could be because of old CEOs following lower-growth strategies, hurting firm performance as well

during a financial crisis (Barker & Mueller, 2002). Besides, they are closer to retirement and have different career concerns due to their age, resulting in lower firm performance (Gibbons & Murphy, 1992). So, it seems that an old CEO's higher level of experience (Ocasio, 1994), does not outweigh its lower levels of flexibility, career concerns and more conservative behavior during a financial crisis (Hambrick & Mason, 1984; Barker & Mueller, 2002; Gibbons & Murphy, 1992).

Table III

Fixed effects difference-in-difference regression model of old CEOs on firm performance

The regression output covers a difference-in-difference analysis and shows the effect of an old CEO on different firm performance measures. Variable descriptions can be found in table BI in Appendix B. ***, ** and * indicate the significance levels at respectively 1, 5 and 10 percent. The standard errors are between the parentheses and are clustered to correct for heteroskedasticity and autocorrelation.

	(1)	(2)	(3)	(4)
VARIABLES	**ROA**	**ROE**	**Tobin's Q**	**Stock return**
crisis	-0.026***	-0.037***	-0.359***	-0.033*
	(0.002)	(0.004)	(0.016)	(0.018)
ceo old	-0.022	-0.099***	-0.437*	-0.507
	(0.034)	(0.032)	(0.256)	(0.533)
crisis * ceo old	-0.006*	-0.015*	-0.040	-0.023
	(0.004)	(0.009)	(0.035)	(0.033)
ceo tenure	-0.000	-0.001**	0.001	-0.003
	(0.000)	(0.000)	(0.002)	(0.004)
ceo chairman	0.034**	-0.014	0.420*	-0.404
	(0.014)	(0.075)	(0.249)	(0.446)
ceo gender	0.041***	-0.015*	0.445***	0.039**
	(0.003)	(0.008)	(0.027)	(0.02)
ln ceo cash compensation	0.007***	0.005	0.038***	0.035
	(0.002)	(0.005)	(0.011)	(0.022)
ln ceo equity compensation	0.002***	0.004***	0.016**	0.006
	(0.001)	(0.001)	(0.006)	(0.007)
deb/tassets	-0.144***	-0.151***	-1.448***	-1.126***
	(0.014)	(0.038)	(0.134)	(0.180)
rd/assets	-0.448***	-0.507**	0.807	-5.503***
	(0.094)	(0.203)	(0.774)	(1.122)
firm size	0.050***	0.107***	-0.165***	-0.712***
	(0.004)	(0.010)	(0.034)	(0.060)
poison pill	-0.001	-0.008	-0.029	-0.069*
	(0.003)	(0.007)	(0.023)	(0.040)
Constant	-0.324***	-0.657***	2.814***	6.131***
	(0.037)	(0.089)	(0.273)	(0.516)
Industry fixed effects	NO	NO	NO	NO
Firm fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Observations	4,665	4,665	4,665	3,435
R-squared within	0.251	0.112	0.331	0.098
Number of groups	1,230	1,230	1,230	1,076

Clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4.2 CEO tenure and firm performance

Hypothesis 2 states that CEOs who are in their role for 10 years or longer (long tenure), negatively affect firm performance during a financial crisis. In this subsection will be further elaborated upon this relationship.

Table IV below shows that in the regression, 1226 firms with 4603 observations are included in the sample for performance measures ROA, ROE and Q and 1076 firms with 3407 observations for $stockreturn$. The variable $ceo_{longtenure}$ indicates that for the whole sample period covering years 2004 – 2009, CEOs with a long tenure significantly negatively affect ROE and $stockreturn$ on significance levels of 10% and 5%, respectively. To find out whether a long tenure of a CEO has a negative effect on firm performance during the financial crisis as well, the interaction term $crisis * ceo_{longtenure}$ should be examined. However, insignificant results are found for all firm performance measures, implying that hypothesis 2 is rejected. A CEO with a long tenure does not affect firm performance negatively during a financial crisis.

This significant negative relationship observed for the whole period, can be due to the fact that an increase of CEO tenure results in lower R&D expenses (Dechow & Sloan, 1991). This results in less innovation, which hurts firm performance, because R&D and innovation are important tools to increase firm performance (Makkonen et al., 2014). Besides, their risk/return efficiency decreases when they are longer in their role as a CEO. Due to this, they need more trainings to stay updated to the changing environment (De Jonghe et al., 2012). Moreover, the level of entrenchment plays a big role. CEOs with a high tenure are more likely to follow their own personal beliefs and hence are more likely to get entrenched, than CEOs with a short tenure (Ryan & Wiggins, 2001). Furthermore, according to Wu et al. (2005) CEOs hurt firm performance when their tenure is really short or really long. According to Hambrick & Fukutomi (1991), they perform best when they are at half of their tenure. So, it seems that for the whole sample period, more firm-specific knowledge of a CEO with a long tenure (Baysinger & Hoskisson, 1990), does not outweigh their higher levels of entrenchment and lower levels of efficient risk-taking behavior (Dechow & Sloan, 1991; Ryan & Wiggins, 2001).

However, the insignificant relationship between CEO long tenure and firm performance during the financial crisis, can be due to the fact that during a crisis it is hard for all CEOs to realize good firm performance. The crisis is a tough, volatile and uncertain period. Therefore it could

be that CEOs who are in their role for a long or short time at the same firm, both do not really know how they should manage the firm in the best way during such a period, because these CEO's both did not have experience with a financial crisis like this one before during their tenure. Besides, the financial crisis has an unpredictable development, causing uncertainty for both CEOs with a short tenure or a long tenure, as they both might not know when it is the right time to invest or change strategies (Lockwood, 2015). So, it seems that theories of Dechow & Sloan (1991), Makkonen et al. (2014), De Jonghe et al. (2012), Wu et al. (2005), Hambrick & Fukutomi (1991), Baysinger & Hoskisson (1990), Ryan & Wiggins (2001) do not hold for a tough period like the financial crisis, but do hold when observing firm performance over a longer time period with different economic environments over time.

Table IV

Fixed effects difference-in-difference regression model of CEO long tenure on firm performance

The regression output covers a difference-in-difference analysis and shows the effect of a CEO with a long tenure on different firm performance measures. Variable descriptions can be found in table BI in Appendix B. ***, ** and * indicate the significance levels at respectively 1, 5 and 10 percent. The standard errors are between the parentheses and are clustered to correct for heteroskedasticity and autocorrelation.

	(1)	(2)	(3)	(4)
VARIABLES	**ROA**	**ROE**	**Tobin's Q**	**Stock return**
crisis	-0.027***	-0.038***	-0.361***	-0.044**
	(0.002)	(0.005)	(0.017)	(0.019)
ceo long tenure	-0.008	-0.035*	-0.129	-0.266**
	(0.006)	(0.019)	(0.081)	(0.135)
crisis * ceo long tenure	-0.002	-0.008	-0.019	-0.016
	(0.003)	(0.007)	(0.031)	(0.031)
ceo age	-0.000	-0.001	-0.000	-0.001
	(0.000)	(0.001)	(0.002)	(0.004)
ceo chairman	0.034**	-0.013	0.418*	-0.407
	(0.015)	(0.074)	(0.244)	(0.458)
ceo gender	0.040***	-0.021***	0.454***	0.036***
	(0.003)	(0.008)	(0.029)	(0.006)
ln ceo cash compensation	0.007***	0.004	0.040***	0.036
	(0.002)	(0.005)	(0.011)	(0.023)
ln ceo equity compensation	0.002***	0.004***	0.016**	0.010
	(0.001)	(0.001)	(0.006)	(0.007)
debt/assets	-0.139***	-0.151***	-1.402***	-1.090***
	(0.015)	(0.038)	(0.146)	(0.194)
rd/assets	-0.439***	-0.548***	0.870	-5.264***
	(0.099)	(0.206)	(0.821)	(1.145)
firm size	0.049***	0.105***	-0.169***	-0.737***
	(0.004)	(0.010)	(0.034)	(0.061)
poison pill	-0.000	-0.008	-0.033	-0.079**
	(0.003)	(0.007)	(0.023)	(0.040)
Constant	-0.305***	-0.558***	2.775***	6.264***
	(0.038)	(0.095)	(0.286)	(0.546)
Industry fixed effects	NO	NO	NO	NO
Firm fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Observations	4,603	4,603	4,603	3,407
R-squared within	0.248	0.111	0.331	0.101
Number of groups	1,226	1,226	1,226	1,076

Clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4.3 CEO duality and firm performance

Hypothesis 3 states that there is a negative relationship between CEO duality and firm performance during the financial crisis. In this subsection will be further elaborated upon this relationship.

Results about the relationship between CEO duality and corresponding firm performance are presented in table V. To examine the relationship, regressions are performed with ROA, ROE and Q and include 4603 observations for 1226 firms. $stockreturn$ includes 3407 observations for 1076 firms. The variable $ceo_{chairman}$ indicates a significant positive relationship between CEO duality and performance measures ROA and Q for the whole sample period of 2004 – 2009, with significance levels of 5% and 10%, respectively. This positive relationship can be due to the fact that these CEOs are busier than others and as a result of this, do their business in a more efficient way (Di Pietra et al., 2008). Besides, these results correspond to findings of Peng et al. (2007) and Donaldson & Davis (1991). They find strong evidence for the stewardship theory, suggesting that CEOs who are chairman as well, profit from the fact that there is shared incumbency. As a result of this, they only have to report to themselves, leading to higher efficiency and therefore firm performance (Di Pietra et al., 2008). So, it seems that for the whole sample period, the higher level of entrenchment and busyness (Peni, 2014), does not outweigh their higher levels of efficiency (Di Pietra et al., 2008), because of their shared incumbency of the role of a CEO and chairman together (Peng et al., 2007; Donaldson & Davis, 1991).

However, when observing the interaction term $crisis * ceo_{chairman}$ in table V, to examine the relationship between CEO duality and firm performance during the financial crisis, no significant results are found. This implies that hypothesis 3 is rejected. During the financial crisis, it cannot be said that CEO duality affects firm performance negatively (Baliga et al., 1996).

Table V

Fixed effects difference-in-difference regression model of CEO duality on firm performance

The regression output covers a difference-in-difference analysis and shows the effect of CEO duality on different firm performance measures. Variable descriptions can be found in table BI in Appendix B. ***, ** and * indicate the significance levels at respectively 1, 5 and 10 percent. The standard errors are between the parentheses and are clustered to correct for heteroskedasticity and autocorrelation.

	(1)	(2)	(3)	(4)
VARIABLES	**ROA**	**ROE**	**Tobin's Q**	**Stock return**
crisis	-0.027***	-0.040***	-0.359***	-0.043**
	(0.002)	(0.004)	(0.016)	(0.018)
ceo chairman	0.034**	-0.012	0.424*	-0.389
	(0.014)	(0.075)	(0.233)	(0.426)
crisis * ceo chairman	-0.002	-0.003	-0.036	0.024
	(0.003)	(0.008)	(0.035)	(0.036)
ceo age	-0.000	-0.001	-0.001	0.003
	(0.000)	(0.001)	(0.003)	(0.006)
ceo tenure	-0.000	0.000	0.001	-0.007
	(0.000)	(0.001)	(0.003)	(0.005)
ceo gender	0.041***	-0.023**	0.446***	0.028*
	(0.004)	(0.009)	(0.032)	(0.02)
ln ceo cash compensation	0.007***	0.005	0.041***	0.036
	(0.002)	(0.005)	(0.011)	(0.023)
ln ceo equity compensation	0.002***	0.004***	0.016**	0.010
	(0.001)	(0.001)	(0.006)	(0.007)
debt/assets	-0.140***	-0.153***	-1.411***	-1.107***
	(0.015)	(0.038)	(0.147)	(0.191)
rd/assets	-0.443***	-0.555***	0.853	-5.327***
	(0.099)	(0.205)	(0.820)	(1.138)
firm size	0.049***	0.105***	-0.170***	-0.727***
	(0.004)	(0.010)	(0.034)	(0.061)
poison pill	-0.000	-0.008	-0.032	-0.080**
	(0.003)	(0.007)	(0.023)	(0.040)
Constant	-0.315***	-0.559***	2.806***	5.970***
	(0.041)	(0.103)	(0.320)	(0.577)
Industry fixed effects	NO	NO	NO	NO
Firm fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Observations	4,603	4,603	4,603	3,407
R-squared within	0.248	0.110	0.330	0.101
Number of groups	1,226	1,226	1,226	1,076

Clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4.4 CEO gender and firm performance

Hypothesis 4 states that male CEOs positively affect firm performance during the financial crisis. In this subsection will be further elaborated upon this relationship.

Table VI shows the results about the relationship between CEO gender firm performance and has 4603 observations for 1226 firms regarding ROA, ROE and Q and 3407 observations for 1076 firms for $stockreturn$. The variable ceo_{gender} indicates significant results for all performance measures ROA, ROE, Q and $stockreturn$, with significance levels of 1%, 10%, 1% and 5% respectively (Kolev, 2012; Faccio et al., 2016). This implies that male CEOs affect firm performance significantly positively over the whole sample period covering years 2004 – 2009. These findings correspond with findings of Faccio et al. (2016) and Kolev (2012). Faccio et al. (2016) find that the behavior of female CEOs is more risk-avoiding, leading to distortion in the allocation of capital and subsequently resulting in a decrease of firm performance. Kolev (2012) states that firms with female CEOs underperform male CEOs by 0.35% in terms of stock returns per month. However, table AIV in Appendix shows that only 110 observations for female CEOs are presented for ROA, ROE and Q and 81 observations for $stockreturn$, this should be taken into account as this could cause a biased result. There will be further elaborated upon this problem in subsection 5.2.

However, when observing the interaction term, $crisis * ceo_{gender}$, to investigate whether male CEOs affect firm performance positively during the financial crisis, no significant results are found (Wolfers, 2006; Lam et al., 2012). So, hypothesis 4 is rejected. Based on the insignificant results, it cannot be concluded that male CEOs affect firm performance positively during the financial crisis. These insignificant results correspond to findings of Wolfers (2006) and Lam et al. (2012). Wolfers (2006) finds no systematical differences in stock return either, in contrary to the finding of Kolev (2012) stated earlier in this subsection. Next to this, Lam et al. (2012) find limited evidence regarding the relationship between CEO gender and firm performance as well.

Table VI

Fixed effects difference-in-difference regression model of CEO gender on firm performance

The regression output covers a difference-in-difference analysis and shows the effect of CEO gender on different firm performance measures. Variable descriptions can be found in table BI in Appendix B. ***, ** and * indicate the significance levels at respectively 1, 5 and 10 percent. The standard errors are between the parentheses and are clustered to correct for heteroskedasticity and autocorrelation.

	(1)	(2)	(3)	(4)
VARIABLES	**ROA**	**ROE**	**Tobin's Q**	**Stock return**
crisis	-0.021**	-0.038*	-0.319***	-0.057**
	(0.009)	(0.020)	(0.093)	(0.108)
ceo gender	0.044***	0.022*	0.466***	0.037**
	(0.006)	(0.012)	(0.054)	(0.019)
crisis * ceo gender	-0.006	-0.002	-0.050	0.020
	(0.009)	(0.020)	(0.093)	(0.110)
ceo age	-0.000	-0.001	-0.001	0.003
	(0.000)	(0.001)	(0.003)	(0.006)
ceo tenure	-0.000	0.000	0.001	-0.007
	(0.000)	(0.001)	(0.003)	(0.005)
ceo chairman	0.034**	-0.012	0.420*	-0.388
	(0.014)	(0.075)	(0.241)	(0.434)
ln ceo cash compensation	0.007***	0.005	0.040***	0.036
	(0.002)	(0.005)	(0.011)	(0.023)
ln ceo equity compensation	0.002***	0.004***	0.016**	0.010
	(0.001)	(0.001)	(0.006)	(0.007)
debt/assets	-0.140***	-0.153***	-1.410***	-1.108***
	(0.015)	(0.038)	(0.147)	(0.192)
rd/assets	-0.443***	-0.555***	0.852	-5.327***
	(0.099)	(0.205)	(0.818)	(1.137)
firm size	0.049***	0.105***	-0.170***	-0.728***
	(0.004)	(0.010)	(0.034)	(0.061)
poison pill	-0.000	-0.008	-0.031	-0.080**
	(0.003)	(0.007)	(0.023)	(0.040)
Constant	-0.317***	-0.559***	2.791***	5.972***
	(0.041)	(0.103)	(0.325)	(0.576)
Industry fixed effects	NO	NO	NO	NO
Firm fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Observations	4,603	4,603	4,603	3,407
R-squared within	0.248	0.109	0.330	0.101
Number of groups	1,226	1,226	1,226	1,076

Clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4.5 CEO compensation and firm performance

Hypothesis 5 states that CEOs who earn high cash compensation, affect firm performance negatively during the financial crisis. Hypothesis 6 states that CEOs who earn high equity compensation, affect firm performance positively during the financial crisis. In this subsection, there will be further elaborated upon this relationship.

Tables VII and VIII show the results about the relationship between different forms of CEO compensation and firm performance. The tables both present 1226 firms with 4603 observations for ROA, ROE and $Q.\ stockreturn$ presents 1076 firms with 3407 observations. When observing variables $ceo_{highcash}$ in table VII and $ceo_{highequity}$ in table VIII, no significant results are found. This implies that over the whole sample period covering years 2004 – 2009, CEO compensation does not have an effect on firm performance. However, when examining the interaction terms $crisis * ceo_{highcash}$ and $crisis * ceo_{highequity}$, to investigate whether there is a significant relationship with firm performance during the financial crisis, both show a significant result. The interaction term $crisis * ceo_{highcash}$ in table VII provides evidence for the fact that that ROA is significantly negatively affected by a high CEO cash compensation during the financial crisis, with a significance level of 5%. The interaction term $crisis * ceo_{highequity}$ in table VIII indicates that ROA and $stockreturn$ are significantly positively affected by a high CEO equity compensation during the financial crisis, with significance levels of 1% and 10%, respectively. Thus, hypothesis 5 and 6 are accepted. A high CEO cash compensation during the financial crisis negatively affects firm performance and a high CEO equity compensation positively affects firm performance during the financial crisis.

The result of a high CEO cash compensation affecting firm performance negatively, is in contrast to the finding of Ozkan (2011), who finds a positive relationship instead. Nevertheless, the finding in this research corresponds to the findings of Yang et al. (2014). They state that during the financial crisis, incentive-based contracts (e.g. bonuses) for CEOs were not effective enough to increase firm performance. Besides, this finding is the same as the findings of Matolcsy & Wright (2011), who state that when compensation is not in line with firm characteristics, firm performance is hurt. In this field of overcompensation, Core et al. (1999) and Brick et al. (2006) find similar results and state that firm performance is lower when there is excessive CEO compensation. According to them, this could be due to the fact that they reached their bonus target too early and easily, resulting in less motivation to boost firm

performance. Moreover, they are more likely to have a short-term view on the company, because of the possible bonuses and make (financing) decisions based on this, which might negatively affect firm performance as well (Bruce et al., 2007).

However, high CEO equity compensation during the financial crisis is positively associated with firm performance. This implies that CEO equity compensation is an important tool to motivate CEOs to perform better during a crisis. Research of Mehran (1995) & Bhagat & Romano (2009) give some reasons for this positive relationship during the financial crisis. It can be due to the fact that they are given much confidence by the board. This subsequently motivates them to make more value-maximizing decisions for the long run (Mehran, 1995). Besides, nowadays the salary component 'stock' is replaced by the component 'restricted stock' (Larcker & Tayan, 2019). This restricted stock takes care of the fact that CEOs cannot profit from good firm performance right away, but later in their years of service, after the vesting period. Bhagat & Romano (2009) state that this gives them an incentive to have a long-term view on the company, because they are more likely to stay until the vesting period. This subsequently results in good long-term firm performance, as CEOs will not only focus on the short-term (Bruce et al., 2007). These CEOs are more motivated to make value-maximizing decisions for the long run. This is because it is of their importance that the firm performs well in the long run, especially in terms of their equity compensation.

Table VII

Fixed effects difference-in-difference regression model of high CEO cash compensation on firm performance

The regression output covers a difference-in-difference analysis and shows the effect of a high cash compensation of a CEO on different firm performance measures. Variable descriptions can be found in table BI in Appendix B. ***, ** and * indicate the significance levels at respectively 1, 5 and 10 percent. The standard errors are between the parentheses and are clustered to correct for heteroskedasticity and autocorrelation.

	(1)	(2)	(3)	(4)
VARIABLES	**ROA**	**ROE**	**Tobin's Q**	**Stock return**
crisis	-0.026***	-0.041***	-0.372***	-0.056***
	(0.002)	(0.005)	(0.018)	(0.019)
ceo high cash	0.005	0.016	0.008	0.089
	(0.010)	(0.025)	(0.118)	(0.064)
crisis * ceo high cash	-0.007**	-0.000	0.000	-0.051
	(0.003)	(0.008)	(0.030)	(0.030)
ceo age	-0.000	-0.001	-0.001	0.003
	(0.000)	(0.001)	(0.003)	(0.006)
ceo tenure	-0.000	0.000	0.001	-0.007
	(0.000)	(0.001)	(0.003)	(0.005)
ceo chairman	0.031*	-0.013	0.412*	-0.367
	(0.016)	(0.074)	(0.249)	(0.426)
ceo gender	0.045***	-0.021**	0.464***	0.043**
	(0.004)	(0.009)	(0.032)	(0.01)
ln ceo equity compensation	0.002***	0.004***	0.016**	0.011
	(0.001)	(0.001)	(0.006)	(0.007)
debt/assets	-0.142***	-0.155***	-1.420***	-1.109***
	(0.015)	(0.038)	(0.146)	(0.191)
rd/assets	-0.453***	-0.563***	0.773	-5.356***
	(0.099)	(0.205)	(0.822)	(1.138)
firm size	0.048***	0.105***	-0.171***	-0.718***
	(0.004)	(0.010)	(0.034)	(0.060)
poison pill	0.001	-0.007	-0.024	-0.079**
	(0.003)	(0.007)	(0.024)	(0.040)
Constant	-0.266***	-0.533***	3.082***	6.056***
	(0.039)	(0.092)	(0.316)	(0.575)
Industry fixed effects	NO	NO	NO	NO
Firm fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Observations	4,603	4,603	4,603	3,407
R-squared within	0.242	0.109	0.327	0.100
Number of groups	1,226	1,226	1,226	1,076

Clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table VIII

Fixed effects difference-in-difference regression model of high CEO equity compensation on firm performance

The regression output covers a difference-in-difference analysis and shows the effect of a high equity compensation of a CEO on different firm performance measures. Variable descriptions can be found in table BI in Appendix B. ***, ** and * indicate the significance levels at respectively 1, 5 and 10 percent. The standard errors are between the parentheses and are clustered to correct for heteroskedasticity and autocorrelation.

	(1)	(2)	(3)	(4)
VARIABLES	**ROA**	**ROE**	**Tobin's Q**	**Stock return**
crisis	-0.032***	-0.042***	-0.368***	-0.006*
	(0.002)	(0.005)	(0.022)	(0.024)
ceo high equity	-0.007	-0.013	0.006	-0.015
	(0.007)	(0.021)	(0.066)	(0.148)
crisis * ceo high equity	0.009***	0.005	0.007	0.055*
	(0.003)	(0.007)	(0.028)	(0.030)
ceo age	-0.000	-0.001	-0.002	0.003
	(0.000)	(0.001)	(0.003)	(0.006)
ceo tenure	-0.000	0.000	0.001	-0.007
	(0.000)	(0.001)	(0.003)	(0.005)
ceo chairman	0.030**	-0.015	0.411*	-0.383
	(0.015)	(0.075)	(0.241)	(0.437)
ceo gender	0.036***	-0.028***	0.423***	0.052**
	(0.004)	(0.009)	(0.033)	(0.008)
ln ceo cash compensation	0.007***	0.004	0.040***	0.036
	(0.002)	(0.005)	(0.011)	(0.023)
debt/assets	-0.141***	-0.156***	-1.422***	-1.119***
	(0.015)	(0.038)	(0.146)	(0.190)
rd/assets	-0.437***	-0.547***	0.877	-5.341***
	(0.099)	(0.205)	(0.823)	(1.136)
firm size	0.050***	0.109***	-0.152***	-0.712***
	(0.004)	(0.010)	(0.034)	(0.060)
poison pill	-0.000	-0.008	-0.033	-0.084**
	(0.003)	(0.007)	(0.023)	(0.040)
Constant	-0.301***	-0.541***	2.844***	5.944***
	(0.041)	(0.104)	(0.321)	(0.585)
Industry fixed effects	NO	NO	NO	NO
Firm fixed effects	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Observations	4,603	4,603	4,603	3,407
R-squared within	0.247	0.108	0.328	0.101
Number of groups	1,226	1,226	1,226	1,076

Clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

5. CONCLUSION

In this section, the findings presented in this research will be summarized in short. Moreover, an answer to the research question will be provided. Afterwards, the limitations and recommendations of this research will be given.

5.1 Summary

The research question is: “Do CEO characteristics affect firm performance during the financial crisis? And if so, what kind of CEO works best?”. The answer to this question is yes, CEO characteristics do matter during the financial crisis. The results presented in section 4, show several significant results regarding the relationship between the CEO characteristics and firm performance during the financial crisis.

Concerning the question about what kind of CEO works best during a crisis and should therefore be hired or retained, the answer is as follows. The results indicate that during the financial crisis, an old CEO affects return on assets and return on equity negatively. So, according to these results, having a CEO who is 64 or older, is not recommended for firms who are in heavy weather. This could be due to the fact that they are too conservative (Hambrick & Mason, 1984), or because of the fact that they follow lower-growth strategies and have other career concerns compared to younger CEOs (Barker & Mueller, 2002; Gibbons & Murphy, 1992).

In contrast to this, CEOs with a long tenure do not seem to significantly affect firm performance. So, a long tenure of a CEO does not matter in terms of firm performance, during a financial crisis. Besides, CEO duality does not have a significant influence on firm performance either, implying that it is not of importance during a financial crisis whether a CEO is chairman, or not (Baliga, 1996). Furthermore, the gender of a CEO does not seem to affect firm performance as well, as the analysis does not show significant results. So, during a crisis it does not matter whether a firm has a female or a male as a CEO (Wolfers, 2006; Lam et al., 2012).

In the field of CEO compensation, results indicate that a high CEO cash compensation significantly negatively affects firm performance, in terms of return on assets. This could be due to the fact that a high cash compensation could imply that a CEO is overcompensated and loses motivation (Brick et al., 2006). In contrary to this, results show that a high CEO equity compensation positively affects return on assets and stock return. This might be as a result of

their long-term view on the company, due to the vesting period of their stocks (Mehran, 1995; Bhagat & Romano, 2009).

To conclude, according to the results of this research, during the financial crisis, firms should not have an old CEO and CEOs should be compensated with a high amount of equity compensation, but not with a (too) high amount of cash compensation.

5.2 Discussion

First of all, table II on page 17 shows that manufacturing firms are in the majority. This could lead to a sample selection bias. Due to this, it might be that the results are more representative for manufacturing firms and less for firms operating in other industries that are represented in the sample. Therefore, it could be that the outcomes of this research only give insight for manufacturing industries in what kind of CEO should be hired or retained, during a financial crisis.

Moreover, as earlier stated in subsection 3.2.3, the parallel trend assumptions do not hold for the performance measure ROE and its relationship with all CEO characteristics. So, results of these regressions should not be taken as highly informative for firms. When generating results, this parallel trend assumption is still assumed to come to a result. However, it should be kept in mind that the parallel trend assumptions were violated for those variables and results of these regressions with return on equity, could therefore be biased.

Next to this, regarding the parallel trend assumption, it could have been observed whether this assumption only holds for the non-financial crisis period covering years 2004 – 2007, instead of observing the whole period of 2004 – 2009. The problem with the parallel trend assumption in this research, is that it cannot be observed over the whole sample period, because the treatment is a time period. So, when it is desirable to know whether the parallel trend assumption holds, completely without any involvement of the treatment (e.g. crisis), then only years 2004 – 2007 should be observed. When these years alone are used to observe the parallel trend assumption, then the assumption would hold for all performance measures and all CEO characteristics. However, in this research, the whole period of 2004 – 2009 is investigated. This is because of the fact that the nature of the parallel trend assumption states that differences in trends of treatment and control groups, related to performance measures, should be constant over the whole sample period.

Furthermore, table AIV in Appendix A shows only 110 observations for firms with female CEOs and 4555 for male CEOs. The low amount of observations for firms with female CEOs, compared to observations for firms with male CEOs, might lead to a bias in the results. Therefore, when drawing conclusions based on the significant results of ceo_{gender} for all firm performance measures, presented in table VI in subsection 4.4, it should be taken into account that these results are very likely to be biased. This is because of the fact that there are way less female CEOs represented in the sample than male CEOs.

Besides, in this research, years considered as the financial crisis are 2008 and 2009 (Lins et al., 2013). However, in some other papers, the year 2007 is considered as a financial crisis year as well and therefore also included in the analysis (Attinasi, Checherita-Westphal & Nickel, 2009; Adrian & Shin, 2010; Acharya & Schnabl, 2010). This is because of the fact that the financial crisis started at the end of 2007, when some firms were already facing issues with their liquidity. Therefore, for further research it may be recommended to include (a part of) 2007 in the analysis as well. Adding this year, might give different insights compared to using only years 2008 and 2009 as the financial crisis period.

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Appendix A

Table AI

Descriptive statistics CEO old

This table represents the descriptive statistics considering firms having old CEOs and firms who have not. The statistics cover the panel dataset for years 2004, 2006, 2007, 2008 and 2009. The t-statistics indicate whether the means between the control and treatment groups significantly differ from zero. The descriptions of the variables can be found in table BI in Appendix B.

CEOs old	**Obs**	**Mean**	**Not old CEOs**	**Obs**	**Mean**	**t-statistic**
Firm characteristics			*Firm characteristics*			
Return on assets (%)	994	0.056	Return on assets (%)	3761	0.052	-1.8828*
Return on equity (%)	994	0.092	Return on equity (%)	3761	0.084	-1.5356
Stockreturn (%)	757	0.041	Stockreturn (%)	2678	0.047	0.3069
Tobin's Q (%)	994	1.312	Tobin's Q (%)	3761	1.291	-0.7466
Debt/assets (%)	994	0.474	Debt/assets (%)	3761	0.508	4.6783***
R&D/assets (%)	994	0.0281	R&D/assets (%)	3761	0.027	-0.1110
Firmsize	994	7.501	Firmsize	3761	7.662	2.9289***
Boardsize	994	9.006	Boardsize	3761	9.174	2.1554**

*** p<0.01, ** p<0.05, * p<0.1

Table AII

Descriptive statistics CEO long tenure

This table represents the descriptive statistics considering firms who have CEOs having a longtenure and firms who have not. The statistics cover the panel dataset for years 2004, 2006, 2007, 2008 and 2009. The t-statistics indicate whether the means between the control and treatment groups significantly differ from zero. The descriptions of the variables can be found in table BI in Appendix B.

CEOs longtenure	**Obs**	**Mean**	**Not longtenure CEOs**	**Obs**	**Mean**	**t-statistic**
Firm characteristics			*Firm characteristics*			
Return on assets (%)	1466	0.055	Return on assets (%)	3199	0.052	-1.5253
Return on equity (%)	1466	0.083	Return on equity (%)	3199	0.087	1.0955
Stockreturn (%)	1098	0.041	Stockreturn (%)	2337	0.048	0.3959
Tobin's Q (%)	1466	1.394	Tobin's Q (%)	3199	1.25	-5.344***
Debt/assets (%)	1466	0.467	Debt/assets (%)	3199	0.517	7.8557***
R&D/assets (%)	1466	0.028	R&D/assets (%)	3199	0.028	0.0287
Firmsize	1466	7.378	Firmsize	3199	7.742	7.5461***
Boardsize	1466	8.648	Boardsize	3199	9.363	10.5133***

*** p<0.01, ** p<0.05, * p<0.1

Table AIII

Descriptive statistics CEO duality

This table represents the descriptive statistics considering firms where CEOs are chairman next to their role as a CEO and firms where CEOs are not. The statistics cover the panel dataset for years 2004, 2006, 2007, 2008 and 2009. The t-statistics indicate whether the means between the control and treatment groups significantly differ zero. The descriptions of the variables can be found in table BI in Appendix B.

CEOs chairman	**Obs**	**Mean**	**CEOs not chairman**	**Obs**	**Mean**	**t-statistic**
Firm characteristics			*Firm characteristics*			
Return on assets (%)	952	0.060	Return on assets (%)	3713	0.052	-3.4716***
Return on equity (%)	952	0.099	Return on equity (%)	3713	0.083	-3.3379***
Stockreturn (%)	728	0.053	Stockreturn (%)	2707	0.044	-0.4401
Tobin's Q (%)	952	1.288	Tobin's Q (%)	3713	1.298	0.3250
Debt/assets (%)	952	0.503	Debt/assets (%)	3713	0.5	-0.3787
R&D/assets (%)	952	0.025	R&D/assets (%)	3713	0.029	2.1581**
Firmsize	952	8.025	Firmsize	3713	7.526	-9.9988***
Boardsize	952	9.351	Boardsize	3713	9.084	-3.3910***

*** p<0.01, ** p<0.05, * p<0.1

Table AIV

Descriptive statistics CEO gender

This table represents the descriptive statistics considering firms having CEOs who are male and firms where CEOs are female. The statistics cover the panel dataset for years 2004, 2006, 2007, 2008 and 2009. The t-statistics indicate whether the means between the control and treatment groups significantly differ from zero. The descriptions of the variables can be found in table BI in Appendix B.

CEOs male	**Obs**	**Mean**	**CEOs female**	**Obs**	**Mean**	**t-statistic**
Firm characteristics			*Firm characteristics*			
Return on assets (%)	4555	0.053	Return on assets (%)	110	0.056	0.5364
Return on equity (%)	4555	0.086	Return on equity (%)	110	0.104	1.4102
Stockreturn (%)	3354	0.045	Stockreturn (%)	81	0.098	0.9931
Tobin's Q (%)	4555	1.292	Tobin's Q (%)	110	1.445	1.8444*
Debt/assets (%)	4555	0.502	Debt/assets (%)	110	0.458	-2.2356**
R&D/assets (%)	4555	0.028	R&D/assets (%)	110	0.020	-1.9219*
Firmsize	4555	7.639	Firmsize	110	7.155	-3.2629***
Boardsize	4555	9.146	Boardsize	110	8.8	-1.6463*

*** p<0.01, ** p<0.05, * p<0.1

Table AV

Descriptive statistics CEO cash compensation

This table represents the descriptive statistics considering firms having CEOs who earn high cash compensation and firms having CEOs who don't earn cash equity compensation. The statistics cover the panel dataset for years 2004, 2006, 2007, 2008 and 2009. The t-statistics indicate whether the means between the control and treatment groups significantly differ from zero. The descriptions of the variables can be found in table BI in Appendix B.

CEOs highcashpay	**Obs**	**Mean**	**CEOs not highcashpay**	**Obs**	**Mean**	**t-statistic**
Firm characteristics			*Firm characteristics*			
Return on assets (%)	1393	0.048	Return on assets (%)	3272	0.055	3.5510***
Return on equity (%)	1393	0.071	Return on equity (%)	3272	0.092	4.8690***
Stockreturn (%)	1052	0.029	Stockreturn (%)	2383	0.053	1.3535
Tobin's Q (%)	1393	1.284	Tobin's Q (%)	3272	1.3	0.6311
Debt/assets (%)	1393	0.445	Debt/assets (%)	3272	0.524	12.4049***
R&D/assets (%)	1393	0.028	R&D/assets (%)	3272	0.028	0.1401
Firmsize	1393	6.893	Firmsize	3272	7.94	22.3825***
Boardsize	1393	8.5	Boardsize	3272	9.41	13.2914***

*** p<0.01, ** p<0.05, * p<0.1

Table AVI

Descriptive statistics CEO equity compensation

This table represents the descriptive statistics considering firms having CEOs who earn high equity compensation and firms having CEOs who don't earn high equity compensation. The statistics cover the panel dataset for years 2004, 2006, 2007, 2008 and 2009. The t-statistics indicate whether the means between the control and treatment groups significantly differ from zero. The descriptions of the variables can be found in table BI in Appendix B.

CEOs highequitypay	**Obs**	**Mean**	**CEOs not highequitypay**	**Obs**	**Mean**	**t-statistic**
Firm characteristics			*Firm characteristics*			
Return on assets (%)	2536	0.058	Return on assets (%)	2129	0.048	-5.2284***
Return on equity (%)	2536	0.105	Return on equity (%)	2129	0.063	-10.3254***
Stockreturn (%)	1929	0.071	Stockreturn (%)	1506	0.014	-3.4163***
Tobin's Q (%)	2536	1.299	Tobin's Q (%)	2129	1.292	-0.2391
Debt/assets (%)	2536	0.537	Debt/assets (%)	2129	0.458	-13.5528***
R&D/assets (%)	2536	0.029	R&D/assets (%)	2129	0.027	-0.8158
Firmsize	2536	8.183	Firmsize	2129	6.966	-29.2846***
Boardsize	2536	9.624	Boardsize	2129	8.6	-17.1049***

*** p<0.01, ** p<0.05, * p<0.1

Appendix B

BI Variable descriptions

Table BI

Variable descriptions

This table represents the descriptives of the variables obtained from the WRDS databases.

VARIABLES	DATABASE	DESCRIPTION
CEO characteristics		
CEO old	EXECUCOMP	This dummy indicates whether a CEO is 64 years old or older.
CEO longtenure	EXECUCOMP	This dummy variable indicates whether a CEO is in this role at the same firm for 10 years or longer.
CEO chairman	EXECUCOMP	This dummy variable indicates whether a CEO is a chairman as well.
CEO gender	EXECUCOMP	This dummy variable indicates whether a CEO is a male of female.
CEO highcash	EXECUCOMP	This dummy variable indicates whether a CEO earns more cash compensation that the median of cash compensation of the sample.
CEO highequity	EXECUCOMP	This dummy variable indicates whether a CEO earns more equity compensation that the median of equity compensation of the sample.
Firm characteristics		
Return on assets (ROA)	COMPUSTAT	Return on assets (ROA) is calculated by net income (loss) divided by total assets of the prior year. Due to outliers, this variable is winsorized at 95%.
Return on equity (ROE)	COMPUSTAT	Return on equity (ROE) is calculated as net income divided by stockholder's equity. It is winsorized at 95%.
Tobin's Q (Q)	COMPUSTAT	Tobin's Q (Q) is measured as total market value of the firm divided by asset value of the firm. It is winsorized at 95%
Stock return	CRSP	Stock return is caluclated as the price of the stock at time *t* plus dividends minus the stock price at time *t-1* , divided by the stock price at time *t-1* . Due to outliers it is winsorized at 99%.
R&D/assets	COMPUSTAT	The variable RD/assets is calculated as the company's total R&D expenses divided by total assets. Due to outliers it is winsorized at 95%.
Debt/assets	COMPUSTAT	The variable debt/assets is calculated as the company's total debt divided by the total assets. Due to outliers it is winsorized at 99%.
Firm size	COMPUSTAT	Firm size is due to outliers, measured as the logarithm of a company's sales.
Board size	ISS	Board size is measured as the number of directors serving a company's board.
Protection mechanisms		
Poison pill	ISS	This variable indicates if particular firm has the ability to use a poison pill or not. his variable is a dummy variable and is 1 if a firm has this form of take-over protection and 0 if not.
Golden parachute	ISS	This variable indicates if there is a golden parachute in place or not. This variable is a dummy variable, which is equal to 1 if a firm has this form of take-over protection and 0 if not.
Dual class stock	ISS	This is a dummy variable and takes the value of 1 when a firm has a dual class structure and 0 if not.

BII Correlation matrix

Table BII

Correlation matrix

This table represents the correlation matrix of the variables presented in the dataset for years 2004 - 2009. Variables with a correlation higher than 0.5 will be left out of the analysis.

	ROA	ROE	Tobin's Q	Stock return	CEO age	CEO tenure	CEO chairman	CEO gender	CEO highcash	CEO highequity	RDassets	Debtassets	Firm size	Board size	Poison pill	Golden parachute	Dual class
ROA	1,0000																
ROE	0,7693	1,0000															
Tobin's Q	0,5680	0,3602	1,0000														
Stock return	0,1159	0,0941	0,2319	1,0000													
CEO age	0,0019	0,0112	-0,0641	0,0053	1,0000												
CEO tenure	0,0081	-0,0299	0,0811	0,0032	0,3677	1,0000											
CEO chairman	0,0484	0,0482	-0,0021	0,0074	0,1781	0,1429	1,0000										
CEO gender	-0,0097	-0,0144	-0,0239	-0,0091	0,0529	0,0419	0,0125	1,0000									
CEO highcash	0,0478	0,0801	-0,1033	-0,0124	0,1022	-0,0051	0,0392	0,0004	1,0000								
CEO highequity	0,0980	0,1386	-0,0646	0,0215	-0,0244	-0,1571	0,0239	0,0349	0,3911	1,0000							
Rdassets	-0,0618	-0,0862	0,3391	0,0032	-0,0817	0,0314	-0,0251	0,0289	-0,1134	-0,0354	1,0000						
Debtassets	-0,1767	0,0219	-0,4095	-0,0592	-0,0099	-0,1670	-0,0031	0,0286	0,1789	0,2675	-0,3124	1,0000					
Firm size	0,1591	0,2726	-0,1572	-0,0226	0,0484	-0,1367	0,1305	0,0496	0,3077	0,3619	-0,3025	0,3873	1,0000				
Board size	0,0296	0,1431	-0,1952	-0,0104	0,0281	-0,1925	0,0498	0,0243	0,2361	0,3437	-0,2219	0,3312	0,6000	1,0000			
Poison pill	0,0138	0,0032	0,0129	0,2422	-0,0046	-0,0937	-0,0188	0,0011	0,0744	0,0790	-0,0404	0,0633	0,0248	0,0619	1,0000		
Golden parachute	0,0172	-0,0120	0,0480	-0,0115	-0,0181	-0,0288	-0,0538	0,0359	-0,0033	0,0183	0,0813	-0,0483	-0,1566	-0,0517	0,5299	1,0000	
Dual class	-0,0970	-0,0924	-0,0431	-0,0251	0,0805	-0,0977	0,0700	-0,0072	0,0296	-0,0321	-0,0605	-0,0171	0,0061	0,0139	-0,1289	0,3213	1,0000