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Executive pay, female representation in top management and firm performance

A study of S&P 500 companies

Abstract

This master thesis investigates the influence of both executive pay and female representation in top management on firm performance. As recent trends in both pay-performance sensitivities and women in executive positions suggest a positive relationship of firm performance with both executive pay and female representation in top management, a nine-year panel data regression is run on the S&P 500 companies to study the potential effects of both CEOs' pay and the presence of female CEOs on corporate performance in the time frame 2010-2018. This research mostly focuses on the components of executive pay which constitute incentive packages, as the topic of incentive pay has become more and more prominent in recent years. We find that executive compensation is strongly positively related to corporate performance, and that the option awards component of executive incentive pay has the strongest influence on firm performance. We furthermore find that the executives' gender is not correlated to corporate performance.

Keywords: executive compensation, gender, firm performance, female executives, incentive pay.

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Stockholm, December 2020

Lilin Ma and Lucia Lamberti

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1. Introduction

The study of the relation between executive pay and firm performance, which is commonly referred to as "pay- performance sensitivity" in academic literature, has become increasingly important since the 1990s (Murphy, 1998). Many companies use stock-options or incentive payment plans as a protocol to improve the company's financial performance and to mitigate the agency problem (Hayes et al., 2012). This master thesis focuses, as a first step, on analyzing the relationship between executive compensation and firm performance. We want to evaluate whether executive pay, and especially some of its components – incentives and bonuses – are linked to firm performance and how.

Specifically, our aim is to identify the potential role that executive (incentive) pay can have in influencing firm performance. In other words, our study focuses on analyzing whether firm performance responds to executive pay.

As pointed out by Edmans et al. (2017), despite decades of research on executive pay, many questions on the topic - such as the causal effect of pay on firm outcomes - remain unanswered also due to the changing nature of compensation practices. Even though the struggle to establish a causal link between executive pay and firm performance is still ongoing (Edmans et al., 2017), empirical studies on the matter are found to be extremely relevant, also in light of - as previously specified - the fact that executive pay composition and trends are continuously changing. Furthermore, studies on the importance of incentive plans and their alleged effects on top management's performance are becoming increasingly relevant in academic literature: as Aggarwal and Samwick (2003) state in their study on performance incentives within firms, pay-performance sensitivities and the alignment of incentives and responsibilities among the top management team are key to understand performance dynamics within the firm.

Performance of top management teams is a growing area of interest for practitioners and academics, especially when it comes to female representation in top management positions. There is an ongoing debate about whether gender diversity in top management teams relates to firm performance, more specifically financial performance (Farag and Mallin, 2017). As Farag and Mallin (2017) state in their recent paper on board diversity, there has been an increased emphasis on the role of gender diversity within boards of directors and top managers in the firm, especially after the global financial crisis. The authors state how "the concept of board diversity as a means for improving corporate governance practices… has proliferated in recent

years… such as there is a growing intervention by regulators to implement quotas for corporate boards" (Farag and Mallin, 2017).

The proponents of diversity within the firms and especially among top executive teams state how - since diversity brings a variety of backgrounds, skills and perspectives - companies may benefit from it both in terms of innovation and strategy (Farag and Mallin, 2017) and in more direct terms by affecting firm financial performance.

As previous studies tried to establish a link between female representation in top management and firm performance - e.g. Dezso and Ross (2012) claim how female representation in top management do improve firm performance, but only when the firm presents certain characteristics - and given the relevant topics of pay-performance sensitivities and the role of incentive schemes in a firm's financial performance, we ultimately aim at adding to the existing literature on the relationship of both executive pay and gender with firm performance in recent years (2010-2018).

The results of our study on S&P 500 firms suggest that CEOs' total compensation is significantly and positively linked to firm performance.

Furthermore, executive incentive pay turns out to be positively correlated to firm performance, and especially option awards seem to impose a strong influence on firm performance when ROA, ROE and EBITDA are used as measures of companies' profitability.

Our findings on the relationship between gender and firm performance suggest that female representation in top management is not significantly linked to firm performance, and we can therefore deduce that the presence of female CEOs seems to have no influence on corporate performance.

The remainder of our study is structured as follows. The next session discusses the literature review on the topics of interest: executive pay, the role of gender in top management and firm performance. We then present our research methodology, followed by relevant findings and results. Finally, we conclude with discussion, limitations, conclusion and directions for future research.

2. Literature Review

2.1. Introduction to Literature Review

Existing literature on the topic of pay-performance sensitivities is vast yet incomplete. A survey study by Edmans et al. (2017) gathers recent literature on the topic, shows trends in executive pay and develops an analysis on wealth-performance sensitivities and pay-performance sensitivities up until 2014. The authors analyze the diverse components of pay and if and how these are related to firm performance. Edmans et al. (2017) however recognize that a causal link between pay and performance, even though diverse studies on the topic have been done by academics and practitioners, is yet to be shown.

On the topic of how pay practices may affect shareholder value and firm performance, Goergen and Renneboog (2011) state that, while it is generally believed that there is an effective link between corporate performance and executive pay, this link has not been sustained by empirical evidence on pay practices. According to the authors, the available empirical evidence shows that the skimming of corporate profits by top management through compensation packages are tangible problems: executive compensation often seems to conflict with shareholder value creation and company performance (Goergen and Renneboog, 2011).

The topic on if and how managerial pay packages are good incentives to increase companies' performance is still debatable and acquires further importance after the global financial crisis.

Jensen and Murphy (1990) run a study on the conflict of interest between shareholders of publicly owned corporations and the corporations' top management teams (especially the CEOs) and define this conflict of interest "a classic example of a principal-agent problem". The authors furthermore state how political forces impose constraints that reduce pay-performance sensitivity, and that "declines in both the pay-performance relation and the level of CEO pay since the 1930s are consistent with this hypothesis" (Jensen and Murphy, 1990).

Despite the seemingly very unlikely "mission" of establishing a causal link between executive pay and firm performance, existing literature on the topic established that a positive relationship exists between executive compensation and firm performance in terms of profitability (Murphy, 1985), and diverse factors contribute to establishing the magnitude of pay-to-performance sensitivity in a firm (Frydman and Saks, 2010). Among those, bonuses and

other incentives to CEOs seem to somehow affect CEOs' behaviors and, consequently, firm performance (Edmans et al., 2017).

Existing literature has also been trying to establish which factors may positively or negatively influence firm performance. On this topic, the role that gender can have in firm performance and more specifically how the gender of top executives and members of the board can influence firm profitability through factors such as incentive schemes - which are a component of executive pay - becomes an increasingly relevant topic nowadays, also given the current worldwide trend to enact boardroom gender quotas (Adams and Funk, 2012).

The role of gender is particularly interesting in light of the fact that previous studies in the field of behavioral economics provided experimental evidence on how differences in preferences and behaviors do exist between men and women (Croson and Gneezy, 2009). Paarsch and Shearer (2007) state how these differences are, in some cases, enhanced when men and women are in positions of power and state therefore that the response to incentives could vary between men and women. Even if the effects of female leaders on corporate performance remains unclear, recent studies (Amore et al., 2014) reported how the performance effect of female CEO transitions (i.e. when a company's CEO is changed from a men CEO to a woman CEO) is increasing in proportion of the number of female directors on the board. Dezso and Ross (2012) established how female representation in top management does improve firm performance, but only when the firm's strategy is focused on innovation.

The first part of our literature review focuses on the existing literature on executive compensation and firm performance. The second section presents instead the topic of gender differences and of the role of female representation in top management and board of directors, and its link to firm performance.

2.2. Executive Compensation

2.2.1. Executive Compensation

Research on the topic of executive compensation until recent times has been effectively reported by Edmans et al. (2017). The authors report stylized facts and economic literature regarding mostly U.S. public firms from 1936 to 2014, stating how "while the level of pay has

increased over time, this trend has been neither constant nor uniform" (Edmans et al., 2017). As the authors illustrate how the debate among academics regarding what causes the observed trends in executive pay is not only still ongoing, but it's also extremely relevant for diverse stakeholders in the financial community - especially if we think about how different forms of incentives may or may not influence executives' behaviors and, hence, their performance for the company and its shareholders - they establish how there are three broad perspectives on the topic: the "shareholder value" view ("compensation contracts are chosen to maximize value for shareholders"), the "rent extraction" view ("contracts are set by executives themselves to maximize their own rents") and a third perspective based on the idea that pay is shaped by institutional forces.

In light of Edmans et al.'s (2017) Shareholder Value view, Berk and DeMarzo (2014) also state the growing importance of the role of shareholders. After the 2008 global financial crisis especially, there has been a trend gaining momentum and regulators' interest, which is "to let shareholders have a "say on pay," vote", typically as a "nonbinding vote to approve or disapprove of the compensation plan for senior executives each year" (Berk and DeMarzo, 2014). Interestingly enough, despite the votes being nonbinding, firms that actively considered shareholder resolutions on pay subsequently saw a stock price increase in response (Berk and DeMarzo, 2014).

In 2010, the Dodd-Frank Act required advisory votes of shareholders on executive pay for big corporations in the U.S.A., also requiring firms to disclose compensation of CEO and other top executives, together with information on the relationship between executive compensation and the firm's financial performance (Berk and DeMarzo, 2014). These recent regulations and interest in the fairness of executive pay is another reason why the topic is becoming increasingly popular among academics and practitioners.

Total pay - as shown in the literature by, among others, Frydman and Saks (2010) - is made of diverse components: executives' annual compensation is the sum of salary, bonuses, payouts from long term incentive plans, the grant-date value of option grants, the grant-date value of restricted stock grants, and miscellaneous other compensation.

In the article "Executive compensation: A New View from a Long-Term Perspective, 1936-2005", Frydman and Saks (2010) show how, from the 1930s up until 2005, the level and structure of executive pay have evolved in a significant way. Among other things, the authors

noticed how, since the 1950s, stock options became more popular in the composition of executive pay packages. The authors study showed how more than 60% of the executives in their sample held options in the 1960s, and this percentage grew to 90% in the 1990s. Furthermore, the number of stock options held by top executives rose considerably from 1980 to 2000 relative to the number of shares outstanding. Hence, as Edmans et al. (2017) state, "since a large portion of the overall rise in CEO pay is growth in options, any theory that explains the surge in CEO pay needs to account for this important change in the structure of pay as well".

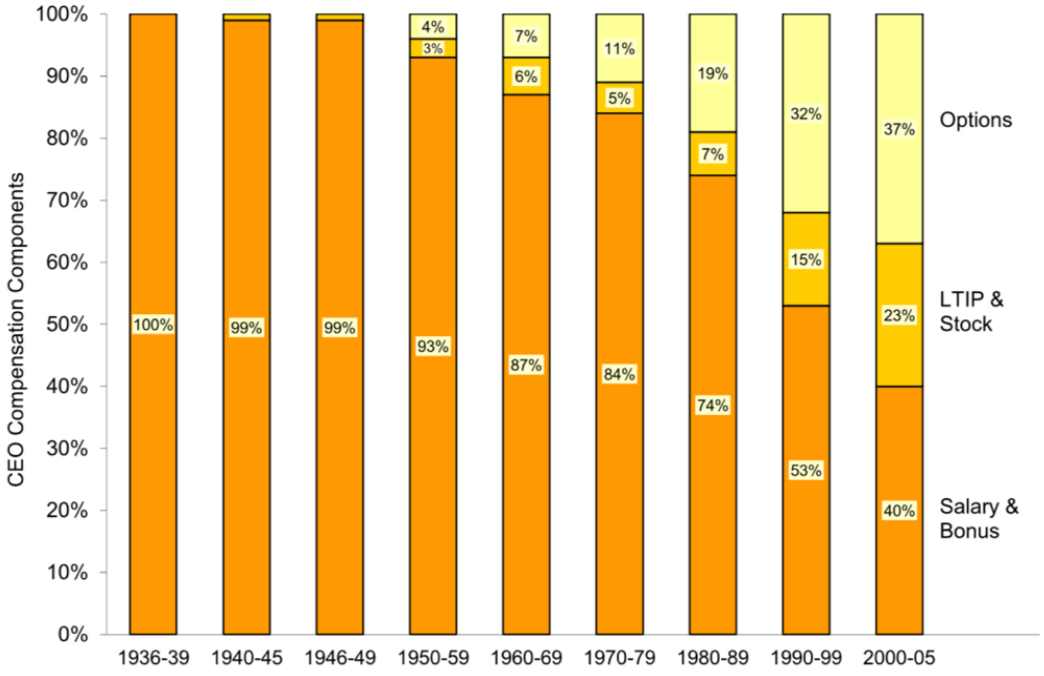


Figure 1: the structure of CEO compensation from 1936 to 2005 according to Frydman and Saks (2010).

Another important change in the structure of pay, recorded by Edmans et al. (2017), occurred between 2000 and 2014, when options - as a component of CEO pay in S&P 500 firms - declined from 49% to 16% of pay, while restricted stock increased from 7% to 44%. Executive pay (excluding CEO) composition - in the same companies for the same time frame - changed instead by a decrease in options from 48% to 14% and an increase of restricted stock from 9% to 41% (see Figure 1 Appendix).

Defining total compensation as the sum of salaries, bonuses, long-term incentive payments and the B-S value of stock option grants, Frydman and Saks (2010) show how total

compensation of CEOs and other top executives from 1936 to 2005 follows a J-shape pattern (see Figure 2 Appendix).

2.2.2. Executive Compensation and Firm Performance

The link between executive pay and firm performance has become increasingly relevant as a research topic in the past decades. As explained in the previous section of the literature review, pay is composed of different components, and each of those has contributed to the evolving composition and definition of pay since the 1930s.

Edmans et al. (2017) explain how - according to the Shareholder Value view - the level of CEO pay is determined by deriving optimal contracts which are often subject to some sort of contracting restrictions. Hence, we can understand how important executive contracts and pay become, as they always present a link to firm performance.

Diving deeper into the topic of the link between executive pay and firm performance, it is relevant to illustrate which are the most commonly used performance metrics in the literature. As stock prices are one, if not the main, most observable measure which can be used to evaluate the performance of a listed company, they are believed to reflect the long-term effects of a firm's management decisions: an increase in stock price is often attributed to management's value creation performance, even if there are indeed other factors influencing the stock price of a specific organization (Kumar, 2017).

According to Edmans et al. (2017), accounting-based performance metrics are used more frequently than stock-price based metrics when evaluating a firm's financial performance, and the use of accounting metrics has increased over time.

As a relevant example, Kato and Kubo (2006) use ROA, negative pre-tax profit, sales growth rate and stock returns as measures of performance for the companies in their study. They conduct a research on CEO compensation and firm performance in Japan, based on the 10-year panel data collected for the years 1986-1995 in a selected pool of Japanese companies, both listed and unlisted. From their analysis, it appears that both ROA and sales growth rate have a positive relationship with CEO compensation, while negative pre-tax profits usually lead to a decrease in CEO compensation (Kato and Kubo, 2006).

Using a large sample of privately-held and public firms in the U.S. over the period 1999–2011, Gao and Li (2015) show that in both private and public firms CEO pay is positively and significantly correlated to the firm's accounting performance, but the pay–performance link is much weaker in privately-held firms.

Frydman and Saks' (2010) study also demonstrates how the highest sensitivity of compensation to performance appears in firms with greater growth opportunities, while a lower correlation between pay and performance is noticed in firms belonging to regulated industries. Their results furthermore suggest that the level of leverage, the noisiness of the stock price, the firm's rate of return, and the size and composition of the board of directors "are not important determinants of pay-to-performance in most decades" (Frydman and Saks, 2010).

Edmans et al. (2017) explore how the level of pay correlates with firm and CEO characteristics for S&P 500, S&P MidCap and S&P SmallCap firms from 1992 to 2014. Their results (see Figure 3 Appendix) show how CEO pay is positively correlated to - among other things - firm size (as also documented by Gabaix et al., 2014), stock return volatility and stock returns. However, on the topic of the accuracy of this result, the authors state how, even though it suggests a strong pay-performance relationship, it underestimates CEOs' incentives since "most CEOs have large equity holdings in their employer, which directly tie their wealth to stock price performance. For a typical CEO, the wealth changes caused by stock price movements are much larger than the corresponding changes in annual pay" (Edmans et al., 2017). Because of the importance of CEO wealth, the authors find it relevant to extend their analysis on what are called in the literature "wealth-performance sensitivities", which study the relationship between executives' equity holdings and firm performance. As also documented by Core and Larcker (2002), "increases in the level of managerial equity ownership result in improvements in firm performance" (Core and Larcker, 2002).

Edmans et al. (2017) also highlight how a causal link between executive pay and firm performance has yet to be established with certainty, and remind the reader that pay is and needs to be treated as an endogenous variable.

On the topic of causality, the authors state how "identifying the causal effect of compensation contracts on any interesting outcome variable is extraordinarily difficult" (Edmans et al., 2017). The authors in fact point out how "these contracts are endogenous – executives, directors, and compensation consultants spend time and effort designing them, considering unobservable

firm, industry, and executive characteristics. As a result, compensation contracts are inevitably correlated with these unobservable characteristics, which in turn affect firm behavior, performance, and value" (Edmans et al., 2017). In their study, the authors further emphasize the non-causal effects of the relationships between CEO pay and diverse firm characteristics - among which stock returns as a measure of firm performance - stating again how "important explanatory variables for CEO pay, such as firm size or risk, are themselves affected by CEOs' incentives and actions, and are also correlated with unobservable firm, industry, and executive characteristics that affect pay. Consequently, their correlations with pay are difficult to interpret" (Edmans et al., 2017).

In light of what is happening in recent times, especially the effects of Covid-19 on diverse aspects of global economy, we find particularly relevant the fact that, due to the current circumstances, executive pay changes have taken place and will be further implemented in the upcoming months as companies in the U.S. prepare for the 2021 annual meetings, when shareholder will vote on executive compensation plans (Temple-West, 2020).

The structure of incentive pay has been subject to diverse changes in the past decades. Frydman and Saks (2010) showed how, after the 1970s, the correlation between pay and aggregate firm size strengthened, managerial incentives got stronger, and salaries and incentive pay have grown dramatically.

Edmans et al. (2017), on the topic of wealth-performance sensitivities and incentives to executives, state how: "Attempts to improve CEO pay should focus on the *incentives* created, and especially on the sensitivity of CEO wealth to long-term performance. The level of pay receives the most criticism, but usually amounts to only a small fraction of firm value. Badly structured incentives, on the other hand, can easily cause value losses that are orders of magnitudes larger."

Executive contracts can be effectively used to alleviate the principal-agent problems between shareholders and executives (Edmans et al., 2017), as these agency problems have been a concern since the turn of the 20th century, when separation of corporate ownership from control started to be customary (Jensen and Murphy, 1990).

Edmans et al. (2017) state how diverse studies on incentives to executives and especially their role in executive pay – despite being able to establish a positive relationship between pay and stock returns – underestimated the role of incentives.

Gao and Li (2015) state how CEOs contracts design plays a number of important roles, including "acting as a sorting mechanism, and providing incentives for effort and the retention of human capital" (Gao and Li, 2015).

A widely used study by the literature on performance and top management pay and incentives is the research done by Jensen and Murphy (1990). The authors provide some insightful thoughts on the topic, stating how declines in both the pay-performance sensitivities and CEOs pay since the 1930s can be at least partly explained by the constraints enforced by both public and private political forces (Jensen and Murphy, 1990).

Jensen and Murphy (1990) furthermore highlight the importance of the role of compensation policies in providing value-increasing incentives: through mechanisms such as performance-based bonuses, salary revisions, stock options and stock ownership, compensation policy can make the difference in improving executive performance and hence firm performance.

Georgen and Renneboog (2011) state that there is an effective link between corporate performance and executive pay, but this link has not been sustained by the empirical evidence on pay practices. The authors furthermore state how, "whereas it is feasible to compensate CEOs for the value they create for the shareholders, this is rarely the case in practice", highlighting the fact that executive pay is often in conflict with shareholder value creation (Georgen and Renneboog, 2011).

2.3. Gender Differences and Female Representation in Top Management

2.3.1. Gender Differences

Previous studies in the field of behavioral economics provided experimental evidence on how differences in preferences and behaviors do exist between men and women, especially for factors like risk aversion, social preferences, and reaction to competition (Croson and Gneezy, 2009). Paarsch and Shearer (2007) state how these differences are, in some cases, enhanced when men and women are in positions of power and state therefore that the response to incentives should vary between men and women.

The research conducted by Croson and Gneezy (2009), which reviews experimental evidence on preference differences between men and women, proved to be particularly relevant as a resource for those who aim at better understanding the potential strategic use of gender differences and gender-specific outcomes in the labor and goods markets (Croson and Gneezy, 2009). The authors identified "robust differences in risk preferences, social preferences, and competitive preferences" (Croson and Gneezy, 2009).

We believe that, among Croson and Gneezy's (2009) findings, it is particularly relevant to our analysis the fact that women proved to be more risk averse than men, both in lab settings and in investment decisions in real life. This finding assumes indeed a relevant role while thinking about its implications in ideating effective incentive plans for men and women in a position of power and - more specifically - men and women who hold executive positions within an organization. The authors point out how this enhanced risk aversion characterizing women is most likely due to the fact that - as previous research (Harshman and Paivio, 1987) indicates, women experience emotions more strongly than men, which leads to effects on the utility of a risky choice and effects on the perceptions of probability of negative outcomes (Croson and Gneezy, 2009). Furthermore, the literature finds that men are more overconfident than women, and that women's decisions are more sensitive to the surrounding environment and situational circumstances compared to their male counterparts' (Croson and Gneezy, 2009).

We find very relevant for our analysis however, how previous studies mentioned in Croson and Gneezy's (2009) paper which specifically focus on gender differences in managers and professionals state that "among this population, gender differences in financial risk preferences are smaller than in the general population and often nonexistent" (Croson and Gneezy, 2009). Atkinson et al. (2003) find that differences in financial risk preferences which are often attributed to gender may instead be caused by education, knowledge of the financial markets and wealth constraints instead. Johnson and Powell's (1994) research also shows how male and female managers "display similar risk propensity and make decisions of equal quality" (Croson and Gneezy, 2009).

As previous literature also strongly stated how women are less competitive than men, Croson and Gneezy (2009) point out how future research should address two relevant facts: examine in depth if these differences are due to nature or to social and educational background, and "an

important bias in the literature on gender differences is that journals are more likely to publish papers that find a gender difference than papers that do not".

A relevant study regarding the role of gender in reactions to incentives is implemented by Paarsch and Shearer (2007). The authors study the behaviors and reactions to incentive pay on groups of male and female workers of a tree-planting firm in Canada, and ultimately declare how the results of their experiment clearly show that "there are no differences in the reaction to incentives between male and female planters" and that the few differences recorded were due to differences in ability and education levels (Paarsch and Shearer, 2007). We believe Paarsch and Shearer's (2007) quantitative analysis would not apply to our research and, furthermore, their results can't be automatically applied to female CEOs and female executives. However, we find their research relevant as their study opens a series of potential interesting future developments in the literature regarding the role of gender in ideating effective incentive schemes and pay practices in the corporate world. Paarsch and Shearer (2007) furthermore recognize how - and hereby we can reconnect to Croson and Gneezy's (2009) research - social conventions may inevitably influence women's responses to incentive payments.

2.3.2. Female Representation in Top Management and Firm Performance

Long has passed since the expression "glass ceiling" was coined in a Wall Street Journal article in 1986. The authors Hymowitz and Schellhardt (1986) used the term to indicate "an invisible barrier" which prevents women from accessing highly powered management positions in the same way men do. According to a research conducted by the authors, to women managers "the road to the top seems blocked by corporate tradition and prejudice", along with the observed facts that women are thought to care too much about family considerations to be as efficient as men on the workplace, that most men seem to feel uncomfortable with women beside them, and that women are believed to be more naturally inclined to certain attitudes and behaviors (Hymowitz and Schellhardt, 1986). We need of course to take into consideration the fact that Hymowitz and Schellhardt's article speaks out about the gender gap representation in top management in 1980s corporate America, but we can nevertheless notice relevant links to the much more recent research by Croson and Gneezy (2009) described in the previous section of the literature review and other recent papers about gender differences in the corporate world.

For example, Bowles (2012) agrees with Hymowitz and Schellhardt (1986) on prevailing stereotypes often being the "why women hit the glass ceiling", e.g. that women have ineffective management styles (Hymowitz and Schellhardt, 1986) or that women are much more emotional while taking important corporate decisions and, hence, not as effective as men as leaders (Bowles, 2012).

As female representation in top management became more and more a topic of high interest in the past few years, diverse academics and practitioners contributed to research and tried to find if there may be a relationship between women leaders and firm performance. Even if the effects of female leaders on company's performance remains unclear, recent studies (Amore et al., 2014) report how the profitability effect of female CEO transitions (i.e. when a company's CEO is changed from a men CEO to a woman CEO) is increasing in proportion of the number of female directors on the board. Their results show that a company's performance increases when a female CEO corresponds to a high percentage of women in the board of directors (Amore et al., 2014).

These findings are particularly relevant as "these top-level gender interactions can have a significant effect not only on corporate profitability but also on such corporate behavior as risk taking in financial and investment policies" (Amore et al., 2014). Furthermore, Amore et al's (2014) results have several implications, among which the connection of their findings to "existing evidence suggesting that women are more sensitive than men to context" (Amore et al., 2014) which is in line with Croson and Gneezy's (2009) study. Also, "by showing that the interactions with a board in which women are largely represented mitigate the observed underperformance of lone female CEOs" (Amore et al., 2014), their results contribute to recent discussions (Dezso and Ross, 2012) on the contexts where female leadership can be more effective.

Dezso and Ross (2012) establish how female representation in top management does improve firm performance, but only when the firm's strategy is focused on innovation. The authors state how "female representation in top management may have important implications for a firm's competitiveness, not merely as a reflection of a more gender-neutral and, thus, more meritocratic recruitment and promotion process, but more specifically because of the potential benefits of gender diversity itself" (Dezso and Ross, 2012). What is also worth mentioning about Dezso and Ross' (2012) analysis is that the authors claim to have identified a causal link

between female representation in top management and firm performance. The authors partly justify this claim by stating how their theory used 15 years of data on "a large and comprehensive sample of public U.S. corporations" (Dezso and Ross, 2012).

Despite the fact that "evidence regarding how and in what circumstances female representation in top management improves firm performance has been lacking", the authors' results contribute to existing research on the topic by showing that "female representation in top management leads to better firm performance, but only to the extent that a firm is focused on innovation as part of its strategy" (Dezso and Ross, 2012) and that, ceteris paribus, a given firm produces more economic value with at least one woman on its top management team compared to when there are no women on its top management team, and also shows superior accounting performance.

The role that gender can have in firm performance and more specifically how the gender of top executives or members of the board can influence firm performance through factors such as incentive schemes, which are a component of executive pay, becomes an increasingly relevant topic nowadays, also in light of the increasing worldwide trend to enact boardroom gender quotas (Adams and Funk, 2012). Previous literature (Adams and Ferreira, 2009 & Apesteguia et al., 2012) argues for benefits of diversity and for the fact that the presence of women in the boardroom does matter for corporate outcomes. Interestingly enough, other recent studies (Ahern and Dittmar, 2012 & Matsa and Miller, 2010) establish that firm value decreased following the introduction of gender quotas for boards of directors in Norway. Adams and Funk (2012) furthermore recognize that "there are fundamental differences between women and men" which provide evidence that "changes in diversity *can* have *causal* effects on corporate outcomes".

3. Methodology

3.1. Introduction to Methodology

As previously highlighted in the literature review section, in the past couple of decades there has been an increasing interest in the debate on the relationship between CEO compensation and firm performance, and more and more research is being done on the topic, especially in light of the fact that CEO compensation levels have been growing significantly in the past few years.

Because of the inherent close connection between a firm's performance and its CEO's compensation, the topic of whether high pay leads to better performance, or if firm performance is a determinant for CEOs being paid generously became controversial (Edmans et al., 2017). Therefore, in our research, we do not aim at proving the existence of a causal link between CEO compensation and firm performance, but our goal is rather to contribute to existing research by analyzing the relationship between CEO pay and firms' financial performance in recent times.

As an additional component of our research, we add a gender variable to check if also CEOs' gender may have – as previous studies (Amore et al., 2014 and Dezso and Ross, 2012) suggested – a link to firm performance.

We use, as a reference for our methodology, a research conducted by Kato and Kubo (2006) on Japanese companies. The authors run a study on CEO compensation and firm performance, and employ as their methodology a method previously employed by Kaplan (1994) in his study on the relation between top executive turnover and compensation and firm performance, comparing Japanese companies with U.S. companies. Kato and Kubo's (2006) methodology is illustrated, together with how it is connected to our own research, here below in 3.3.

We also use some recent papers (Amore et al., 2014 and Dezso and Ross, 2012) on the topic of the relationship between executives' gender and firm performance as an inspiration for our supplementary research on the role of gender in firm performance.

3.2. Hypotheses and Research Design

Our study aims at testing the following hypotheses:

Hypothesis 1:
There is a positive correlation between CEOs' (incentive) pay and firm performance.

Hypothesis 2:
There is a positive correlation between female representation in top management (female CEOs) and firm performance.

As we aim at analyzing the relationship between CEOs' pay and firm performance, and to furthermore study the link between female CEOs and firm performance, we divide our analysis into two parts corresponding to the hypotheses above.

In the first part, we run an analysis on the companies' performance and the CEOs' pay packages to illustrate if there is a connection between the two factors. As the role of incentives to executives is becoming increasingly important - as highlighted in our literature review - we mainly focus on those components of pay which constitute incentives to CEOs. Then, in the second part of our research, we go one step further and we enrich our analysis by adding a gender variable to study the potential effects of a female CEO on the firms' performance.

Here below we show how we employ Kato and Kubo's (2006) research on Japanese companies as the main reference for our own methodology and how we differentiate our study from theirs. We also find Amore et al.'s (2014) study to be relevant for our methodology development as the authors - like us - use accounting metrics as dependent variables in setting up the regressions in their study. Furthermore, both Amore et al.'s (2014) and Dezso and Ross' (2012) research were important for us to build our second analysis on the relationship between gender and firm performance.

3.3. CEO Compensation and Firm Performance

Kato and Kubo (2006) conduct a research on CEO compensation and firm performance in Japan, based on the 10-year panel data they collected for years 1986-1995 in a selected pool of Japanese companies, both listed and unlisted.

In order to determine the relation between CEO compensation and firm performance, the authors (Kato and Kubo, 2006) run an ordinary OLS regression - where the dependent variable is $\Delta\ln(APAY)_{it}$ (change in the log of CEO annual cash compensation of firm *i* in year *t*) and the independent variables are: $DROA_{it}$ (change in ROA of firm *i* from year *t*-1 to year *t*), $NEGPROF_{it}$ (a dummy variable which equals 1 if firm *i* has negative pre-tax profit for year *t,* and equals 0 otherwise), $GSALES_{it}$ (sales growth rate of firm *i* from year *t*-1 to year *t*) and ROR_{it} (stock returns of firm *i* in year *t*) for listed companies - with the following equation:

$$\Delta \ln(APAY)_{it} = \alpha + \beta_d(DROA)_{it} + \beta_n(NEGPROF)_{it} + \beta_g(GSALES)_{it} + \beta_r(ROR)_{it} + u_{it}$$

Kato and Kubo's (2006) analysis on pay-performance.

As it can be noticed from the regression here above, the authors (Kato and Kubo, 2006) use first-differenced pay and performance variables in their study. Kato and Kubo's results suggest that both ROA and sales growth rate have a positive relationship with CEO compensation, while negative pre-tax profits usually lead to a lower CEO compensation.

Since our research focuses on the hypothesis that CEOs' pay has some link to, and may have an influence on, firm performance, we start with Kato and Kubo's (2006) methodology as the main reference in the development of our study but we then differentiate our analysis from theirs by implementing different equations and models as illustrated below.

We start by checking the relationship between CEOs' total pay and firm performance (equations 1 - 4); then we focus on the relationship between CEOs' incentive pay and firm performance (equations 5 - 8) which is the main part of our analysis.

$$DROA_{it} = \alpha + \beta_1 \Delta \ln(TDC)_{it} + u_{it} \quad (1)$$

$$DROE_{it} = \alpha + \beta_1 \Delta \ln(TDC)_{it} + u_{it} \quad (2)$$

$$\Delta \ln(EBIT)_{it} = \alpha + \beta_1 \Delta \ln(TDC)_{it} + u_{it} \quad (3)$$

$$\Delta \ln(\text{EBITDA})_{it} = \alpha + \beta_1 \Delta \ln(TDC)_{it} + u_{it} \quad (4)$$

As measures of firm performance, we use ROA (return on assets), ROE (return on equity), EBIT (earnings before interest and taxes) and EBITDA (earnings before interest, taxes, depreciation and amortization). The reason why we use these metrics to measure performance is that previous literature (Edmans et al., 2017 among others) highlights the importance of accounting metrics as means to track firm performance. We furthermore think that limiting our analysis to the use of one performance metric only, as Amore et al. (2014) do in their study, would limit our chances to observe the desired relation between executive pay and firm performance.

In our equations (1) - (4), $DROA_{it}$ is the change of ROA of firm *i* from year *t*-1 to year *t*, $DROE_{it}$ represents the change of ROE of firm *i* from year *t*-1 to year *t*, $\Delta\ln(EBIT)_{it}$ and $\Delta\ln(EBITDA)_{it}$ are the log changes in EBIT and EBITDA of firm *i* from year *t*-1 to year *t* respectively. For any firm that generates a negative EBIT or EBITDA in year *t*, we take the log of its absolute value and then add a minus sign to assure that it is consistent with the direction of its original value. Finally, $\Delta\ln(TDC)_{it}$ is the log change of CEO's total compensation of firm *i* from year *t*-1 to year *t*.

As EBIT, EBITDA and TDC are numerical values (and not percentages like ROA and ROE) we make use of the logarithm to "yield more interpretable regression coefficients and reduce the skewness of the size distribution of sample firms", as Murphy highlights in his research (Murphy, 1985). The fixed effects of different firms which are possibly causing biased results are worth considering, as Murphy (1985) points out. Therefore, in the first part of our analysis we use the first-difference method for estimators - as Kato and Kubo (2006) do - to control for firm fixed effects. Results and further discussions on this topic are presented in later sections.

As previously mentioned, we differentiate our analysis from previous research on the topic of pay-performance sensitivities also by examining if CEO compensation is associated with and may lead to better firm performance focusing especially on those components of executive pay which constitute the "incentive package part" of the total compensation. Therefore, after testing the relationship between total compensation and firm performance, we proceed by testing if those specific components of executive pay are correlated with firm performance by running a panel data regression on equations (5) - (8) shown below.

$$DROA_{it} = \alpha + \beta_1 \Delta \ln(SALARY)_{it} + \beta_2 \Delta \ln(BONUS)_{it} + \beta_3 \Delta \ln(STOCK\_AWARDS)_{it} + \beta_4 \Delta \ln(OPTION\_AWARDS)_{it} + u_{it} \quad (5)$$

$$DROE_{it} = \alpha + \beta_1 \Delta \ln(SALARY)_{it} + \beta_2 \Delta \ln(BONUS)_{it} + \beta_3 \Delta \ln(STOCK\_AWARDS)_{it} + \beta_4 \Delta \ln(OPTION\_AWARDS)_{it} + u_{it} \quad (6)$$

$$\Delta \ln(EBIT)_{it} = \alpha + \beta_1 \Delta \ln(SALARY)_{it} + \beta_2 \Delta \ln(BONUS)_{it} + \beta_3 \Delta \ln(STOCK\_AWARDS)_{it} + \beta_4 \Delta \ln(OPTION\_AWARDS)_{it} + u_{it} \quad (7)$$

$$\Delta \ln(\text{EBITDA})_{it} = \alpha + \beta_1 \Delta \ln(SALARY)_{it} + \beta_2 \Delta \ln(BONUS)_{it} + \beta_3 \Delta \ln(STOCK\_AWARDS)_{it} + \beta_4 \Delta \ln(OPTION\_AWARDS)_{it} + u_{it} \quad (8)$$

where SALARY is the base salary component of executive compensation, BONUS is the bonus component, STOCK_AWARDS represents stock awards and OPTION_AWARDS represents option awards[1].

Log values are here used for all numerical values as for equations (1) - (4). Furthermore, what is mentioned regarding the use of changes for equations (1) - (4) is also valid here for equations (5)-(8).

As far as it concerns the use of these specific components (base salary, bonuses, stock awards and option awards) to represent CEO incentive pay, we refer to the structure of executive pay presented by Frydman and Saks (2010) in their study.

[1] Both stock awards and option awards have their valuation based upon the value of shares and options respectively that vested during the year as detailed in FAS123R. Option awards is the value of option-related awards (e.g. options, stock appreciation rights, and other instruments with option-like features) which is recorded by the companies on their income statement, as well as any amount that was capitalised on the balance sheet for the fiscal year.

3.4. Gender, CEO Compensation and Firm Performance

In light of the current trends in studying the role of gender in executive positions and companies' performance, in addition to the increasing relevance of gender equality in our modern society, as a second step of our analysis and to test our Hypothesis 2 we add a gender variable to our new equations, to shed some light on the possibility of a link between gender and firm performance, aside from only considering CEOs' pay. Specifically, we want to test if the fact that a firm's CEO is female would have significant implications for the firm's performance, compared to when the firm has a male CEO.

Dezso and Ross (2012), who establish how female representation in top management improves firm performance, identify female representation in top management using a dummy variable, which takes the value of 1 (if any) or 0 (if none) of the managers for a given firm in a specific year is female. Also Amore et al. (2014) treat gender as a dummy variable in their study, as shown below.

Building our second analysis with the aid of Dezso and Ross' (2012) and Amore et al.'s (2014) studies, we also treat gender as a dummy variable as illustrated below in equations (9) - (12) and (13) - (16). As the topic of gender-performance sensitivities, if we may call it this way, is still not well documented by the literature, our methodology for our Hypothesis 2 focuses on the research we find to be most relevant to develop our analysis (i.e. Dezso and Ross, 2012 and Amore et al., 2014), in addition to of course our main reference paper used to develop the methodology for our Hypothesis 1 (i.e. Kato and Kubo, 2006).

Amore et al. (2014), who highlight in their study how difficult it is to establish the existence of a link between executives' gender and firm performance, conduct an analysis where they compare firm profitability before and after transitions from male to female CEOs, with a control sample of transitions from male to male CEOs, to then analyze how the resulting difference in the firms' profitability performance is shaped by the presence of female directors. The authors (Amore et al., 2014) use Return on Assets - as we do in our analysis - as the dependent variable and - here we differentiate our analysis from theirs - use ROA as the only measure of firm performance.

Here below we briefly illustrate Amore et al.'s (2014) methodology.

Given the authors' (Amore et al., 2014) goal of analyzing how the interaction of women in executive positions affects firm profitability – they first estimate the following model separately for firms with at least one female CEO and firms without a female CEO:

$$\mathrm{ROA}_{it} = \beta_0 + \beta_1(Female\ directors_{it}) + \delta_t + \alpha_j + \mathrm{X}_{it-1}\eta + \varepsilon_{it}$$

Amore et al.'s (2014) analysis on gender-performance, first part.

where ROA_{it} is the Return on Assets for firm *i* at time *t*, and $Female\ directors_{it}$ is the main explanatory variable which represents the ratio of female directors to all directors for firm *i* at time *t* (Amore et al., 2014).

Amore et al.'s (2014) model also includes year dummies δ_t to control for common shocks as well as two-digit industry dummies α_j to control for sectoral differences in profitability. The vector X_{it-1} captures firm characteristics. Then, the authors estimate the following interaction model on the full sample, using gender as a dummy variable:

$$\begin{aligned}\mathrm{ROA}_{it} = \beta_0 &+ \beta_1(Female\ CEO\ presence_{it}) \\ &+ \beta_2(Female\ directors_{it}) + \beta_3(Female\ CEO\ presence_{it} \\ &\times Female\ directors_{it}) + \delta_t + \alpha_j + \mathrm{X}_{it-1}\eta + \varepsilon_{it}\end{aligned}$$

Amore et al.'s (2014) analysis on gender-performance, second part.

where $Female\ CEO\ presence_{it}$ measures the presence of women in CEO positions and is equal to 1 (0) if at time *t* any (none) of the CEOs of firm *i* is female, β_1 measures the effect on profitability of female CEOs as the fraction of female directors tends to zero, β_2 measures the effect of female directors on the profitability of companies without female CEOs and β_3 measures how the profitability of companies with at least one female CEO varies with the fraction of female directors (Amore et al., 2014). Thus, for any given value of $Female\ directors_{it}$, the effect on firm profitability of female CEOs is given by $\beta_1 + \beta_3(Female\ directors_{it})$ (Amore et al., 2014).

Moving on to the second part of our study, we hereby show how - as a further step in our research - we introduce the gender variable in our analysis.

We differentiate the second part of our analysis from the first part by employing the fixed effects method to analyze the estimators for our model. The first-difference method is not employed here as it is not relevant. In fact, taking the first difference for the gender dummy variable would mean a switch of a firm CEO's gender from female to male or the other way around, or simply no change to the CEO's gender, which is different from what we want to test. We furthermore still refer to Kato and Kubo's (2006) study, as the authors analyze the dummy variable in their model ($NEGPROF_{it}$, which equals 1 if firm *i* has negative pre-tax profit for year *t,* and equals 0 otherwise) using a fixed effects model, as we do here in the second part of our analysis when we introduce the dummy variable $FEMALE_{it}$, which equals 1(0) if the CEO of the firm *i* at time *t* is a woman (man).

New equations for our Hypothesis 2 are set up as follows:

$$ROA_{it} = \alpha + \beta_1 \ln(TDC)_{it} + \beta_2(FEMALE_{it}) + u_{it} \quad (9)$$

$$ROE_{it} = \alpha + \beta_1 \ln(TDC)_{it} + \beta_2(FEMALE_{it}) + u_{it} \quad (10)$$

$$\ln(EBIT)_{it} = \alpha + \beta_1 \ln(TDC)_{it} + \beta_2(FEMALE_{it}) + u_{it} \quad (11)$$

$$\ln(\text{EBITDA})_{it} = \alpha + \beta_1 \ln(TDC)_{it} + \beta_2(FEMALE_{it}) + u_{it} \quad (12)$$

$$ROA_{it} = \alpha + \beta_1 \ln(SALARY)_{it} + \beta_2 \ln(BONUS)_{it} + \beta_3 \ln(STOCK\_AWARDS)_{it} + \beta_4 \ln(OPTION\_AWARDS)_{it} + \beta_5(FEMALE_{it}) + u_{it} \quad (13)$$

$$ROE_{it} = \alpha + \beta_1 \ln(SALARY)_{it} + \beta_2 \ln(BONUS)_{it} + \beta_3 \ln(STOCK\_AWARDS)_{it} + \beta_4 \ln(OPTION\_AWARDS)_{it} + \beta_5(FEMALE_{it}) + u_{it} \quad (14)$$

$$\ln(EBIT)_{it} = \alpha + \beta_1 \ln(SALARY)_{it} + \beta_2 \ln(BONUS)_{it} + \beta_3 \ln(STOCK\_AWARDS)_{it} + \beta_4 \ln(OPTION\_AWARDS)_{it} + \beta_5(FEMALE_{it}) + u_{it} \quad (15)$$

$$\ln(\text{EBITDA})_{it} = \alpha + \beta_1 \ln(SALARY)_{it} + \beta_2 \ln(BONUS)_{it} + \beta_3 \ln(STOCK\_AWARDS)_{it} + \beta_4 \ln(OPTION\_AWARDS)_{it} + \beta_5(FEMALE_{it}) + u_{it} \quad (16)$$

3.5. Data Collection Techniques

The companies we analyze are all in the category of S&P 500 public companies.
We find this pool of companies to be relevant for our analysis, as the dataset is wide enough and, also, data are readily available since their annual published financial statements and proxy statements are public. Furthermore, diverse authors who published papers on the topic – Edmans et al. (2017) among others – also used, for their analyses, the S&P 500 companies as their data sample, or some subgroups of this category.

All data in this study are accessed from the database WRDS, under COMPUSTAT. We collect the 9-year CEO compensation data from 2010 to 2018 and the 9-year companies' financial statistics. The data analysis has been done using the R software with the aid of Latex to produce tables for relevant results.

4. Empirical Analysis

4.1. Introduction to Empirical Analysis

In this section of our thesis we aim at focusing on our research data and at illustrating the results of our analysis as explicated in the Methodology section.

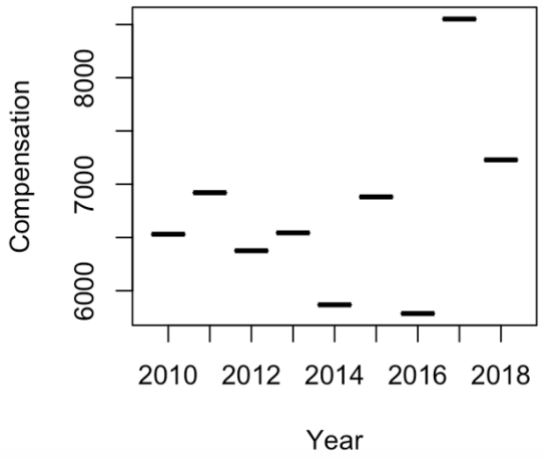
We start with presenting relevant data regarding our study and we proceed, in sections 4.3. and 4.4., with the presentation of our results. As in our Methodology, we here divide our research results into two parts, regarding our first and second hypothesis respectively. We then conclude this chapter with a discussion of our results and analysis.

4.2. Executive Compensation Data

Compensation plans for top executives vary across different firms and industries. In general, CEOs receive their compensation in various forms: in addition to basic salary and bonus, there is a performance-based remuneration including - but not limited to - stock grants, option grants, deferred compensation, saving plans, pension plans and other fringe benefits (Jensen and Murphy, 1990). As briefly introduced in our Methodology section, we - after careful

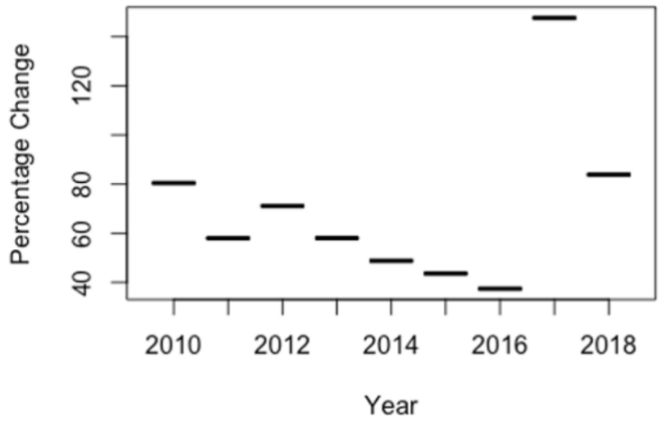
consideration - focus, in our research, on those components of CEO compensation packages which became extremely relevant in the past few decades and in recent years especially.
As in the first part of our analysis (equations 1-4) we consider CEOs' total pay as the independent variable, we - by tracking and analyzing how CEO compensation has developed in the most recent decades - run a basic analysis on how the composition of total compensation has changed in the past few years using the nine-year CEO compensation data we gather from 2010 to 2018.

Graph 1 below illustrates the change of the average CEOs' total compensation from year 2010 to 2018. Values are adjusted to dollars in 2010 using CPI index (FY2000=100).
Total compensation presents an upward trend in the past few years and - in a time frame of nine years - the average CEO annual compensation ranged from 2 million USD to 8 million USD. Because of lack of available data, we unfortunately could not include the most recent information regarding executive pay in 2019.



Graph 1: average CEO total compensation, 2010 - 2018. Compensation values on the Y-axis are in USD thousands. All values are adjusted using CPI, employing 2010 as base year with base=100.

In graph 2, we can visualize the average percentage change of CEOs' total compensation.
By looking at the graph, we can see how the lowest average compensation occurred in 2016, while the highest average compensation took place in 2017. It is interesting to notice the abrupt variation from 2016 to 2017.



Graph 2: average CEO total compensation percentage change, 2010 - 2018.

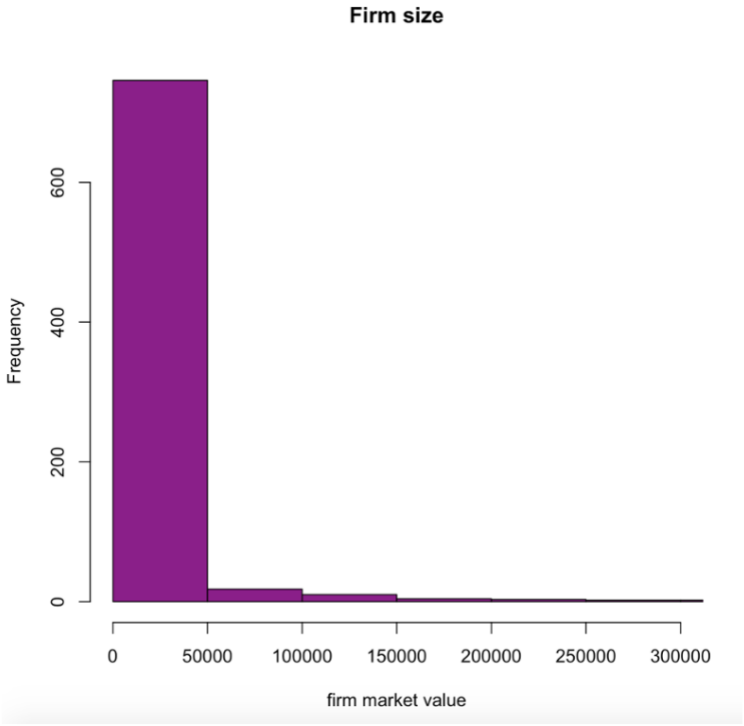
Overall, collected data make us notice how in the time frame 2010 - 2018 there have been some fluctuations in CEOs' average compensation, but generally within the range 5 million USD - 8 million USD (as observable in Graph 1). Compensation is generally increasing from year to year, and a steep climbing line is observed from 2016 to 2017. This last observation is consistent with our findings that show the highest CEO average pay occurring in 2017.

To have a more thorough understanding of our compensation data, we also run some simple analysis on other dimensions regarding CEOs, for example their gender (as of course this is also relevant for our Hypothesis 2) and age. Our results suggest that the average age of CEOs is 57.2 years old, and while the youngest CEO is 30 years old, the oldest one is 84 years old, creating a huge range.

Another interesting fact that we find out about gender is that - out of the 785 observations across nine years of 399 companies which constitute our data sample, as further specified here below - only 26 observations on the selected firms turn out to have a female CEO, which constitute as little as 3.3% of our total sample size. Given however our research on female representation in top management and the struggle to break the glass ceiling (Hymowitz and Schellhardt, 1986) highlighted in our Literature Review, we can't say we are surprised by the very low percentage of women CEOs.

As the importance of firms' size and its relationship with firm performance and executive pay have been highlighted by previous research on the topic - Gabaix et al. (2014) among others -

we think a brief note on the size of the firms belonging to our sample is worth mentioning. In our sample, the firm size - determined by each firm's most recent market value as reported below in Graph 3 - range is very ample and it goes from giant companies with a market value exceeding 300 billion USD, to small businesses with a market size of 23 million USD.



Graph 3: histogram of firm size (measured as firm market value) of the firms in our data sample. Values on the X-axis are in USD millions.

4.3. CEO Compensation and Firm Performance: Results

As previously specified in our Methodology section, in the first part of our analysis we test our Hypothesis 1: there is a positive relationship between CEOs' (incentive pay) and firm performance. If such correlation does exist between executive compensation and firm performance, we aim at unveiling which component of CEOs' compensation packages - among the four components we selected - has the strongest correlation with firm performance.

As we collect and review the most recent 9-year panel data on CEO compensation of the S&P 500 companies in the U.S., we find out that in some companies' proxy statements the published CEO's total compensation equals zero. As an illustrative example, we bumped into a firm, Evergy Inc., which presents, in its 2017 proxy statement, a CEO compensation equal to zero,

as reported in the executive compensation table. The explanation for this is that Evergy's CEO has another job as the director of Evergy's parent company. As a result, the CEO receives the so-called management fees from the parent company and not from Evergy directly.

Given this fact, we find some compensation data to be irrelevant to our research and we thus eliminate those data from our sample. By removing those data from our study, our analysis results in an unbalanced panel data of 9 years that range from 2010 to 2018, and encompasses 399 companies, for a total of 785 observations.

As previously specified in our Methodology chapter, in this first part of our analysis we use the first-difference method for the estimators of our model. As some firms belonging to our data sample only have data for one year and thus do not provide significant differenced data, we find that there are only 386 observations used in the estimation, as visible in Table 1 and Table 2.

Results for our equations (1) - (4) and (5) - (8) are shown here below in Table 1 and Table 2 respectively. To account for possible issues with serial correlation of errors, we use clustered standard errors.

Table 1: Results

	Dependent variable:			
	DROA	DROE	ΔlnEBIT	ΔlnEBITDA
	(1)	(2)	(3)	(4)
Δlog(TDC1)	0.039***	0.380***	0.539***	0.296***
	(0.009)	(0.059)	(0.148)	(0.067)
Constant	−0.016***	−0.109	−0.158**	0.036**
	(0.005)	(0.126)	(0.061)	(0.018)
Observations	386	386	386	386
R^2	0.019	0.001	0.008	0.006
Adjusted R^2	0.017	−0.001	0.005	0.003
F Statistic (df = 1; 384)	7.571***	0.492	2.975*	2.146
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 1: results for equations (1) - (4). All variables are first-differenced (values adjusted using CPI, employing 2010 as base year with base=100).
Table created using Hlavac & Marek (2018)'s R-package Stargazer, Well-Formatted Regression and Summary Statistics Tables.

From the results shown in Table 1, we notice that the coefficients for the 4 equations are all significant at 1% level, indicating that there is a strong positive relationship between total CEO compensation and firm performance. In equation (1), corresponding to column (1) in Table 1, the coefficient of Δln(TDC) is 0.04, with a p-value of less than 0.01. Hence, we conclude that total compensation is statistically significant at 1% level and a 1% increase in the total compensation leads to a 0.04% increase in the firm's ROA. Similarly, column (2) in Table 1 shows that the coefficient of Δln(TDC) is 0.38, and also significant at 1% level. This suggests that 1% increase in the total compensation will result in a 0.38% increase in the firm's ROE. The coefficient of Δln(TDC) in equation (3), as we can see in column (3) of Table 1, is significant at 1% with an estimate of 0.54. This would indicate that a 1% increase in the total CEO compensation corresponds to a 0.54% increase in the firm's EBIT. By looking at the results of equation (4), corresponding to column (4) in Table 1, we can also argue that the coefficient is significant, and that a 1% increase in the total compensation implies an increase of 0.3% in EBITDA.

The findings in Table 1 confirm our Hypothesis 1 as they suggest that a positive correlation between firm performance and CEOs' total compensation exists - however, we can't determine from this result which exact component of CEO pay is strongly positively correlated with firm performance.

As presented in our Methodology, we then run regressions to test the relationship between each component of executives' incentive compensation and firm performance - still using the same four accounting metrics as dependent variables - as shown in equations (5) - (8).

Results for equations (5) - (8) are illustrated in Table 2 here below.

Table 2: Results

	Dependent variable:			
	DROA	DROE	ΔlnEBIT	ΔlnEBITDA
	(5)	(6)	(7)	(8)
Δlog(SALARY)	−0.013	−0.203	0.260	−0.076
	(0.013)	(0.358)	(0.563)	(0.386)
Δlog(BONUS)	0.008***	−0.098***	0.130*	−0.012
	(0.001)	(0.024)	(0.068)	(0.031)
Δlog(STOCK_AWARDS)	0.002	0.263***	0.051	0.041
	(0.006)	(0.070)	(0.088)	(0.050)
Δlog(OPTION_AWARDS)	0.016***	0.280***	−0.036	0.103***
	(0.006)	(0.036)	(0.074)	(0.027)
Constant	−0.012***	−0.112	−0.122*	0.067***
	(0.003)	(0.154)	(0.064)	(0.019)
Observations	386	386	386	386
R^2	0.012	0.004	0.003	0.002
Adjusted R^2	0.002	−0.006	−0.007	−0.008
F Statistic (df = 4; 381)	1.193	0.396	0.334	0.210
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 2: results for equations (5) - (8). All variables are first-differenced (values adjusted using CPI, employing 2010 as base year with base=100).
Table created using Hlavac & Marek (2018)'s R-package Stargazer, Well-Formatted Regression and Summary Statistics Tables.

By looking at Table 2, we can see how column (5) corresponds to equation (5) as the change of ROA from year *t*-1 to year *t* is the dependent variable. Both bonus and option awards appear to be statistically significant at a 1% significance level, while the other two variables representing components of executive pay, i.e. basic salary and stock awards, turn out to be not significant. These results indicate that both the bonus and the option awards components of CEOs' incentive package have positive relationships with ROA. The coefficient for bonuses indicates that a 1% increase in the bonus will lead to a 0.008% increase in the ROA, and the coefficient for option awards suggests that a 1% increase in option awards leads to a 0.016% increase in ROA. Simply comparing these two results, we find that the option award component has a relatively larger influence on firm performance than the bonus.

By looking at column (6), which corresponds to equation (6) as the change of ROE from year *t*-1 to year *t* is the dependent variable, we can see that the coefficients for all the three components of the incentive package are significant at 1% level: bonus, stock awards and option awards. Here our findings slightly differ from the results we observed in column (5), as the coefficient for bonuses turns negative and indicates that a 1% increase in the bonus will actually lead to a 0.098% decrease in the ROE. The coefficient for stock awards in column (6) suggests that a 1% increase in stock awards leads to a 0.263% increase in ROE. The coefficient for option awards suggests that a 1% increase in option awards leads to a 0.28% increase in ROE. Comparing the results of equation (6) on stock awards and option awards, we find that the option awards component has a relatively larger influence on the firm performance than the stock awards, but they basically have a similar influence on ROE.

As those components of executive pay are the so-called incentive package, we are not surprised by the results that confirm a positive link between CEOs' incentive pay and firm performance.

However, when considering EBIT and EBITDA as measures of firm performance, as indicated in equations (7) and (8), most of the explanatory variables turn out to be insignificant, as shown in column (7) and (8) in Table 2. By looking at the results depicted in column (7), we can observe how only the bonus component is significant at a 10% significance level, and hence a 1% increase in the bonus suggests a 0.13% increase in EBIT. As far as it concerns EBITDA, only the coefficient for option awards is significant at 1% level, and results in column (8) of Table 2 indicate that a 1% increase in option awards is likely leading to a 0.103% increase in EBITDA.

4.4. Gender and Firm Performance: Results

As previously mentioned in our Methodology section, our Hypothesis 2 aims at establishing a link between CEOs' gender and firm performance. Hence, to take the research a step further from the first part of our analysis, in this section we add a gender variable as shown in equations (9) - (12) and (13) - (16).

Our Hypothesis 2 states that there is a positive correlation between female representation in top management (female CEOs) and firm performance; therefore, we expect the dummy variable to have a positive significant coefficient.

Results for equations (9) - (12) and (13) - (16) are shown below in Table 3 and Table 4 respectively.

Table 3: Results

	Dependent variable:			
	ROA	ROE	lnEBIT	lnEBITDA
	(9)	(10)	(11)	(12)
log(TDC1)	0.016	0.268	0.573	0.519**
	(0.013)	(0.215)	(0.399)	(0.230)
FEMALE	−0.013	0.228	−1.247	−1.488
	(0.050)	(0.164)	(1.832)	(1.784)
Observations	785	785	785	785
R^2	0.003	0.001	0.013	0.036
Adjusted R^2	−1.035	−1.040	−1.015	−0.968
F Statistic (df = 2; 384)	0.592	0.144	2.498*	7.202***
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 3: results for equations (9) - (12). Values are adjusted using CPI, employing 2010 as base year with base=100. Table created using Hlavac & Marek (2018)'s R-package Stargazer, Well-Formatted Regression and Summary Statistics Tables.

By analyzing the results presented in Table 3 - corresponding to equations (9) - (12) where we add a dummy variable to our regressions with firm performance and total compensation - we can see how the coefficients of the dummy variable across the four equations are not significant. Therefore, we cannot say that there exists a relationship between a CEO's gender and firm performance. Even though the results depicted in Table 3 turn out to be not significant, it is worth noticing that the coefficients for the dummy variable in equations (9), (11) and (12) are all negative numbers.

Table 4, which shows the results for equations (13) - (16), depicts how the gender coefficient across all four equations (13) - (16) turns out to be insignificant, in line with our findings in Table 3.

Table 4: Results

	Dependent variable:			
	ROA	ROE	lnEBIT	lnEBITDA
	(13)	(14)	(15)	(16)
log(SALARY)	−0.069	−1.124	0.315	0.734
	(0.055)	(1.137)	(1.124)	(0.507)
log(BONUS)	0.006	0.195	0.049	−0.041
	(0.005)	(0.266)	(0.147)	(0.084)
log(STOCK_AWARDS)	0.001	0.162	0.059	0.134
	(0.008)	(0.229)	(0.281)	(0.149)
log(OPTION_AWARDS)	0.012	0.177	0.019	0.185
	(0.008)	(0.147)	(0.218)	(0.129)
FEMALE	0.003	0.468	−1.258	−1.563
	(0.047)	(0.354)	(1.787)	(1.813)
Observations	785	785	785	785
R^2	0.012	0.004	0.004	0.038
Adjusted R^2	−1.033	−1.050	−1.049	−0.979
F Statistic (df = 5; 381)	0.932	0.283	0.337	3.021**
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 4: results for equations (13) - (16). Values are adjusted using CPI, employing 2010 as base year with base=100. Table created using Hlavac & Marek (2018)'s R-package Stargazer, Well-Formatted Regression and Summary Statistics Tables.

5. Discussion

In this chapter we discuss the results presented above in 4.3 and 4.4. of our Empirical Analysis and the limitations of our study.

5.1. Discussion

The results of the first part of our analysis, concerning the relationship between executive (incentive) pay and firm performance, confirm our Hypothesis 1. Our empirical analysis shows that there exists a significant relationship between firm performance and CEO compensation.

Our findings demonstrate that an increase in the CEO's total compensation leads to an increase in ROA, ROE, EBIT and EBITDA.

It is worth noticing that our results prove to be consistent with previous studies on the topic of pay-performance sensitivities, which emphasize the positive correlation between executive pay and firm performance (e.g. Gao and Li, 2015 and Murphy, 1985).

As we examine in depth the findings for the first part of our analysis, we can notice that - as visible in Table 2 in the Empirical Analysis chapter - when we consider those components of pay related to executives' incentive package, we find a weaker positive correlation between ROA and bonuses, and a stronger correlation between ROA and option awards. The results also suggest that an increase in option awards leads to a significant increase in ROE and EBITDA as well. We believe this finding on a positive correlation between option awards and firm performance is especially relevant, given the characteristics in the trends of composition of executive pay we have been noticing in the past few decades and years, where options are becoming more and more prominent, as illustrated in our Literature Review section and as clearly visible in Figure 1 on page 6, which shows the structure of CEO compensation from 1936 to 2005 according to Frydman and Saks (2010).

It is interesting however to notice how not all components of executive incentive pay have a positive correlation with firm performance, especially when we consider EBIT as the dependent variable.

Elaborating on this point, we can notice how our choice to analyze only certain specific components of pay as independent variables – instead of considering all the components constituting total pay – may have influenced the results of our analysis in a way that it is possible that other components of executive pay, that we did not include in our study, would better correlate to firm performance in the studied time frame (2010 – 2018).

Overall we believe however that our results are coherent with previous studies on the topic (e.g. Murphy, 1985), and with those analyses run on a similar data sample (e.g. the survey study by Edmans et al., 2017) - i.e. the S&P 500 companies or some subgroups of it - which manage to demonstrate a positive correlation between executive pay and firm performance, even if a causal link between the two factors is yet to be shown.

The results of the second part of our analysis lead us to believe we cannot confirm our Hypothesis 2. In fact, by looking at our results we can only conclude that women CEOs don't make a difference in influencing firm performance.

We find our findings to conform to previous studies which highlight the difficulty in establishing that a link between executives' gender and firm performance does exist (e.g. Amore et al., 2014).

In fact, despite some authors state to have found a causal link between gender and firm performance (Deszo and Ross, 2012), we believe gender-performance sensitivities require further research to delve into the topic and to - eventually - show that a causal link between the two factors actually exists.

As our results for Hypothesis 2 are not particularly significant, we cannot relate our findings to previous studies (Amore et al., 2014 and Dezso and Ross, 2012) which find a positive relationship between female representation in top management and firm performance.

It is interesting however to notice how both studies (Amore et al., 2014 and Deszo and Ross, 2012) state how the positive correlation between women as executives and firm performance depends on firm-specific factors. Specifically, Amore et al. (2014) show in their study how firm performance and the presence of female CEOs are positively correlated, but only when there is a relevant percentage of women in the firm's board of directors. When instead there are no women in the board of directors, or the female representation within the board is very low, the presence of a female CEO is negatively correlated to firm performance (Amore et al., 2014).

Dezso and Ross' (2012) study emphasizes instead how female representation in top management does improve firm performance, but only when the firm's strategy is focused on innovation.

Since we could not access certain data on the companies belonging to our data sample (e.g. the gender of the board of directors members) - as specified in our limitations here below - and as our sample for the second part of the analysis is relatively small, it is possible that our findings do not show similarities with Amore et al.'s (2014) and Deszo and Ross' (2012) study - i.e. a positive correlation between female executives and firm performance - because of the limitations of our research.

Our results for Hypothesis 2 seem however to conform to previous evidence in the literature which suggests how, among managers and executives in the business world, the differences in

preferences and performance between men and women observed in the general population (Croson and Gneezy, 2009) become less and less relevant. For example, Atkinson et al. (2003) and Johnson and Powell (1994) find that male and female managers do not differ significantly in their risk preferences and leadership attitudes.

It is also worth mentioning the link between our results and the study run by Paarsch and Shearer (2007), which shows no differences in the reaction to incentives and in performance between men and women.

5.2. Limitations

The purpose of our analysis was first and foremost to shed light on topics which are becoming increasingly relevant in our modern society, i.e. the study of pay-performance sensitivities and the role of gender in firm performance.

Because of the fact that the above-mentioned topics have only in recent years become of interest among researchers, these topics and especially the one concerning gender and firm performance have been discussed rather modestly by previous literature. Hence, one of the main difficulties while developing our analysis has been to find a methodology employed by the previous literature which we could use as a point of reference for our own, as we also aimed at unveiling the potential effects of executive pay on firm performance, and not vice versa as often investigated by previous research on the topic of pay-performance sensitivities (see Edmans et al., 2017). We faced this issue by using Kato and Kubo's (2006) study as the main reference while building our analysis and we used other studies (Amore et al., 2014) to add the gender variable for the second part of our analysis, as illustrated in our Methodology chapter.

We could argue however that the methodology of our study could be further improved, together with the choice of variables employed in our analysis. For example, previous literature (Murphy, 1985) use stock prices, and not only accounting metrics, as a measure of firm performance. Also, as previously highlighted in our Discussion section, it may be wise to consider all components of pay while running a pay-performance analysis, as in this way it may be clearer which exact components of executive pay drive firm performance the most.

Another major concern is that the data sample we used for our regressions may be too small, and the panel data is very unbalanced. There are a few reasons for that. Firstly, when analyzing

the compensation data, we find that the compensation data for the CEOs of some companies equals 0, which is highly unlikely and could be an indicator of a more sophisticated payment structure for the executives of such companies, which we could not analyze. Secondly, since we used companies pooled from the S&P 500 companies, the firms belonging to this category are not persistent throughout time: over the relevant time frame there had been new entries and dropouts of firms to the S&P 500 pool, which means we could not have all companies' financial data or compensation statistics for the full 9-years time horizon. For example, some of the data on a specific firm may only refer to one year. For the second part of our analysis the selection of firms with a female CEO led to a rather small sample size, as illustrated in previous sections of our study. Hence, we could argue that the sample size for the second part of our analysis is not large enough to state that our results for Hypothesis 2 are significant.

Another issue regarding data is indeed the fact that we could not access the extensive dataset on executive compensation contained in the Standard & Poor's ExecuComp database. In fact, as also previous literature (e.g. Edmans et al., as shown in Appendix, Figure 3) developed pay-performance sensitivities analyses using this database, thanks to S&P ExecuComp we could have accessed relevant information on, for example, the gender of the members of the board of directors, which could be very relevant to find out – among other things – if the percentage of women in the board of directors may have an influence on the relation between female CEOs and firm performance, as shown by Amore et al. (2014). In addition, the relevant data for 2019 are not included as they are not readily available yet, which is unfortunate as data on 2019 could provide us with interesting insights. In fact, as it is visible in our data section in the Empirical Analysis chapter (Graph 1 and 2), executive pay has been characterized by interesting changes and trends during the past decade.

These limitations regarding the accessibility of relevant data indeed influence our results and hence future research and studies on the topics of the relationship between firm performance and executives' gender, and between firm performance and executives' (incentive) pay seem necessary to further investigate current trends in pay-performance sensitivities and in gender-performance sensitivities.

We would furthermore like to point out here in our limitations that, as Jensen and Murphy (1990) highlight in their study, the bonus reward for CEOs reported in the proxy statement

often reflects the performance for the previous year. Therefore, each year's reported bonus may not correlate with the current year's company performance. However since, as previously specified, we use the first-difference method in our analysis as we would like to control for the fixed effects of firms, the possible bias caused by the lag of bonus effect should be minimized as we used changes of bonus instead of bonus of the year.

6. Conclusion and Suggestions for Future Research

In this master thesis, we investigate the relationship between executive (incentive) pay and firm performance. We furthermore expand our analysis to the role of gender in firm performance, as both the topics of pay-performance sensitivities and gender-performance sensitivities are becoming more and more relevant for both academics and practitioners to understand which factors have a positive influence on firm performance and to further analyze the role of incentive schemes in improving executives' performance and, hence, firm performance.

In this study, we analyze a sample constituted by the S&P 500 companies, as previous studies have done (Edmans et al., 2017), in the time frame 2010 - 2018, to see if our analysis on pay-performance sensitivities is in line with previous studies run on executive compensation data before the 2010s (e.g. Murphy, 1985), which show a positive correlation between executive pay and firm performance. We furthermore try to elaborate on the role gender can have in firm performance, as previous literature (Amore et al. 2014 and Dezso and Ross, 2012) tried to establish a connection between the two factors, which however is yet to be proven and hence indeed requires further research.

Our results suggest that executives' – and more specifically CEOs' – pay in the S&P 500 companies in the time frame 2010 – 2018 is linked to firm performance in a relevant and significant way: total CEO compensation is positively correlated to firm performance, when using ROA, ROE, EBIT and EBITDA as measures of performance. Most components of CEOs' incentive pay are also positively correlated with firm performance, and especially option awards have a positive effect on the ROA, ROE and EBITDA.

Results furthermore suggest how the presence of female CEOs is uncorrelated with firm performance. This result seems to be in line with Paarsch and Shearer's study (2007), which shows no differences in the reaction to incentives and in performance between men and women.

This finding is indeed puzzling especially in light of the nowadays prominent role of gender equality and given the current trend to enact boardroom gender quotas (Adams and Funk, 2012). Hence, we believe this topic is worthy of future research on the role of gender – and specifically of female representation in executive positions and in board of directors – in firm performance.

We furthermore believe our analysis on the two above-mentioned topics could be expanded through a study on the specific role of gender in the pay-performance relationship. It would be worth understanding if gender, through incentive schemes or other factors, influence pay-performance sensitivities.

As those components of pay constituting executives' incentive packages are becoming more and more relevant as shown by previous literature (Frydman and Saks, 2010) which studies the evolution of the structure of executive pay, we believe it would be worth to examine more in depth the relationship between executives' incentive pay and firm performance. The findings of such a study would indeed be relevant to better understand if incentives to CEOs and other executives lead to an improve in firm performance. If yes, this could have important implications for future trends in structuring executives' contracts and incentive packages.

Including the gender component in the above-mentioned study would indeed contribute to the understanding of the potential effectiveness, as a positive influence on firm performance, of customizations of executives' contracts based on executives' gender or on other subjective characteristics. On this subject we would find relevant, as a suggestion for future research, an analysis who take into consideration behavioral economics studies, such as the one by Croson and Gneezy (2009), on differences in preferences and behaviors between men and women, and how these studies can be useful to analyze the role of gender in the pay-performance relationship and in the structure of executives' contracts.

The implications of our findings may be of interest for academics and practitioners who aim at investigating pay-performance sensitivities trends and at delving into the increasingly

relevant topic of female representation in top management. Furthermore, our insights and future research on the topics we analyzed may be valuable for those who are interested in the effectiveness of the structure of executives' contracts and incentive packages as means to improve firm performance.

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Appendix

Figure 1. The structure of CEO and executive compensation in the S&P 500 firms from 1994 to 2014. Charts from Edmans et al.'s study (2017).

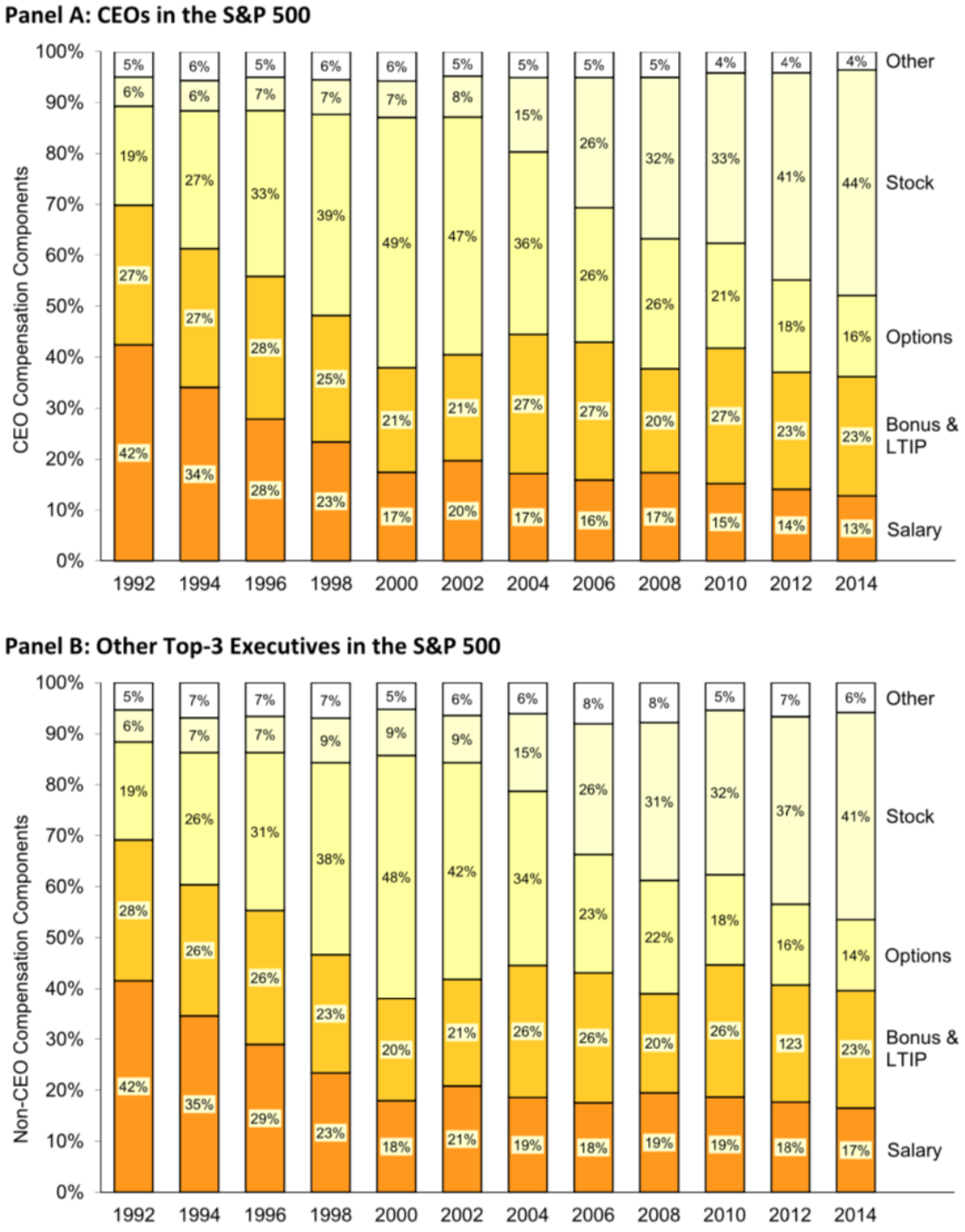

Figure 2. Median compensation of CEOs and other top executives from 1936 to 2005 according to Frydman and Saks (2010), as documented in Edmans et al.'s (2017) research.

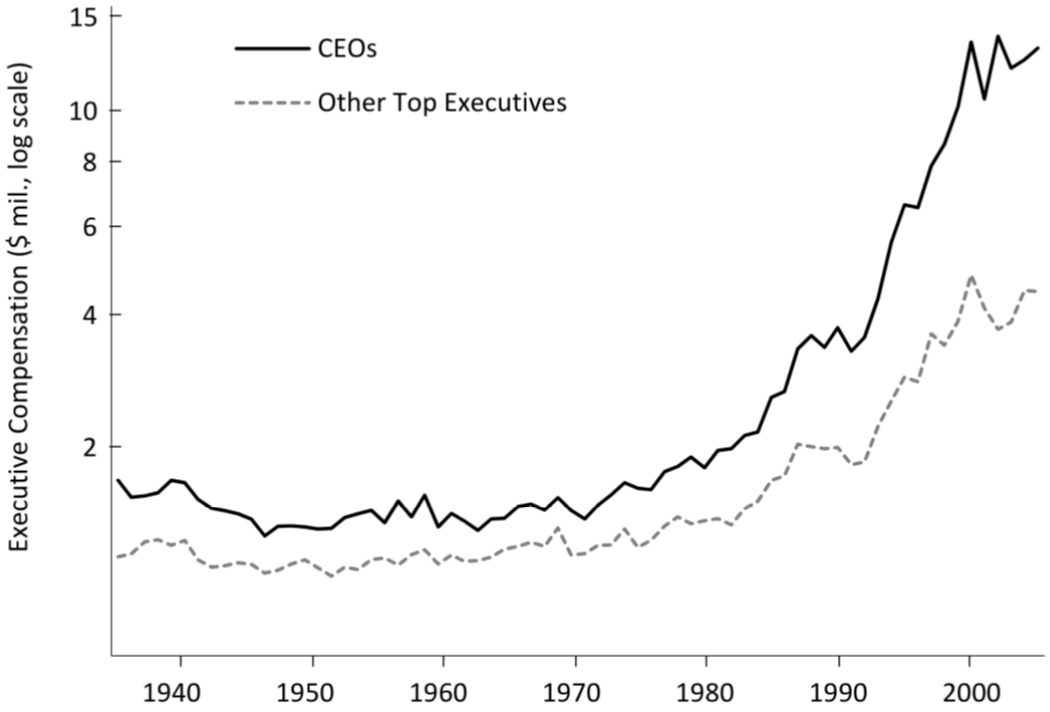

Figure 3. Panel regressions of annual CEO pay on firm and CEO characteristics using ExecuComp data from 1992–2014 for S&P 500, S&P MidCap, and S&P SmallCap firms, from the study by Edmans et al. (2017). Annual CEO pay is regressed on firm value, volatility, stock return performance, CEO age, CEO tenure, and a female CEO indicator. Stock returns are introduced into the regression in column (6), which shows how CEO pay is strongly positively correlated with both contemporaneous and lagged returns. Annual compensation is the sum of salary, bonus, payouts from long-term incentive plans, the grant-date value of option grants (calculated using Black–Scholes), the grant-date value of restricted stock grants, and miscellaneous other compensation (Edmans et al., 2017).

	ln(Total Pay$_t$)					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Firm value$_{t-1}$)	0.426***	0.459***	0.456***	0.455***	0.303***	0.463***
	[0.008]	[0.008]	[0.008]	[0.009]	[0.017]	[0.011]
Volatility$_{t-1}$	2.842***	1.488***	1.606***	1.527***	0.00727	2.047***
	[0.177]	[0.185]	[0.199]	[0.197]	[0.233]	[0.257]
ln(Age$_t$)				−0.163*	0.950	
				[0.083]	[0.864]	
ln(Tenure$_t$)				0.00854	0.0365*	
				[0.011]	[0.017]	
Female$_t$				0.0404		
				[0.056]		
Ln(1+Return$_t$)						0.293***
						[0.016]
Ln(1+Return$_{t-1}$)						0.146***
						[0.016]
Ln(1+Return$_{t-2}$)						0.0915***
						[0.016]
Ln(1+Return$_{t-3}$)						0.0748***
						[0.015]
Ln(1+Return$_{t-4}$)						0.0648***
						[0.014]
Constant	4.097***	3.509***	3.994***	4.651***	1.311	3.840***
	[0.075]	[0.078]	[0.082]	[0.325]	[3.275]	[0.106]
Year FEs		Yes			Yes	
Industry FEs		Yes				
Industry × Year FEs			Yes	Yes		Yes
CEO FEs					Yes	
N	36,009	35,771	35,771	35,193	35,410	22,872
R^2	0.408	0.492	0.513	0.516	0.797	0.524