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The Boardroom Quota: Spillover Effects on the Corporate Executive Committee

An event study of Norway's boardroom quota and its spillover effects on the gender wage gap and female representation in the corporate executive committee

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ABSTRACT

In 2006, Norway introduced a boardroom quota requiring a minimum of 40 percent of each gender in the boardroom of public limited liability companies (ASA). Companies were given until January 2008 to comply. This paper investigates whether Norway's boardroom quota has had positive spillover effects on the corporate executive committee (C-suite). Through econometric modeling, I will test if there was a significant increase in female representation and reduced gender wage gap among chief executive officers (CEOs) and executive vice presidents (EVPs) post-quota. My empirical analyses on CEOs are conducted based on data from Statistics Norway from 2004 to 2015. For the EVPs, a case study examining the ten largest ASA companies in Norway is conducted.

My empirical results indicate limited evidence of higher female representation in the C-suite post-quota (2008-2015). While the female representation has increased in CEO and EVP positions post-quota, my analyses fail to prove that this increase is due to the quota. When investigating a shorter time period (2008-2011) there is some evidence of higher female representation due to the quota. However, this finding only applies to CEOs in large firms where the workforce is dominated by women.

Furthermore, I find that female CEOs and EVPs earn on average 28.9% and 16.2% less than their male counterparts when comparing the fixed salary, respectively. My analyses also find a significant gender gap in other types of remunerations. When investigating the effects of the quota, my findings suggest no reduced gender wage gap among CEOs and EVPs.

Altogether, this study suggests that the boardroom quota has had no substantial spillover effects on the female representation and gender wage gap in CEO and EVP positions.

PREFACE

This master thesis concludes my Master of Science in Financial Economics at the Norwegian School of Economics (NHH). Writing this thesis has been challenging, but most of all it has been exciting and educating. It has also increased my insight and interest in the topic, as well as enhanced my econometric skills and knowledge.

For a long while, I have been interested in the topic of female leadership. I find the underrepresentation of female leaders as a challenge that needs to be addressed and discussed. The interest in the topic has been stimulated through attending presentations held by McKinsey & Company on their research program *Women Matter*, which analyzes and discusses women's representation at the top of organizations. I have also read and been inspired by several articles.

There has been a growing literature on gender equality in top management positions as well as on the boardroom quota. The previous research has however mainly focused on the quota's impact on firm performance, and little on the spillover effects of the quota on the corporate executive committee. Being able to contribute to the literature on this matter, and at the same time write about a topic that is important to society, has been very motivating.

I wish to express my gratitude to several people who have contributed academically, as well as encouraged and motivated me during the writing process. First, I would like to thank my supervisor, Professor Karin S. Thorburn. I am thankful for receiving constructive feedback and valuable advice. Her experience and expertise have improved the quality of my analyses and thesis. I would also like to thank Beate Bartsch, among others, in Statistics Norway for providing essential data for my study on chief executive officers. Finally, Øivind A. Nilsen deserves acknowledgement for providing me with valuable insight regarding econometric analysis.

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1. INTRODUCTION

1.1 Background

In 2003, Norway passed a law to ensure gender balance on boards of public limited liability companies (hereafter ASA). The law became compulsory in 2006, mandating a 40 percent representation of each gender in the boardroom of ASA firms. Companies were given until January 2008 to comply. Eight years after Norwegian companies' full compliance to the quota, Norway is the country with the highest proportion of women in the boardroom (Forbes, 2016). The proportion of women is, however, much lower in positions where it perhaps matters the most – the corporate executive committee (hereafter C-suite). Today, there are only 7.2 percent female chief executive officers (hereafter CEOs) in ASA firms (Statistics Norway, 2016). When looking at the ten largest ASA firms in Norway, there were only 22.1 percent female executive vice presidents (hereafter EVPs) in 2015, see Figure 6.

The main purpose of this paper is to investigate whether the boardroom quota has had positive spillover effects on CEO and EVP positions in terms of increased female representation and reduced gender wage gap. Thus, this paper contributes to the growing literature on the boardroom quota and on the gender equality in management positions. By now, most of the research seeks to understand the quota's impact on firm value and is mainly focusing on the boardroom. As of today, there is limited research on the spillover effects of the quota on CEO and EVP positions. To the best of my knowledge, there is no evidence that the boardroom quota has had any spillover effects on female representation or gender wage gap in the C-suite. This can therefore be regarded as one of the first papers examining this topic.

It is important to investigate the spillover effects of the boardroom quota for many reasons. Firstly, several countries have followed Norway's lead and passed similar quota regulations. Examples include Spain, Belgium, France, Germany, Iceland, Italy and the Netherlands. The European Commission has also proposed legislation of a 40% representation of each gender in the boardroom (European Commission, 2012). As more countries pass similar quotas, the effects of the boardroom quota in Norway is of interest as it can give an indication of what we can expect in other countries.

Secondly, the spillover effects can also give an indication of whether the quota is an effective tool to improve gender equality in the rest of the organization. The spillover effects of the quota on CEOs and EVPs may be particularly important as these roles have a substantial influence on a firm's performance and company culture (Berk & DeMarzo, 2014). Hence, these positions heavily influence the organization as a whole. Increased female representation and reduced gender wage gap in these positions might therefore have an impact on the whole organization in terms of improved gender equality.

1.2 Research questions

In this paper, I attempt to investigate whether the boardroom quota has had positive spillover effects on the C-suite. Norway provides an ideal context to explore the spillover effects of the quota because it was the first country that passed a boardroom quota law.

This study can be viewed as a two-part analysis. In the first part, I will analyze the effect of the quota on the female representation in the C-suite. In the second part, I will investigate the effect of the quota on the gender wage gap among C-suite members. To examine these topics, the C-suite is further divided into two subgroups: CEOs and EVPs. From these analyses, I attempt to answer the following research questions:

1. **How did the boardroom quota affect female representation in CEO positions?**
2. **How did the boardroom quota affect female representation in EVP positions?**
3. **How did the boardroom quota affect the gender wage gap among CEOs?**
4. **How did the boardroom quota affect the gender wage gap among EVPs?**

To examine the topics on CEOs, I have gathered data from Statistics Norway. The data includes all CEOs in Norway from 2004 to 2015. To analyze the effects on EVPs, I have conducted a case study of the ten largest ASA firms in Norway. The data used in the case study is hand-collected, mainly from the annual reports from 2004 to 2015.

1.3 Structure

This paper is structured as follows. The following section presents an overview of the context for this study including important concepts, theories and history. Section 3 explains my hypotheses on what I expect to find when answering the four research questions. Further, section 4 summarizes the previous literature on the boardroom quota and on gender disparity in the C-suite. This section also explains how this paper relates to previous literature. In section 5 and 6, I present the data and methodology applied for this study. Section 7 presents the experimental setups and results, while section 8 presents limitations of the analyses and suggestions for further research. Finally, I will present my overall conclusion and final discussion in section 9.

2. CONTEXT: FEMALE LEADERSHIP AND THE BOARDROOM QUOTA

2.1 Management of corporations

In this sub-section, I will provide a brief description of relevant terms that are used in this paper.

2.1.1 The board of directors

The board of directors is a group of people usually elected by the shareholders of the company (Berk & DeMarzo, 2014). The composition and size of the board vary. The board has the ultimate decision-making authority in a company and is responsible for making decisions regarding major issues, investments and acquisitions. Most of the decisions that involve day-to-day operations of the business are delegated to the C-suite. The board also monitors performance and establishes policies and rules on how the company should be run. In addition to this, the board hires the CEO and sets the CEO's compensation.

2.1.2 The CEO

The CEO is in charge of running the company by following the policies and rules that are established by the board of directors (Berk & DeMarzo, 2014). The CEO may also be a board member. Further, the CEO is responsible for making decisions that involve the company's daily operations and profitability. The tasks also typically include communicating messages inside and outside of the organization, as well as motivate and encourage employees (Porter & Nohria, 2010). The CEO also recruits and leads the C-suite (Berk & DeMarzo, 2014).

2.1.3 The C-suite

The C-suite is a team responsible for the company's day-to-day operations of the company (Berk & DeMarzo, 2014). The C-suite consists of the CEO as the leader of the group and several EVPs. EVPs are typically responsible for different areas such as a geographic unit, a product or a function. The size of the C-suite varies. The C-suite gets its name because the C-suite members usually have titles beginning with the letter *C* for *chief*, such as chief executive officer and chief financial officer (Cambridge Dictionary, 2016).

2.2 Gender imbalance at the top of corporations

Today, women are underrepresented in leadership positions, globally across all industries (McKinsey & Company, 2013). On average, the proportion of women in the boardroom of the largest public listed companies in the European Union (hereafter EU) is today 23.3% (European Commission, 2016). This figure is a significant increase from 11.9% in 2010 when the European Commission first began to strengthen their work to promote gender equality in leadership positions (European Commission, 2015). The situation is similar for America's 500 largest companies where 21.0% of the board members are women today (Lindzon, 2016).

Despite significant progress in female representation at the board level, the figure has hardly changed over the last years in the C-suite. There are only 3.6% female CEOs in Europe's largest companies and 4.2% in America's 500 largest companies (European Commission, 2015; Zarya, 2016). Furthermore, the average female representation in the C-suite was only 10% in 2013 according to McKinsey's *Women Matter 2013* study of 13 countries[1] (McKinsey & Company, 2013). The study predicts that there will still be less than 20 percent females in the C-suite in these countries by 2022 (McKinsey & Company, 2012).

The lack of women is not only a problem in the C-suite. Women become increasingly underrepresented as they move higher up in the organization (McKinsey & Company, 2012). Women account for 52% at the entry level in companies in Europe, United States and Asia, while only 2% at the top of the organization. Women at the entry level are 2.1 times less likely than men to be promoted into the middle management, while women in the C-suite are five times less likely than men to become a CEO, see Figure 1.

The few women who manage to reach the CEO and EVP positions, don't receive the same compensation as their male counterparts. Fortune (2015) reports that female CEOs in the US are paid 70% of their male counterparts on average, a gender wage gap of about 30%. Furthermore, in a study of the five best-paid executives in each of the Standard & Poor's 500 Index firms, the conclusion was that women earn 18 percent less than men on average (Hymowitz & Daurat, 2013).

[1] The 13 countries in McKinsey's *Women Matter 2013* study are Norway, Sweden, France, Denmark, Germany, Belgium, United Kingdom, United States, Italy, China, Brazil, India and Japan. The numbers for Denmark, Italia and Japan reflect figures from 2011, and for China 2012 (McKinsey & Company, 2013).

2.3 Explanations for gender disparity at the top of the organization

The lack of women in the C-suite and the gender wage gap in these positions can be explained by the supply side and the demand side (Matsa & Miller, 2011). These will be discussed in this sub-section.

2.3.1 Supply side explanations

The supply side explanations are built on the assumption of different preferences and productivity for men and women (Matsa & Miller, 2011). One explanation suggests that women might not be willing to sacrifice part of their personal and family life to reach a leadership position. In particular, fertility plans and childbirth may be hurdles to women's career path (Miller, 2009). Matsa and Miller (2011) also suggest that females avoid the stress associated with the leadership role, and shy away from the competition for promotions.

McKinsey & Company examines some of these supply side explanations in their *Women Matter 2013* report. The report suggests that women's ambition is in line with their male counterparts. In fact, the report shows that 79% of the women from their panel had the desire to reach top management positions compared with 81% of the men. The survey also reveals that women and men expressed similar willingness to sacrifice part of their personal and family life to reach top positions. It should be mentioned that the report finds that women are less confident than men that they will succeed in reaching top management roles.

2.3.2 Demand side explanations

The demand side explanations refer to the institutional barriers to women's career paths. Matsa and Miller (2011) argue that women may be prevented from progression in their career because of the discrimination and stereotypes by gender they experience from top managers, most of which are men. Matsa and Miller also argue that based on the historically low fraction of women in leadership positions, hysteresis[2] creates a barrier for women to progress.

[2] Hysteresis is the phenomenon in which history affects the value of current issue (English Oxford Dictionaries, 2016). In this case, hysteresis states that historically low fraction of female leaders and a gender wage gap among leaders are likely to influence the current and future female representation and gender wage gap in these positions. As a result, the gender wage gap among leaders and female leaders being underrepresented can be lagging factors.

Furthermore, Sealy and Singh (2010) argue that the lack of females in top positions is a barrier itself. They explain that the low fraction of women in top positions leads to few female senior role models that can act as an example of how to overcome the barriers discussed above.

The term *glass ceiling* is a metaphor describing the demand side explanations. Glass ceiling describe the invisible barriers that women face as they approach top management positions. The term glass ceiling came to wide attention in 1986 in a *Wall Street Journal* article with that title (United States department of labor, 1995). In 1991, The Civil Rights Act of 1991 created The Federal Glass Ceiling Commission (Federal Glass Ceiling Commission, 1995). The commission issued a fact-finding report in 1995 that confirms the metaphor of glass ceiling.

2.4 Gender equality in Norway

Norway is considered to be at the forefront when it comes to gender equality. The World Economic Forum's *Global Gender Gap Report* ranks Norway as the second most gender equal country in the world right after Iceland (The World Economic Forum, 2015). The report examines gender gaps in 145 countries in four categories: *Economic Participation and Opportunity*, *Educational Attainment*, *Health and Survival* and *Political Empowerment*. The report estimates that Norway has closed 85% of the gender gap in the country.

Even in countries like Norway with a high degree of gender equality, female leaders earn significantly less than their male counterparts. The average monthly pay for female CEOs in Norway was 72 percent of the average monthly pay for male CEOs in 2015 (Statistics Norway, 2015). The gender wage gap among leaders has hardly changed over the last 10 years.

Furthermore, Norwegian women are underrepresented in top positions. Today, the proportion of female CEOs is 16.0 percent in AS firms, while it is only 7.2 percent in ASA firms. In the C-suite, there are just 14 percent women (McKinsey & Company, 2013). However, the figure is substantially higher when looking at the board level, where the proportion of female board members is 18.2 percent for AS firms and 41.6 percent for ASA firms. The fairly high representation of women in the boardroom of ASA firms can be attributed to the legally binding boardroom quota.

2.4.1 The boardroom quota

To ensure gender balance in the boardroom and address the gender disparity in top positions, the Norwegian Parliament passed a law on a voluntary basis in 2003 mandating a 40 percent representation of each gender on ASA boards.[3] Most firms, however, did not comply and failed to increase the proportion of women in the boardroom. As a consequence of this, the law became compulsory in the beginning of 2006. The law gave companies founded before 2006 two years to comply. Firms that did not comply by the beginning of 2008 would be denied registration in the Brønnøysund Register[4] and dissolved, as they still do. Today, all ASA firms meet the requirements. The proportion of women in the boardroom is today 41.6 percent (Statistics Norway, 2016).

The boardroom quota only applies to ASA firms and not AS firms (Regjeringen, 2011). Thus, the development of the proportion of women in the boardroom differs for these types of firms, see Figure 2. ASA companies are often big as they are required to have a share capital of at least one million NOK cf. the Public Limited Liability Companies Act of 1997 § 3-1 (1) (hereafter asal). AS firms are required to have a share capital of at least 30 000 NOK and are therefore generally smaller cf. the Private Limited Liability Companies Act of 1997 § 3-1 (1) (hereafter asl). Consequently, there are substantially more AS firms than ASA firms, see Table 1. In 2015, there were 238 registered ASA companies, while there were over 264 000 AS companies which the boardroom quota does not cover (Store norske leksikon, 2015).

[3] The boardroom quota applies correspondingly to public-owned enterprises (state-owned), intermunicipal companies, large cooperatives and companies that are more than 2/3 parts municipal owned (Regjeringen, 2011). It does not apply to AS companies.

[4] The Brønnøysund Register develops and operates Norway's most important registers and electronic solutions (The Brønnøysund Register Centre, 2016).

3. HYPOTHESES

In this section, I will present my hypotheses on what I expect to find when answering the four research questions presented in section 1.2. In particular, I will discuss why the boardroom quota may have had spillover effects on CEOs and EVPs in terms of increased female representation and reduced gender wage gap.

3.1 Female representation in CEO and EVP positions

When it comes to the first two research questions, I will attempt to answer how the boardroom quota has affected female representation in CEO and EVP positions. My hypothesis is that the boardroom quota will lead to a higher female representation in CEO and EVP positions.

I believe that there are several reasons why the proportion of female CEOs and EVPs should increase as a result of the boardroom quota. Firstly, the board has a direct influence on the appointment of the CEO, while it may have some influence on the selection of EVPs through recommendations (Berk & DeMarzo, 2014; Bertrand, Black, Jensen and Lleras-Muney, 2014). In the selection of CEOs and EVPs, female board members can be vocal proponents of female candidates for these positions (Bertrand et al., 2014). Thus, as more females join the boardroom, it may be easier for women to influence the selection of female candidates, which in turn can increase the representation of female CEOs and EVPs.

Secondly, more women on the board might help the organization to overcome challenges such as discrimination, stereotypes by gender and hysteresis as explained in section 2.3.2 (Beaman, Chattopadhyay, Duflo, Pande, & Topalova, 2009; Joy, 2008; Matsa & Miller, 2011). If stereotypes that devalue women's abilities are removed, more female candidates might be considered as CEOs and EVPs. As a result, more females might be hired in these positions.

Thirdly, more females on the board can increase the number of women that can serve as senior role models and mentors (Joy, 2008). These women might inspire and encourage other women in the pipeline to apply for top management positions. Because of this, we might see an increased female representation in the C-suite post-quota. These arguments are supported by Sealy & Singh (2010) which claim that the lack of female senior role models is one of the key barriers to women's career progression. Moreover, research finds that female

managers who had mentors believed mentoring facilitated their career advancement (Linehan & Scullion, 2008).

Lastly, more women on the board may result in the adoption of human resource policies that benefit females, such as flexible work for female leaders with small children (Bertrand et al., 2014; Joy, 2008). Such policies can make the top management positions relatively more appealing for women, as fertility plans and childbirth was explained as one of the hurdles to women's career path in section 2.3.1. As a consequence, it may lead to an increase in female representation in CEO and EVP positions.

However, negative spillover effects of the quota might also occur. The boardroom quota can imply that less qualified and experienced women are hired on the board to meet the 40 percent rule (Ahern & Dittmar, 2011; Smith, 2014). This can strengthen the negative stereotypes by gender. It is also possible that the boardroom quota requiring 40 percent of each gender on the board does not give women majority in board decisions (Bertrand et al., 2014). Hence, the women's influence on board decisions can be limited. Based on these arguments, we may not see an increase in female representation in CEO and EVP positions post-quota.

3.2 Gender wage gap among CEOs and EVPs

When it comes to the final two research questions, I will attempt to answer how the boardroom quota has affected the gender wage gap among CEOs and EVPs. My hypothesis is that the boardroom quota will lead to a reduced gender wage gap among CEOs and EVPs.

I believe that there are several reasons why the boardroom quota may lead to a reduced gender wage gap in CEO and EVP positions. Firstly, previous research has concluded that a higher proportion of women on the board has reduced the gender wage gap in the boardroom (Bertrand et al., 2014). This finding might suggests that there is a correlation between female representation and gender wage gap in top positions. The same relationship could apply to CEOs and EVPs. If female representation increases due to the quota as proposed in section 3.1, we might therefore also see a reduced gender wage gap among CEOs and EVPs post-quota.

Secondly, the boardroom quota might help the organization to overcome discrimination and stereotypes as mentioned in section 3.1 (Beaman et al., 2009; Joy, 2008;

Matsa & Miller, 2011). If less discrimination is an outcome of the quota, this could also be a reason why we should expect to see improvements in the gender wage gap among CEOs and EVPs. This statement, however, implies that some of the gender wage gap is caused by discrimination. However, economists tend to be cautious about attributing the gender wage gap to discrimination, because of the lack of direct evidence (Matti, Knüpher, & Tåg, 2016).

Nevertheless, negative spillover effects of the quota on the gender wage gap might also occur. The arguments for these have many similarities with the discussion of negative spillover effects on female representation, see section 3.1. As mentioned, less qualified and experienced women recruited in the boardroom can strengthen negative stereotypes by gender (Ahern & Dittmar, 2011; Smith, 2014). Furthermore, women's influence on board decisions might be limited as the 40%-quota does not give women majority on board decisions (Bertrand et al., 2014). As a result, we might not observe a reduced gender wage gap among CEOs and EVPs post-quota.

4. LITERATURE REVIEW

The literature on Norway's boardroom quota has been growing. Up until now, the previous research has mainly been focusing on the boardroom and the impact on firm value. However, several studies have reached different conclusions regarding the impact of a gender-balanced board on firm performance (see among others Eckbo, Nygaard, & Thorburn, 2016; Matsa & Miller, 2013).

The research on gender equality in the C-suite has also mainly been focusing on the effect on firm value. McKinsey & Company's *Women Matter 2013* report shows that companies with top-quartile representation of women in the C-suite experienced a 47% higher average return on equity (ROE) and a 55% higher average earnings before interest and tax (EBIT), when compared with companies with no women in the C-suite. While the result can indicate the companies perform better by having a higher proportion of female in the C-suite, it can also indicate that profitable firms are more likely to appoint female C-suite members.

In this paper, I will examine whether the boardroom quota has had positive spillover effects on the gender composition and pay gap of the C-suite in Norway. There is limited research on this topic, which in fact was one of my main motivations to perform this study. However, I will in the following sub-sections highlight some interesting findings from previous literature that I find relevant for this study. I will also discuss how this paper relates to previous literature.

4.1 Female representation in CEO and EVP positions

A recent study by Bertrand et al. (2014) examines the effects of the boardroom quota on the likelihood of women entering the top positions in ASA firms. The study investigates the effects on the top earner (used as a proxy for the CEO), as well as on the five highest paid roles within an organization (used as a proxy for C-suite members). Bertrand et al. define the year 2003 as pre-quota, and the period between 2004-2010 as post-quota. The study does not observe a statistically significant relationship between the percentage of women on the board and the likelihood that a female employee is the top earner in ASA firms. However, they conclude that a higher share of women in the boardroom may have increased the chance that a female employee is one of the top five paid in ASA firms.

In contrast to the findings by Bertrand et al. (2014), Wang and Kelan (2012) demonstrate a significant increase in the likelihood of females being appointed to CEO roles after the quota. Wang and Kelan find that the quota increased the probability of a female CEO by 1.01%. The study defines 2001-2007 as the pre-quota period and 2008-2010 as the post-quota period.

Another interesting study addressing the relationship between a higher proportion of women in the boardroom and female representation in other top positions is Matsa and Miller (2011). In their study of large U.S. corporations between 1997 and 2009, they find a significant increase in the likelihood of having a female CEO when there is a higher share of female board directors. This result is in accordance with the findings made by Wang and Kelan (2012), while the result appears to contradict the study by Bertrand et al. (2014). Matsa and Miller also find that a higher share of women in the boardroom increased the likelihood of having a female in the four top executive positions. This is in accordance with Bertrand et al. (2014).

Furthermore, Joy (2008) study the correlation between the percentage of female board members in the past and the percentage of female corporate officers in the future. The corporate officers are defined as the highest-level executives in an organization. Joy shows a positive correlation between the percentage of female board members in Fortune 500 companies in 2001 and the percentage of female corporate officers in the same companies in 2006. Moreover, a higher share of women in the boardroom increased the percentage of line positions[5] held by women more than it increased the percentage of staff positions held by women. This is an interesting finding as line experience is considered necessary for advancing into CEO positions (Joy, 2008).

Finally, it is useful to establish how this paper relates to the previous literature discussed above. When it comes to research question one, previous literature has reached different conclusions regarding the quota's effect on female representation in CEO positions (Bertrand et al., 2014; Wang & Kelan, 2012). I therefore wish to contribute to the existing literature on this topic.

[5] Line positions are responsible for profits, while staff positions support the business operations such as human resources and corporate affairs (Joy, 2008).

Regarding research question two, several studies find evidence of a higher female representation in executive positions when there is a higher share of female board directors (Bertrand et al., 2014; Joy, 2008; Matsa & Miller, 2011). However, no studies as far as I know are investigating the effect of the boardroom quota on EVPs specifically. The most closely related study is Bertrand et al. (2014) using the top five earners in ASA firms as a proxy for C-suite members. This approach may be inadequate when it comes to surveying the effect on female representation in EVP positions. This paper will therefore be the first to examine this topic.

4.2 Gender wage gap among CEOs and EVPs

Several studies investigate the gender wage gaps in management positions. A recent study by Matti et al. (2016) documents a gender wage gap among CEOs and executives in Sweden. They find that male CEOs and other executives earn on average 7.1% and 21.6% more than their female counterparts, respectively. Geiler and Renneboog (2014) confirm the significant pay gap for top executives in their study for UK listed companies. Geiler and Renneboog do not, however, find any evidence of a gender wage gap among CEOs, after controlling for firm size, industry, age and position among other factors.

Another interesting study documenting the gender wage gap in management positions is Bertrand and Hallock (2001). This study finds that women earn on average 45% less than men in the highest-paid segment of corporate executives. This is in accordance with Matti et al. (2016) and Geiler and Renneboog (2014). The study also finds that 75% of the gender wage gap can be explained by the fact that female managers work for smaller companies than men and are less likely to be CEO, Chair or company president than their male counterparts (Bertrand & Hallock, 2001).

The only paper I have managed to detect that investigates the quota's effect on gender wage gap is Bertrand et al. (2014). First, they investigate the quota's effect on the gender wage gap among individuals that are serving as board members in ASA companies. Bertrand et al. find that the gender gap in residual earnings within boards decreased after the quota. Furthermore, they investigate the quota's effect on highly qualified women whose

qualifications mirror those of board members, but who were not appointed to the board. For these women, they find no statistically significant change in the gender wage gap post-quota.[6]

To summarize, there is mixed evidence of a gender wage gap among CEOs, while there is evidence of a gender wage gap among other top executives (Bertrand & Hallock, 2001; Geiler & Renneboog, 2014; Matti et al., 2016). There is, however, no prior research that examines the effect of the boardroom quota on the gender wage gap among CEOs and EVPs. This paper will therefore be the first to examine this topic, see research question three and four. The most closely related work on this topic is Bertrand et al. (2014), which investigates quota's effect on the gender wage gap among highly qualified women.

[6] However, standard errors are large enough in some specifications that they cannot rule out economically meaningful effects (Bertrand et al., 2014).

5. DATA

This paper uses three datasets for the analyses of the four research questions. *Dataset 1* is used for the study on female representation in CEO positions, *Dataset 2* is used for the study on the gender wage gap among CEOs and *Dataset 3* is used to investigate the female representation and gender wage gap among EVPs.

In this section, I will present the data sources and sample selection for each dataset. This section also discusses potential biases in the data and provides descriptive analysis. I have used Microsoft Excel for structuring and filtering the data, while I have used the statistical tool STATA to conduct my empirical analyses.

5.1 Dataset 1

5.1.1 Data sources

I obtained CEO data from the *StatBank* of Statistics Norway[7], which contains detailed tables with time series. The data collected for the study on female representation in CEO positions is from two data tables in StatBank: source table 07249 (*Actors in limited companies, by industrial activity (SIC2007), legal form, type of actors, size groups and sex)* and source table 05189 (*Actors in limited companies, by industrial classification (SIC2002), legal form, type of actors, size groups and sex, closed series).* In section 5.1.2, I will explain how I merged the two tables into one dataset.

Both tables consist of the variables; legal form (*ASA* and *AS*), region (*The whole country*, C*ounties, Group of counties* and *Regions*), type of agents (*Chairman of the board, Deputy chairman, Board members* and *General manager*), number of employees (*No one employed, 1-4 employees, 5-9 employees, 10-19 employees, 20-49 employees, 50-99 employees, 100-249 employees* and *250 employees and more*) and gender (*Males* and *Females*). Table 07249 contains data from the years 2009 to 2016, while table 05189 is a closed series from the years 2004 to 2008. Further, the industrial classification in table 07249

[7] Statistics Norway is responsible for the official statistics in Norway (Statistics Norway, 2016).

is based on the *Standard Industrial Classification of 2007* (hereafter SIC2007), while table 05189 is based on the *Standard Industrial Classification of 2002* (hereafter SIC2002).

5.1.2 Sample selection and filtering

To achieve a proper dataset on female representation in CEO positions, I have merged Statbank source table 07249 and 05189 together. In order to merge the data tables, certain assumptions have been made. First of all, I have chosen to concentrate on the whole country. Therefore, regions and counties data are excluded from the dataset. The year 2016 is also excluded so the time period (2004-2015) is consistent in all analyses in this paper. Further, the variable *General manager* is assumed to be equivalent to the title CEO and is therefore included in the dataset. The last adjustment that was needed to merge the two datasets was to find an equal industrial classification. As mentioned, table 07249 is based on SIC2007, while table 05189 is based on SIC2002. I decided to use SIC2007 as a common industrial classification because it is the current version that Statistics Norway uses today. Therefore, I changed the industrial classification of SIC2002 in table 05189 so it became equivalent to the industrial classification of SIC2007, see Appendix Table 11.

Finally, I calculated the percentage of female CEOs in each firm group[8] in each year. Firm groups with no CEOs reported are filtered out as this can be a source of potential bias in the data. My final sample contains of 2752 firm group-year observations from 2004 to 2015.

5.1.3 Descriptive statistics

Descriptive statistics and time trend analysis are conducted to investigate the data collected. The descriptive statistics are used to quantitatively describe the main features of the data in Dataset 1.

The descriptive statistics for Dataset 1 are given in Figure 3, Figure 4 and Figure 5. Figure 3 shows the percentage of female CEOs in AS and ASA firms from 2004 until 2016. The figure shows that AS companies have a higher proportion of female CEOs than ASA companies. It also shows that the proportion of female CEOs have been increasing the whole

[8] Recall that the data in Dataset 1 is gathered from tables provided by Statistics Norway. Statistics Norway reports the number of female and male CEOs in each industry, for each size group and for each legal form. Therefore, a firm group is defined as a combination of industry, legal form and size group. For instance, one firm group consists of CEOs within manufacturing with 1-4 employees with ASA as their legal form.

period for both types of companies. Furthermore, Figure 4 shows the percentage of female CEOs by size group. As we can see from the figure, there is a higher proportion of female CEOs in medium sized firms for AS companies, while it is difficult to draw such conclusions for ASA companies. Finally, Figure 5 shows the percentage of female CEOs in companies where the workforce is dominated by women and by men. The figure shows that there was a higher proportion of female CEOs in female dominated industries than in male dominated industries in 2015.

5.2 Dataset 2

5.2.1 Data sources

The data on CEO's remuneration is also gathered from the StatBank of Statistics Norway. The data collected is from two data tables in Statbank: source table 08059 (*Average monthly earnings for employees, full-time equivalents, by working hours, sector, sex and occupational group*) and source table 05624 (*Average monthly earnings for employees in private sector, full-time equivalents, by working hours, by sex and occupational group, closed series*). I will in section 5.2.2 explain how I merged the two data tables together.

Both tables provide detailed information on average monthly earnings for employees by working hours (*Full-time employees* and *Part-time employees*), gender (*Males* and *Females*) and occupational group (*Directors and chief executives*, *Senior officials and managers*, *General managers of small enterprises* and *Professionals* among others). The average monthly earnings are divided into *Monthly earnings (NOK), Basic monthly salary (NOK), Variable additional allowances (NOK), Bonuses (NOK)* and *Overtime pay (NOK)*. The tables also provide information on the number of employees covered by the survey. Table 08059 contains data for the years 2008 to 2015, while table 05624 is a closed series for the years 2003 to 2008. Table 08059 has data on different sectors, while 05624 only measures average monthly earnings in private sector.

5.2.2 Sample selection and filtering

Dataset 2 is created by merging StatBank source table 08059 and 05624. First of all, I have chosen to focus on full-time employees, and *Part-time employees* are therefore excluded from the dataset. Furthermore, I have only included the occupational group *Directors and chief*

executives to the dataset. According to Statistics Norway (2016), *Directors and chief executives* are corporate managers of large and medium-sized enterprises. I assume that *Directors and chief executives* are the closest to CEOs in ASA companies. Due to insufficient and missing data in 2003, the data from this year is excluded. The time period will therefore be consistent in all my empirical analyses from 2004 to 2015.

Finally, the two datasets had to be at the same sector level to be able to merge the two datasets together. As mentioned, table 08059 contains data on several sectors, while 05624 only applies to the private sector. Thus, table 08059 was filtered to the private sector. My final sample contains of 120 year-gender-wage observations.

5.2.3 Descriptive statistics

Finally, descriptive statistics are conducted to investigate the main features of Dataset 2. Figure 7 shows the gender wage gap in all types of monthly earnings for CEOs from 2004 to 2015. The gender wage gap is given as women's earnings as a percentage of men's earnings. The figure shows that the gender wage gap in all types of monthly earnings has increased during the period. Moreover, the gender wage gap is larger in bonuses than in fixed salary.

5.3 Dataset 3

5.3.1 Data sources

Statistics Norway among other data sources has insufficient data on salary and benefits paid to EVPs. The gender of the EVP is not disclosed either. To study female representation and gender wage gap in EVP positions, I have therefore hand-collected the data myself. It was the most time-consuming part of the data gathering process, but yielded rewarding results.

I collected data on the EVPs of Norway's ten largest ASA companies from 2004 until 2015. ASA firms are an appropriate group of companies to investigate since they are affected by the quota. I created a sample of the ten largest ASA firms based on three criteria. Firstly, the companies had to have one of the highest reported operating revenues based on different rankings (Hanstad, Lorentzen, & Aakvik, 2012; Kapital, 2016; Largest Companies, 2016). Secondly, the firms must have existed since 2004 or earlier until today. Thirdly, the companies had to have sufficient and available data in their annual reports. The companies fulfilling these criteria were Statoil ASA, Telenor ASA, Yara International ASA, Norsk Hydro ASA,

Norgesgruppen ASA, Norwegian Air Shuttle ASA, DNB ASA, Orkla ASA, Kongsberg Gruppen ASA and Schibsted ASA.

The data gathered on EVPs is mainly taken from the annual reports of the above mentioned companies, see section 10.1. From the annual reports, I collected the names, fixed salaries and bonuses for the EVPs for each year in the time period 2004-2015. In addition to this, the year of birth was collected based on information from the annual reports, Proff and LinkedIn.[9] Lastly, I gathered data on whether an EVP had a position within human resources (hereafter HR), and within communication. This data was gathered from the annual reports and LinkedIn.

During the data collection process, I discovered that some EVPs joined or left the C-suite during the fiscal year. This can be a source of potential bias in the data, see section 5.3.3. I therefore collected data on how long the EVPs stayed in the C-suite to adjust for this later. Furthermore, I also discovered that some companies had missing remuneration data in 2004 and 2005. Only one of ten companies reported the EVP's remuneration in 2004, while only four of ten companies reported remunerations in 2005. From 2006, all companies reported remunerations. In section 5.3.3, I will also discuss how I am dealing with the missing data in 2004 and 2005.

5.3.2 Sample selection and filtering

In order to achieve a proper dataset for the study on female representation and gender wage gap in EVP positions, certain adjustments have been made. First, I was able to identify the gender of the EVPs by name. I therefore created a new variable regarding the gender of each EVP. Second, I calculated the EVP's age in each year based on the year of birth. In addition to this, further adjustments in the dataset have been made due to potential biases in the data. These are described in section 5.3.3.

The final sample in Dataset 3 includes ten firms. For the study on female representation in EVP roles, the final sample includes 120 firm-year observations. When it comes to the study

[9] Proff.no is an official distributor of enterprise information from the Brønnøysund Register. They provide information on directors and general managers in firms, including the year of birth. LinkedIn is an online social networking service for the business community. Each user can post their CV on this platform.

on the gender wage gap among EVPs, the final sample includes 835 people-year observations for fixed salary and 665 for bonuses.

5.3.3 Potential biases in the data

Further, I will discuss the potential biases in the data in Dataset 3. I will also describe adjustments that have been made to take account for the potential biases.

Outliers

Outliers are observations in a dataset that are substantially different from the rest of the data (Wooldridge, 2014). Outliers can bias the result of an analysis. For instance, large residuals (both negative and positive) receive a lot of weight in the ordinary least squares regression[10] (hereafter OLS), and OLS is therefore sensitive to outliers. Adjusting for outliers is therefore important.

As mentioned, some EVPs joined or left the C-suite during the fiscal year. As a result, the fixed salary for these EVPs became very low compared to the rest. In order to take account for these outliers, wages were annualized as if all EVPs worked in the C-suite for the whole year. This adjustment was only conducted on fixed salary and not on bonuses. The fixed salary is assumed to be the same each month in the year and therefore easy to annualize. Bonuses are often performance based and are not necessary the same each month.

Measurement error

Measurement error is the difference between the observed variable and the true variable (Wooldridge, 2014). Hence, the observed variable does not perfectly capture the true variable. Measurement error can cause biases in OLS.

Initially, the calculation of the proportion of female EVPs was based on the number of individuals in the C-suite every year. However, some EVPs joined or left the C-suite during the year as explained in section 5.3.1. As a consequence, the calculated proportion of female EVPs did not perfectly reflect the *true* proportion. To illustrate, I found instances where a female EVP replaced another female EVP during the year. As a result, they counted as two

[10] This paper will apply an OLS multiple regression model. OLS is a method which estimates the parameters of a multiple regression so that the sum of squared residuals is minimized (Wooldridge, 2014).

female EVPs in the calculation, while there was actually just one at each point in time that year. The calculated proportion of female EVPs therefore became too high compared with the *true* proportion of female EVPs.

In order to adjust for this, I converted the workload for each EVP in each year into full-time equivalents (hereafter FTEs). An FTE of 1.0 is equivalent to an EVP working in the C-suite for the whole year, while an FTE of 0.5 is equivalent to an EVP working in the C-suite for only six months. I was able to do this based on the information in the annual reports on when EVPs joined or left the C-suite. Consequently, when a female EVP now replaces another female EVP in the middle of the year, they will count as two FTEs of 0.5. In sum, they will count as one FTE rather than two individuals.

Missing data

Missing data problem occurs when we do not observe values on some variables for certain observations in the sample (Wooldridge, 2014). When we are dealing with missing data, it is important to understand *why* the data is missing. This is because the statistical consequences of missing data depend on why the data is missing.

As mentioned, there are a lot of missing remuneration data in 2004 and 2005 for EVPs. The reason why the data is missing is the absent of two law paragraphs: The accounting act of 1998 (hereafter rskl) § 7-31b. and the asal § 6-16a. In June 2005, the rskl § 7-31b. entered into force requiring large enterprise (including ASA cf. rskl § 1-5) to disclose the total remuneration to senior executives. Furthermore, it was added to the asal in December 2006 that ASA firms need to disclose the detailed remuneration to senior executives cf. asal. § 6-16a.

The data on remuneration for EVPs in 2004 and 2005 is said to be *missing at random*, meaning that the reason why we have missing data does not depend on the unobserved data (Wooldridge, 2014). It is equivalent to saying that no firms or EVPs are more likely to have missing remuneration data or that no values of remunerations are more likely to be missing. The only statistical consequence of missing data at random is that the sample from the population is reduced. Even though this can make the estimators less precise, it does not cause any bias (Wooldridge, 2014).

Sample selection bias

The *sample selection bias* may arise when the data is selected for a restricted, non-random sample (Cuddeback, Wilson, Orme, & Combs-Orme, 2004). It is further referred to as a problem when the sample is not representative of the actual population. I acknowledge that sample selection bias may be present in Dataset 3. The sample selected includes the ten largest ASA firms, which also are considered as the most influential companies in Norway. However, it does not necessary give an accurate picture of the Norwegian business when only studying the ten largest ASA companies. Obviously, the ideal sample would be all ASA firms in Norway. However, the collection of this data would be time-consuming and this appeared to not be a feasible solution due to time constraints for this study.

5.3.4 Descriptive statistics

Finally, descriptive statistics are conducted to investigate the data in Dataset 3. Figure 6A shows the percentage of female EVPs from 2004 to 2015. The figure shows that the proportion of female EVPs has increased during the period. From Figure 6B we see that female EVPs accounted for 71% of the HR and similar staff positions in the C-suite in 2015. This was a 12 percentage point decrease from 2004.

Furthermore, Figure 8 shows the gender wage gap among EVPs given as women's earnings as a percentage of men's earnings. The figure shows that the gender wage gap in fixed salary and bonuses has decreased during the period from 2004 until 2015. It also shows that the gender wage gap is greater in bonuses than in fixed salary.

6. METHODOLOGY

In this section, I will describe the methodology applied for this study. I will first discuss the event window, and then discuss the choice of treatment and control group. This section also explains robust regression methods in STATA. The experimental setups that will be used when examining the four research questions is also a part of the methodology applied for this study. However, these will be discussed thoroughly in section 7 together with the results.

6.1 Event window

An *event window* is a period over which the impact of an event will be examined (McWilliams & Siegel, 1997). In this study, the boardroom quota is the event and the spillover effects of the quota on the C-suite are the effects of the event that will be examined. Figure 9 gives an overview of the event window.

I have chosen 1st of January 2008 as the date of the event because this is the final date for implementation of the boardroom quota. From this point, all companies had to comply with the law and would be dissolved if they failed to meet the quota's requirements. By choosing 1st of January 2008 as the date, I will be able to investigate the full effect of the quota. This is the same date of the event as Wang and Kelan (2012).

The time period over which the effects of the quota will be examined is from 2004 to 2015. The time period includes four years as the pre-quota period (from 2004 to 2007) and eight years as the post-quota period (from 2008 to 2015). The post-quota period is chosen to be this long because the appointments of new CEOs and EVPs usually do not happen very often (Kets de Vries, 2014). Consequently, it might have taken some time before the spillover effects on female representation in these positions began to occur. A longer post-quota period is therefore appropriate when investigating the full effect of the quota.

The law entered into force in 2006, and companies had two years to comply. In these two years, the proportion of women on ASA board was growing from 17.8% to 25.0%, see Figure 2. It is not clear whether the spillover effects on the C-suite began to occur already in the quota implementation period. However, I assume that it took some time before the spillover effects began to occur, and that the effects of the quota in 2006 and 2007 was small. As a consequence, I have chosen to include 2006 and 2007 in the pre-quota period. The pre-

quota period will therefore be based on four years instead of two. A longer pre-quota period is also preferred in order to draw an accurate picture of the period pre-quota. I will perform robustness checks to ensure that including 2006 and 2007 in the pre-quota period does not bias the results. The robustness checks will exclude the years 2006 and 2007, see section 7.5.

Additionally, the post-quota period will be divided into two periods in the analyses. The first period includes the first four years of the quota (2008-2011), while the second period includes the following four years (2012-2015). I will therefore be able to investigate the effects of the quota both short-term and long-term.

6.2 Treatment and control group

In order to make inferences about the spillover effects of the quota, a control group is needed. The treatment group will be affected by the quota, while the control group will not. Both groups should represent the same population (Everitt & Skrondal, 2010). I consider AS firms as an appropriate control group and ASA firms as an appropriate treatment group, since the quota only affected ASA firms and not AS firms. Furthermore, both types of firms are quite similar as they are present in Norway and stock-based companies. Many of the main features of the regulations are therefore the same for both types of firms. However, the sizes of AS and ASA firms usually differ and there is also more AS firms than ASA firms, with reference to section 2.4.1.

6.3 Robustness

The empirical analyses in this paper will apply an OLS multiple regression model (see section 5.3.3, footnote 10). The OLS model is based on different assumptions such as normality and homoscedasticity (Wooldridge, 2014). Failure to meet these assumptions can lead to biased estimates of coefficients and standard errors. Furthermore, observations in the data may exhibit large residuals or influence. In order to deal with these concerns, I will include a robust option in the STATA *regress* command in my empirical analyses. The robust option estimates the standard errors using the Huber-White sandwich estimators (UCLA Institute for Digital Research and Education, 2016). Hence, the standard errors will take into account the concerns discussed above, while the point estimates of the coefficients remain the same as in the ordinary OLS.

7. ANALYSIS

In this section, I will present and discuss the experimental setups that will be used when examining the four research questions. The variables used in the experimental setups are described in greater detail in Appendix 11.2. For each research question, I will also present the results from the regression analysis and discuss them in relation to previous studies. Finally, I will perform some robustness checks to validate the results.

7.1 How did the boardroom quota affect female representation in CEO positions?

My first research question is whether the boardroom quota affected female representation in CEO positions. As mentioned, I will use data from Dataset 1 to study the proportion of female CEOs, see section 5.1.

7.1.1 Experimental setup

To answer my first research question, I will compare the percentage of female CEOs for ASA firms (treatment group) and AS firms (control group) before and after 2008. Given these circumstances, I will be able to investigate the causal effect of the quota. I consider the use of the differences-in-differences estimator (hereafter diff-in-diff) as the most appropriate approach to examine the causal effect. The diff-in-diff estimator is defined as the difference in period means for the treatment group less the difference in the period means for the control group (Everitt & Skrondal, 2010).

First, I estimate the causal effect of the quota on the percentage of female CEOs. In general, the baseline regression is specified as follows:

$$Percentage\ of female\ CEOs_{it} = \beta_0 + \beta_1 ASA_i + \beta_2 Post_t + \beta_3 ASA_i \times Post_t + \varepsilon_{it}$$
$$\varepsilon_{it} = a_i + u_{it} \quad (1)$$

where *i* refers to the firm group and *t* refers to the time. The dependent variable measures the percentage of female CEOs in a firm group. ASA_i is a dummy variable used to differentiate CEOs in ASA firms and AS firms. It takes the value of one for ASA firms and zero for AS

firms. $Post_t$ is a dummy variable representing the quota implementation. It takes the value of one in the post-quota period, and zero in the pre-quota period. β_3 is the diff-in-diff estimator and represents the causal effect of the quota. Finally, the last term is the error term being time-invariant and varying over time.

Further, I expand equation (1) with variables controlling for firm size and industry. The regression is specified as follows:

$$\begin{aligned} Percentage\ of\ female\ CEOs_{it} \\ &= \beta_0 + \beta_1 ASA_i + \beta_2 Post_t + \beta_3 ASA_i \times Post_t + \beta_4 Controls_i \\ &+ \beta_5 Controls_i \times Post_t + \beta_6 Controls_i \times ASA_i \\ &+ \beta_7 \times Controls_i \times Post_t \times ASA_i + \varepsilon_{it} \\ &\varepsilon_{it} = a_i + u_{it} \end{aligned} \quad (2)$$

$Controls_i$ includes firm size dummies and a dummy variable for an industry where the workforce is dominated by women. The firm size dummies consist of *Smallsize*, *Mediumsize* and *Bigsize*. *Smallsize* indicates firms with no employees, *Mediumsize* indicates firms with between 1 and 49 employees and *Bigsize* indicates firms with 50 and more employees. Furthermore, *Femaledom* is a dummy variable indicating if the CEO work in an industry where the workforce is dominated by women. The latter variable is based on an additional analysis described in Appendix Table 12.

In the multiple regression presented above, the equation includes a three-way interaction term given as β_7. Three-way interactions involve an interplay of several variables. The interpretation of the three-way interaction term is therefore more complex than the common two-way interaction term. I have chosen to follow the procedure presented by Dawson and Richter (2006) to analyze the three-way interaction term. In short, the methodology is as follows. The dependent variable *Percentage of female CEOs*$_{it}$ is regressed on the independent variables ASA_i, $Post_t$ and $Controls_i$, as in equation (2). To interpret the three-way interactions, the procedure can be generalized to test the effect of ASA_i on *Percentage of female CEOs*$_{it}$ depending on different values of $Post_t$ and $Controls_i$. Dawson and Richter conduct this analysis by first computing the simple slopes of *Percentage of female CEOs*$_{it}$ on ASA_i at high and low values of $Post_t$ and $Controls_i$ (see the illustration in Appendix 11.1, Figure 10). Then, they test whether the simple slopes at combinations of high and low

values of $Post_t$ and $Controls_i$ differ significantly from zero. For a more detailed explanation and the mathematics behind this approach, see Appendix 11.1.

In this regression, we are dealing with aggregated data since the percentage of female CEOs in each firm group is calculated based on several firms. Hence, I need to use analytic weights in my regression in STATA (Kohler & Kreuter, 2005). The weighted variable is the number of firms used to calculate the percentage of female CEOs in each firm group.

7.1.2 Results

In the following, I will present the regression analysis and results regarding research question one. I will use the experimental setup discussed above.

I start the analysis by applying equation (2) without the interaction terms to investigate the relationship between the explanatory variables and the percentage of female CEOs. The results are reported in Table 2 Column (1) and (2). All coefficients are highly significant at the 1% level. First, I find that the percentage of female CEOs is on average 1.7 percentage points higher post-quota than pre-quota. This finding is in accordance with Wang and Kelan (2012), and Matsa and Miller (2011). Second, I find that ASA companies have on average 8.4 percentage points lower proportion of female CEOs than AS firms. Third, I find a 12.0 percentage points higher proportion of female CEOs in female dominated industries than in male dominated industries. This finding is reasonable as female dominated industries may have a larger number of female candidates that can be appointed to CEOs, as well as a broader female network that can help other females to reach top positions. Finally, medium sized firms have on average 4.3 and 7.3 percentage points higher proportion of female CEOs than small sized firms and big sized firms, respectively.

Furthermore, I divide the post-quota period into two periods (*2008-2011* and *2012-2015*), as explained in section 6.1. The results are presented in Column (3) and (4). I find no evidence of increased female representation in CEO positions in the first four years of the quota given as $Post_{2008\text{-}2011}$, while there is strong evidence of increased female representation in the following four years given as $Post_{2012\text{-}2015}$. There is also a significant increase in female CEOs between the two post-quota periods.

Despite a significant increase in the proportion of female CEOs post-quota, a control group is necessary to draw a causal conclusion from the quota. I apply equation (2) where the

three-way interaction term represents the causal effect of the quota, as explained in the experimental setup. The results are given in Table 3 and 4. Most importantly, the three-way interaction effects are insignificant, see Table 4 Column (1). This finding suggests a lack of positive spillover effects of the quota. When I further divide the post-quota period into two periods (*2008-2011* and *2012-2015*), some evidence was found suggesting short-term positive spillover effects, see Column (2) – (4). However, this finding only applies to large companies where the workforce is dominated by females.

Furthermore, I conduct the same analysis as presented above, except now I aggregate the firm group data to years.[11] I will therefore investigate the variation in the percentage of female CEOs between years and not between firm groups. I apply the baseline regression as presented in equation (1). The results are given in Table 5 Column (1). The coefficient of the interaction term is insignificant, indicating a lack of positive spillover effects. When dividing the post-quota coefficient into two periods (*2008-2011* and *2012-2015*), I find however weak evidence of positive short-term spillover effects, see Column (2) and (3).

Altogether, the results suggest limited evidence of positive spillover effects of the boardroom quota on female representation in CEO positions. However, I find some evidence of short-term spillover effects, especially in large companies where the workforce is dominated by women. That being said, the statistical significance is weak. Hence, it does not seem reasonable to conclude that there is evidence of positive spillover effects of the quota. This finding is in accordance with Bertrand et al. (2014).

[11] In an additional analysis, I have aggregated the firm group data in Dataset 1 to years. Hence, I will investigate the percentage of female CEOs in each year rather than the percentage of female CEOs in each firm group.

7.2 How did the boardroom quota affect female representation in EVP positions?

My second research question is whether the boardroom quota affected female representation in EVP positions. Dataset 3 is used to investigate the female representation in these positions, see section 5.3.

7.2.1 Experimental setup

To answer my second research question, I will compare the percentage of female EVPs in ASA firm before and after the quota. It is appropriate to study ASA firms since these firms are affected by the quota. However, by investigating only ASA firms I will not be able to compare the effect of the quota with a control group. Hence, the results of this analysis must be interpreted with caution.

I begin the analysis by estimating the change in female representation in EVP positions after the quota, in addition to include several control variables. The regression can be expressed as follows:

$$Percentage\ of\ female\ EVPs_{it} = \beta_0 + \beta_1 Post_t + \beta_2 AverageWage_{it} + \beta_3 AverageAge_{it} + \beta_4 Firm_i + u_{it} \quad (3)$$

where *i* refers to the group of EVPs in each firm and *t* refers to the time. The dependent variable is the percentage of female EVPs in the C-suite. $Post_t$ is a dummy variable taking the value of one in the post-quota period, and zero otherwise. This is the variable of interest, capturing the change in female representation post-quota. The control variables include $AverageWage_{it}$, $AverageAge_{it}$ and $Firm_i$. $AverageWage_{it}$ and $AverageAge_{it}$ refer to the average wage and age for each C-suite (excluding the CEO) each year. $Firm_i$ is a set of firm dummies, where nine firm dummies are included in the regression and the last one is included in the base group.

Firm dummies are included in the regression since we are dealing with panel data[12]. As we observe the same ten companies over time, there might be unobserved firm specific

[12] The data is defined as panel data since we observe the C-suite in the same ten companies over time.

effects that are time-invariant and correlated with the regressors. Unobserved firm specific effects can result in a biased and inconsistent OLS (Wooldridge, 2014). In order to control for these fixed effects, the firm specific effects are removed from the error term by including firm dummies. This method is called the dummy variable regression (Wooldridge, 2014). As a consequence, the time-invariant component, a_i, is taken out from the error term.

Lastly, the data used in this experimental setup is aggregated data. For the same reason as explained in section 7.1.1, I need to use analytic weights in the regression in STATA. The weighted variable is the number of EVPs that are used to calculate the percentage of female EVPs in each firm in each year.

7.2.2 Results

Further, I will present the results from the regression analysis regarding research question two. I will use the experimental setup presented above.

I start my analysis by applying equation (3). The estimates of the coefficients are reported in Column (1) of Table 6. Most importantly, the coefficient of $Post_{2008\text{-}2015}$ is positive and statistically significant. The coefficient of 0.0516 implies a 5.16 percentage points increase in the proportion of female EVPs post-quota. This result may indicate a positive spillover effect of the quota. However, a control group is needed to prove if the quota has had a causal effect on the representation of women.

Furthermore, I divide the post-quota period into two periods (*2008-2011* and *2012-2015*) to investigate the effects of the quota both short-term and long-term. The results are reported in Column (2) and (3). The coefficient of $Post_{2008\text{-}2011}$ is marginally significant at the 10% level while $Post_{2012\text{-}2015}$ is significant at 5%. The two coefficients are positive, indicating an increased proportion of female EVPs post-quota both short-term and long-term. There is, however, no significant increase in female EVPs between the two post-quota periods. This might indicate that the spillover effects have flattened out after the first four years of the quota.

Regarding the control variables, only *AverageAge* is significant, see Column (1) – (3). The coefficient of -0.0180 indicates that the proportion of female EVPs decreases on average by 1.8 percentage points when the average age of the C-suite increases by one year. Hence, C-suites with high average age tend to have few females on the committee. This is most likely due to a lower average age for female EVPs than their male counterparts.

Overall, there is evidence of an increased female representation in EVP positions post-quota. Previous literature has also concluded that higher proportion of females in the boardroom has resulted in a higher proportion of female executives (Bertrand et al., 2014; Joy, 2008; Matsa & Miller, 2011). Without a control group, it is however impossible to prove that this increase is due to the quota.

7.3 How did the boardroom quota affect the gender wage gap among CEOs?

My third research question is whether the boardroom quota affected the gender wage gap among CEOs. As mentioned earlier, Dataset 2 is used for the study on the gender wage gap among CEOs, see section 5.2.

7.3.1 Experimental setup

To answer the third research question, I will compare the gender wage gap among CEOs before and after the quota. With missing data on individuals and firm characteristics, I am not able to include control variables in the regression. Moreover, I am not able to distinguish between AS and ASA firms, and the analysis therefore lacks a treatment and control group. Thus, it will be impossible to investigate the causal effect of the quota. Due to these limitations, I need to interpret the regression results with caution.

I will use the following regression to test for reduced gender wage gap in CEO positions post-quota:

$$Log(CEO\ wage_{it}) = \beta_0 + \beta_1 Female_i + \beta_2 Post_t + \beta_3 Female_i \times Post_t + \varepsilon_{it}$$
$$\varepsilon_{it} = a_i + u_{it} \quad (4)$$

where *i* indexes the group of CEOs and *t* indexes the time. The dependent variable is the logarithm of the average wage for CEOs in each year. The logarithm of wage is used because it makes more sense to investigate the percentage change in wage rather than absolute changes. This approach follows several papers on gender wage gap such as Bertrand et al. (2014), Geiler and Renneboog (2014) and Matti et al (2016). I will use five different types of wage as the dependent variable; *Monthly earnings (NOK), Basic monthly salary (NOK), Variable additional allowances (NOK), Bonuses (NOK)* and *Overtime pay (NOK).*

The independent variables include $Female_i$, $Post_t$ and the interaction term $Female_i \times Post_t$. $Female_i$ takes the value of one if the group of CEOs are females, and zero if males. $Post_t$ is a dummy variable taking the value of one in the post-quota years and the value of zero in the pre-quota years. β_3 is the coefficient of the interaction term indicating the percentage change in gender wage gap between the pre-quota period and the post-quota period. Lastly, the error term is being time-invariant and varying over time.

The data used in this experimental setup is aggregated data. Following the same arguments as in section 7.1.1 and 7.2.1, I will include analytic weights in the regression in STATA. The weighted variable is the number of CEOs used to calculate the average wage for men and women in each year.

7.3.2 Results

Further, I will present and discuss the results from the regression analysis when examining research question three. The analysis is based on the experimental setup presented above.

I start the analysis by examining whether there is a significant gender wage gap in CEO positions. The analysis is conducted by applying equation (4) without the interaction term. The results are presented in Table 7A Column (1) – (5). We observe a highly significant gender wage gap in all types of monthly earnings. Female CEOs earn on average 28.9% less in basic monthly salary, 31.4% less in monthly earnings, 66.1% less in bonuses, 34.5% less in overtime pay, and finally, 36.8% less in variable additional allowances than their male counterparts. These results are in accordance with Matti et al. (2016), but inconsistent with Geiler and Renneboog (2014). The results should however be interpreted with caution due to the lack of proper control variables.

Furthermore, I find that the basic monthly salary, monthly earnings and bonuses for all CEOs increased significantly post-quota, see Column (1) – (3). The coefficients are still positive and significant when dividing the post-quota period into two (*2008-2011* and *2012-2015*), see Table 7B Column (1) – (3). The results suggest a higher wage level in the post-quota period compared with the pre-quota period. There is however limited evidence suggesting higher wage post-quota for overtime pay and variable additional allowances, see Table 7A and 7B Column (4) and (5).

So far, I have presented evidence suggesting a significant gender wage gap among CEOs, as well as a higher wage level post-quota. Next, I will investigate the effects of the quota by applying equation (4). This time, I will include the interaction term to capture the change in gender wage gap post-quota. The results are given in Table 8. I find no significant change in the gender wage gap post-quota in terms of basic monthly salary, monthly earnings, bonuses and variable additional allowances, see Table 8A. The interaction terms are still insignificant when dividing the post-quota period into two (*2008-2011* and *2012-2015*), see Table 8B. This finding suggests a lack of spillover effects of the quota on the gender wage gap in CEO positions. This finding is in accordance with the study by Bertrand et al. (2014), which finds an insignificant change in gender wage gap among highly qualified women after the quota.

Regarding the overtime pay, I find evidence of an increased gender wage gap post-quota, see Table 8A and 8B Column (4). However, this type of monthly earnings is based on work performance beyond contractual working hours. This result might therefore indicate that working hours for male CEOs have increased more than for females post-quota.

In sum, my findings suggest no evidence of reduced gender wage gap among CEOs post-quota, which is in accordance with previous literature (Bertrand et al., 2014). This result might indicate a lack of spillover effects of the boardroom quota.

7.4 How did the boardroom quota affect the gender wage gap among EVPs?

My fourth and final research question is whether the boardroom quota affected the gender wage gap among EVPs. As mentioned, I will use data from Dataset 3 to study the gender wage gap among EVPs, see section 5.3.

7.4.1 Experimental setup

To answer the fourth research question, I will compare the gender wage gap among EVPs in ASA firms before and after the boardroom quota. Following the same discussion as in 7.2.1, I will not be able to compare the change in gender wage gap with a control group when only investigating ASA firms. Thus, it is impossible to interpret the causal effect of the quota. The results must therefore be interpreted with caution.

I begin the analysis by estimating the percentage change in gender wage gap among EVPs post-quota, in addition to include several control variables. The regression is specified as follows:

$$\begin{aligned} Log(EVP\ wage_{it}) &= \beta_0 + \beta_1 Female_i + \beta_2 Post_t + \beta_3 Female_i \times Post_t + \beta_4 HR_{it} \\ &+ \beta_5 Communication_{it} + \beta_6 Age_{it} + \beta_7 Age_{it}^2 + \beta_8 Firm_i + \varepsilon_{it} \\ \varepsilon_{it} &= a_i + u_{it} \end{aligned} \quad (5)$$

where *i* refers to each EVP at time *t*. The dependent variable is the logarithm of wage for each EVP. The logarithm of wage is used instead of wage in level form, following the same arguments as in section 7.3.1. Both *Fixed Salary (NOK)* and *Bonuses (NOK)* will be used as the dependent variable.

$Female_i$ is a dummy variable taking the value of one if the EVP is female, zero otherwise. $Post_t$ is a dummy variable as well, taking the value of one in post-quota years and zero in pre-quota years. The coefficient of $Female_i \times Post_t$ captures the percentage change in the gender wage gap between the pre-quota period and the post-quota period. Hence, the interaction term is the variable of interest in this study.

The regression also includes several control variables. HR_{it} and $Communication_{it}$ are included in the regression to control for the different types of EVP positions. These variables take the value of one if the EVP headed the HR or communication department in a specific year, respectively. Furthermore, I assume that wage will increase by experience, but at a diminishing rate. To capture this effect Age_{it} and Age_{it}-*squared* are included in the regression as a proxy for experience. Age_{it} refers to the age of each EVP in each year. Furthermore, the wage level will most likely differ between firms due to different remuneration policy. To control for this, I have included firm dummies given as $Firm_i$. Finally, the error term is both time-invariant and varying over time.

7.4.2 Results

In the following, I will present the regression analysis and results regarding research question four. I will use the experimental setup as discussed above.

I start the analysis by investigating whether female EVPs have significantly lower compensation than their male counterparts. I apply equation (5) without the interaction term. Table 9A and 10A Column (1) summarize the results. Women in EVP positions earn on average 16.2% and 31.2% less than their male counterparts in fixed salary and bonuses, respectively. The results are highly significant at the 1% level. These findings are in accordance with previous research (Bertrand & Hallock, 2001; Geiler & Renneboog, 2014; Matti et al., 2016).

Further, I find that EVPs earn on average 20.8% more in fixed salary and 29.6% more in bonuses post-quota, see Table 9A and 10A Column (1). These findings suggest a higher wage level in the post-quota period compared with the pre-quota period. These results are highly significant at the 1% level.

So far, I have found a significant gender wage gap among EVPs, as well as a significantly higher wage level post-quota. In order to investigate the change in gender wage gap post-quota, I will apply equation (5) with the interaction term. The results are given in Table 9A Column (2) when using *Fixed Salary* as the dependent variable. Of particular interest is the interaction term, which captures the change in gender wage gap post-quota. The interaction term is insignificant, indicating that the gender wage gap has not changed after the quota. The same result applies when using *Bonuses* as the dependent variable, see results in Table 10A Column (2). The interaction terms are also insignificant for *Fixed Salary* and

Bonuses when dividing the post-quota period into two periods (*2008-2011* and *2012-2015*), see Table 9A and 10A Column (3) and (4). Altogether, these results may indicate a lack of spillover effects of the quota on the gender wage gap in EVP positions. This finding is in accordance with Bertrand et al. (2014) which find an insignificant change in the gender wage gap among highly qualified women after the quota. The result must however be interpreted with caution due to the absence of control group.

Regarding the control variables, only *HR* and the *Age* terms are statistically significant. The coefficient of *HR* is highly significant (at the 1% level) when *Fixed Salary* is the dependent variable. The coefficient indicates that EVPs in HR positions earn on average 21.3% less in fixed salary than other EVP positions, see Table 9A Column (1). There is also some evidence (significant at the 10% level) that EVPs in HR positions earn 18.8% less in bonuses than other EVP roles, see Table 10A Column (1).

As explained in the experimental setup, the *Age* terms are included in the regression as a proxy for experience. The non-linear *Age* terms capture that age has diminishing returns to fixed salary, see Table 9A and 9B. The finding suggests that fixed salary increases with age as people become more experienced, but at a diminishing rate. When using bonuses as the dependent variable, I find an insignificant impact of age on bonuses, see Table 10B.

Overall, my findings suggest a lack of spillover effects of the quota on the gender wage gap in EVP positions. This finding suggests that the gender equality that has occurred in the boardroom have not been spread to the EVP positions. This is in accordance with Bertrand et al. (2014).

7.5 Robustness checks

So far, my findings suggest limited evidence of positive spillover effects of the quota on CEOs and EVPs in terms of increased female representation and reduced gender wage gap. I will in this sub-section perform some robustness checks to validate my results. I will conduct the same analyses as presented earlier in this section, except now I will exclude the years 2006 and 2007 as discussed in section 6.1. For the sake of brevity, the regression tables are not presented in this paper. Instead, I will explain and discuss the most important results from the robustness checks.

First, I conduct the same analysis as presented in section 7.1.2, but I exclude the years 2006 and 2007. The three-way interaction term is the variable of interest as it represents the causal effect of the quota on female representation in CEO positions. Most importantly, the three-way interaction effect on large companies in female dominated industries remain positive, but has changed from being weakly significant at 10% to insignificant. Furthermore, all interaction terms when aggregating the data from firm groups to years are insignificant. In sum, weakly significant coefficients of the interaction terms have become insignificant in the robustness checks. Hence, it seems reasonable to conclude that there is limited evidence of spillover effects of the quota on female representation in CEO positions.

Second, I explore the robustness of my results presented in section 7.2.2 by excluding the years 2006 and 2007 in the regression analyses. The post-term is the variable of interest as it represents the change in female representation in EVP positions post-quota. $Post_{2008\text{-}2015}$ remains positive, but has changed from being significant at the 5% level to insignificant. When dividing the post-quota period into two, the coefficients of $Post_{2008\text{-}2011}$ and $Post_{2012\text{-}2015}$ also remain positive. However, $Post_{2008\text{-}2011}$ has changed from being weakly significant at 10% to insignificant, while $Post_{2012\text{-}2015}$ has changed from being significant at 5% to significant at only 10%. In total, all the post-term coefficients have become insignificant or weakly significant in the robustness checks. Hence, it does not seem reasonable to conclude that there is evidence of positive spillover effects of the quota on female representation in EVP positions.

Third, I investigate the robustness in the analyses in section 7.3.2 by excluding 2006 and 2007. The interaction term indicates the percentage change in gender wage gap among CEOs post-quota. Most importantly, the interaction term remains insignificant in all regression analyses of *Basic monthly salary*, *Monthly earnings*, *Bonuses* and *Variable additional*

allowances. When using *Overtime Pay* as the dependent variable, the interaction term remains negative, but have changed from being significant at 5% to 10%. Overall, the results do not drastically deviate from my initial results.

Fourth and finally, I perform robustness checks on the analyses as presented in section 7.4.2. I conduct the same analyses, but now I exclude the years 2006 and 2007. The interaction term is the variable of interest capturing the percentage change in gender wage gap among EVPs post-quota. The interaction term remains insignificant in all regressions. The results from the robustness check therefore remain similar as my initial findings.

After the robustness checks of the initial results, my findings still suggest a lack of positive spillover effects of the boardroom quota on CEO and EVP positions in terms of increased female representation and reduced gender wage gap.

8. LIMITATIONS AND FURTHER ANALYSIS

During my work with this study, I came across several interesting aspects and alternative methods to my research questions. Based on these, I will in this section present suggestions for further research as well as limitations of this study.

The most obvious limitation of this study is the lack of control group in all empirical analyses. I acknowledge that without a proper control group it is impossible to draw causal conclusions of the quota. Thus, one can enhance this study by collecting more data that includes a comparison group. In this paper, I argue that AS companies are an appropriate control group to use, see section 6.2. Another control group that could be relevant are Swedish firms. Sweden has not passed a boardroom quota law and Swedish firms are therefore not affected by the quota. Matsa and Miller (2013) suggest that firms in Nordic countries are an appropriate comparison group as they are considered to be quite similar to firms in Norway.

Furthermore, the study on EVPs is based on Dataset 3 which only includes ten ASA companies. The small sample is due to the time-consuming process of gathering data by hand, in combination with restricted time for this study. I acknowledge that it may be insufficient to draw conclusions about the population from a small sample. Thus, a larger sample of ASA firms in combination with a control group as discussed above will improve the analyses of EVPs.

One additional limitation of this study is the limited number of control variables that are included in the regressions. Regarding the analysis on CEO's remuneration, there is particular room for improvements. Differences in education, experience, outside offers and leadership ability can justify gender wage gap and should therefore be controlled for. Moreover, firm and industry characteristics can explain wage differences between CEOs and would ideally be included in the regressions. This can be achievable by gathering more detailed data on CEO's remuneration.

Moreover, female EVPs tend to have HR and similar staff positions with reference to the descriptive statistics in section 5.3.4. One can argue that these roles are important, but do not serve as the gateway to CEO positions (Joy, 2008). Thus, the positions female EVPs have might be an explanation on why there are so few female CEOs. For further research, it could be interesting to investigate this further.

Finally, one can argue that increased female representation in the C-suite can create positive spillover effects further down in the organization. The C-suite may act as senior role models and inspiration figures in the organization. Because of this, the decisions and actions made by the C-suite might have a big impact on the organization. For further research, it would be interesting to investigate the relationship between female representation in the C-suite and the impact on gender equality in the rest of the organization.

9. FINAL DISCUSSION AND CONCLUSIONS

In 2006, Norway passed a boardroom quota law requiring a 40% representation of each gender on ASA boards. The law gave companies until January 2008 to meet the quota's requirements. In this paper, I have investigated whether the boardroom quota has had positive spillover effects on CEOs and EVPs in terms of higher female representation and reduced gender wage gap.

This is an important study because of two reasons. Firstly, several countries are now implementing similar laws as the boardroom quota in Norway. It is therefore important that all effects of the quota are discussed thoroughly and properly. Secondly, the spillover effects of the quota can give an indication of whether the quota is an effective tool to improve gender equality in the rest of the organization, as well as in society as a whole.

When it comes to research question one, some evidence was found suggesting short-term positive spillover effects on CEOs in some of the sample groups. However, this finding only applies to large companies where the workforce is dominated by females. When looking at the selected sample as a whole, I find limited evidence that the boardroom quota has had positive spillover effects on female representation. Altogether, it does not seem reasonable to conclude that there are positive spillover effects of the boardroom quota on CEOs. This finding is in accordance with Bertrand et al. (2014).

When examining research question two, I find evidence of a higher proportion of female EVPs post-quota. This is in accordance with previous research (Bertrand et al., 2014; Joy, 2008; Matsa & Miller, 2011). That being said, it is impossible to prove that the quota has had a causal effect on the female representation without a control group. Also, the statistical significance is weak in the robustness checks. Hence, it does not seem reasonable to conclude that there is evidence of positive spillover effects of the quota on EVPs.

When it comes to research question three, I find a significant gender wage gap in all types of monthly earnings for CEOs. However, I find no indication of a reduced gender wage gap post-quota. Bertrand et al. (2014) find also an insignificant change in gender wage gap when investigating the quota's effect on highly qualified women.

When examining research question four, I document a significant gender wage gap among EVPs after controlling for firm, age and HR positions among other factors. I find

however no evidence of reduced gender wage gap among EVPs post-quota. This result is in accordance with previous literature (Bertrand et al., 2014).

To conclude, I find no evidence of a reduced gender wage gap in CEO and EVP positions post-quota. While there is an observed improvement in the representation of women in CEO and EVP positions, there is no compelling evidence that this improvement is due to the quota. Even though the quota has been successful in its primary objective of increasing women in the boardroom, this study suggests a lack of spillover effects of the quota on CEOs and EVPs. One might therefore argue that the boardroom quota is not an effective tool to improve gender disparity in the rest of the organization, at least not in the C-suite.

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Figure 1
Percentage of women at various organizational levels

The figure shows the average percentage of women at various organizational levels. Women account for 52% at the entry level, while only 2% at the top of the organization. The figure indicates that women become increasingly underrepresented as they move higher up in the organization. Women at the entry level are 2.1 less likely than men to be promoted into the middle management, while women on the executive committee are five times less likely than men to become a CEO. The data is collected from McKinsey & Company's *Women Matter 2012* report.

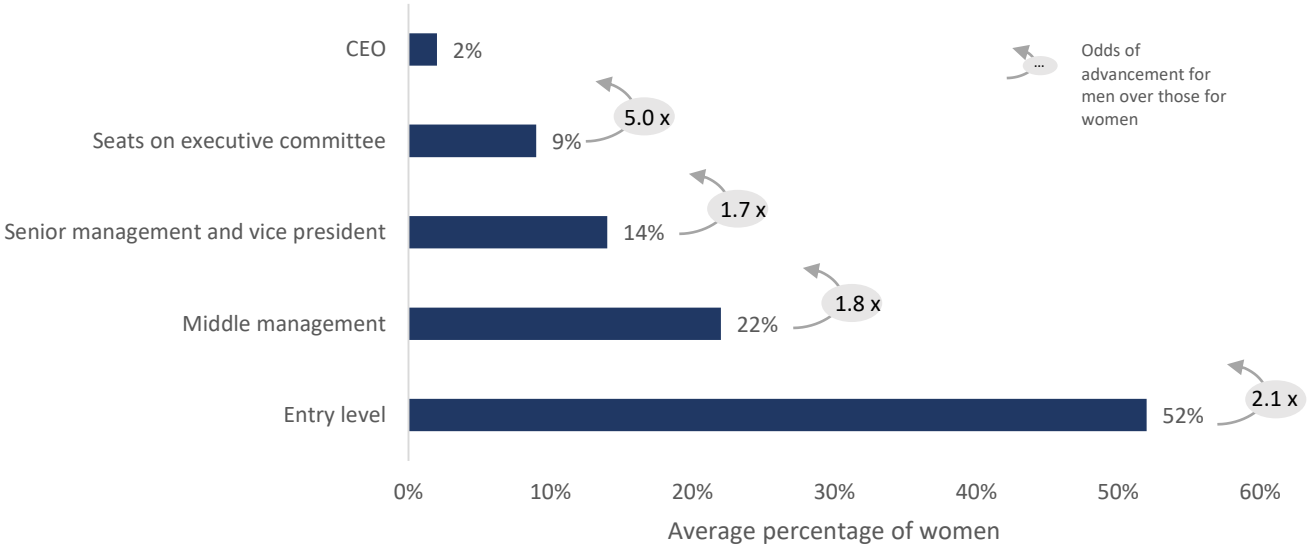


Figure 2
Percentage of women on the board, 2004-2016

The figure shows the annual proportion of women in the boardroom in AS and ASA companies. The figure shows that the proportion of women on ASA boards increased from 8% in 2004 to nearly 40% in 2008. This increase is due to the boardroom quota. AS companies are not affected by the quota and did therefore not experienced a similar increase as ASA firms. Today, there are far less women in the boardroom in AS companies than in ASA companies. The calculations are based on data from Statistics Norway (2016).

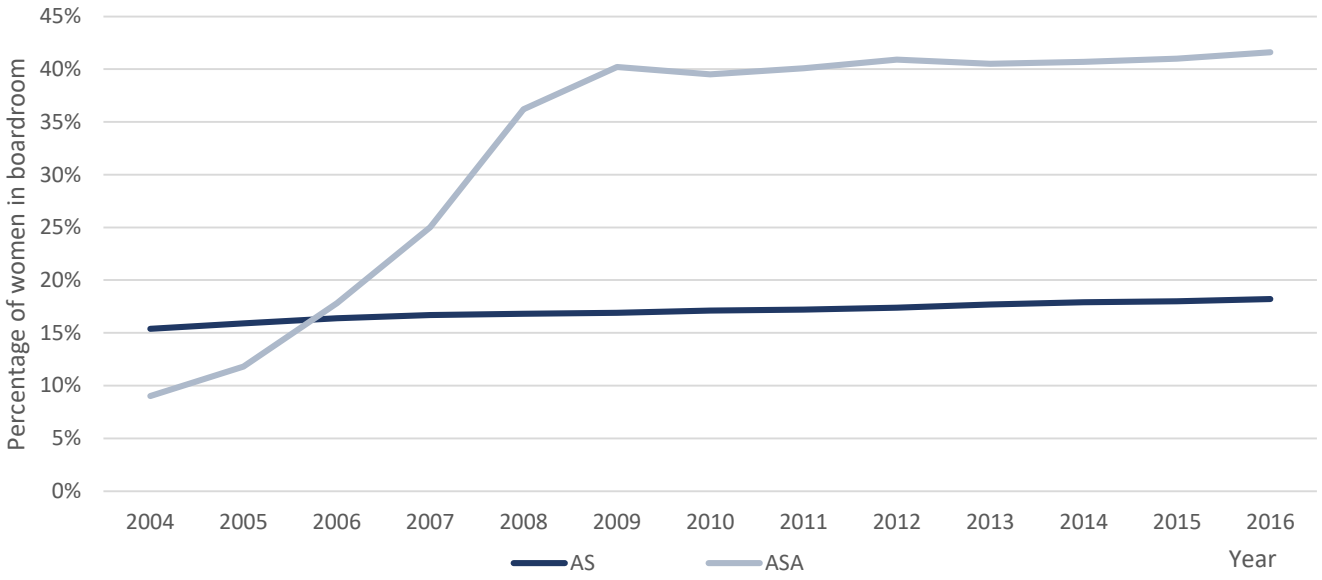


Figure 3
Percentage of female CEOs by legal form, 2004-2016

The figure reports the percentage of female CEOs in AS and ASA companies from 2004 to 2016. During the whole period, AS companies have experienced a higher proportion of female CEOs than ASA companies. The proportion of female CEOs has been increasing during the period for both types of firms. The figure is based on data from Dataset 1.

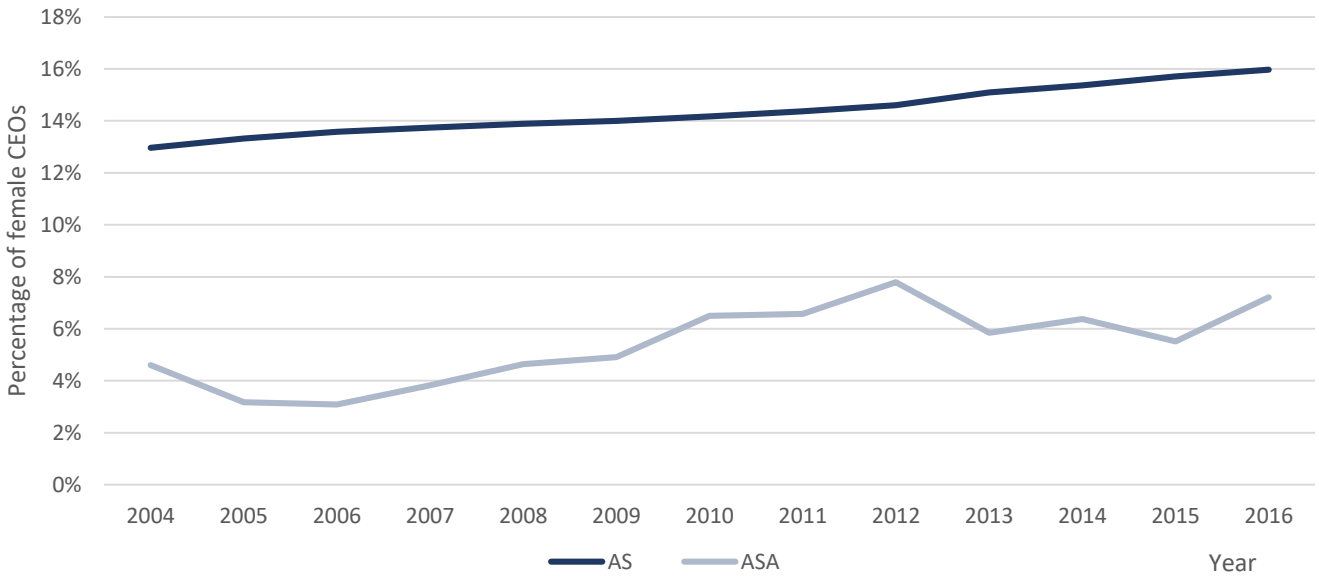
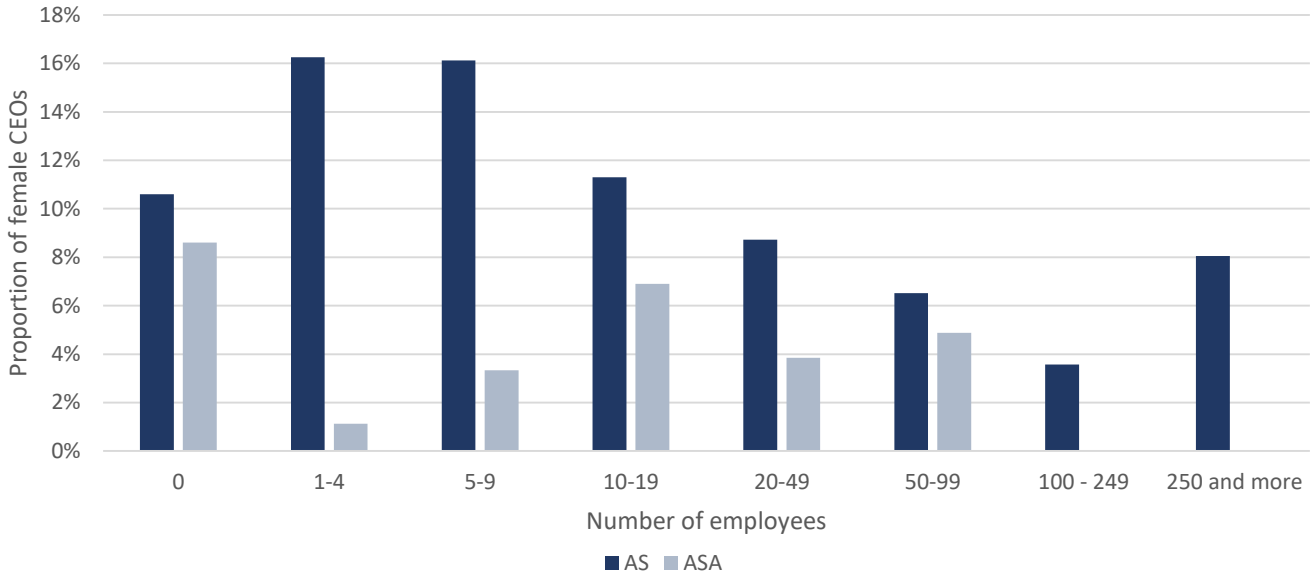


Figure 4
Percentage of female CEOs by size group and legal form

The figures show the proportion of female CEOs by size group for AS and ASA firms. Figure A reports the numbers from the year 2004, while Figure B reports the numbers from 2015. AS firms have a higher percentage of female CEOs than ASA firms in all size groups. The proportion of female CEOs in AS firms was highest in medium sized companies in 2004 and 2015, particularly with 1-19 employees. It is difficult to draw such conclusions for ASA firms. The figures are based on data from Dataset 1.

A: Year 2004



B: Year 2015

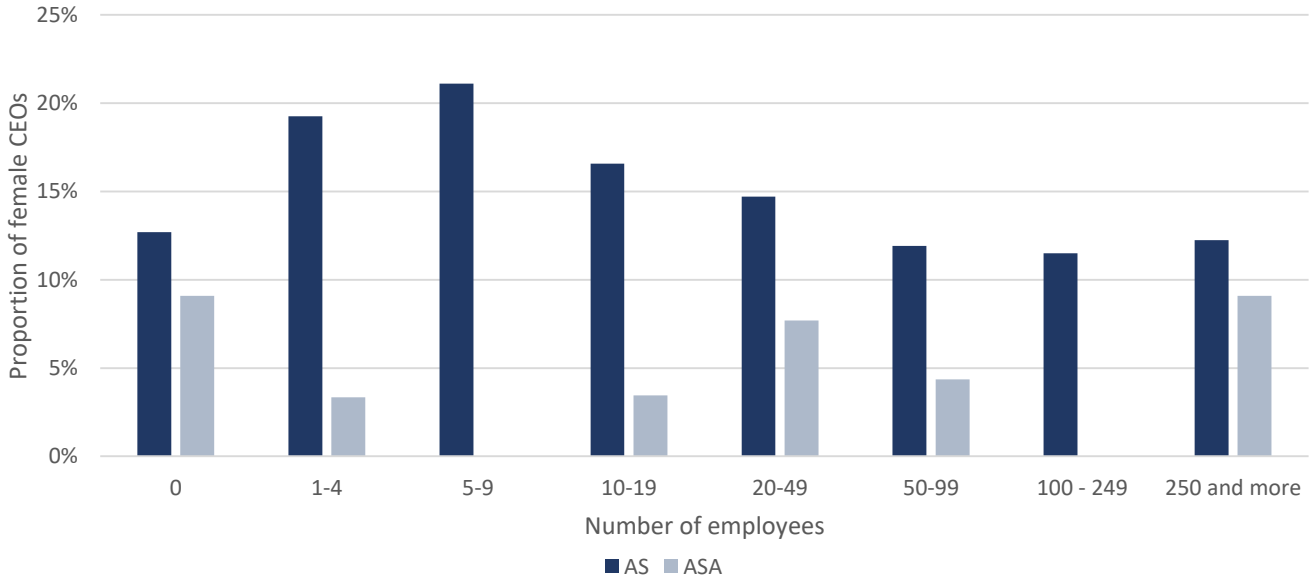
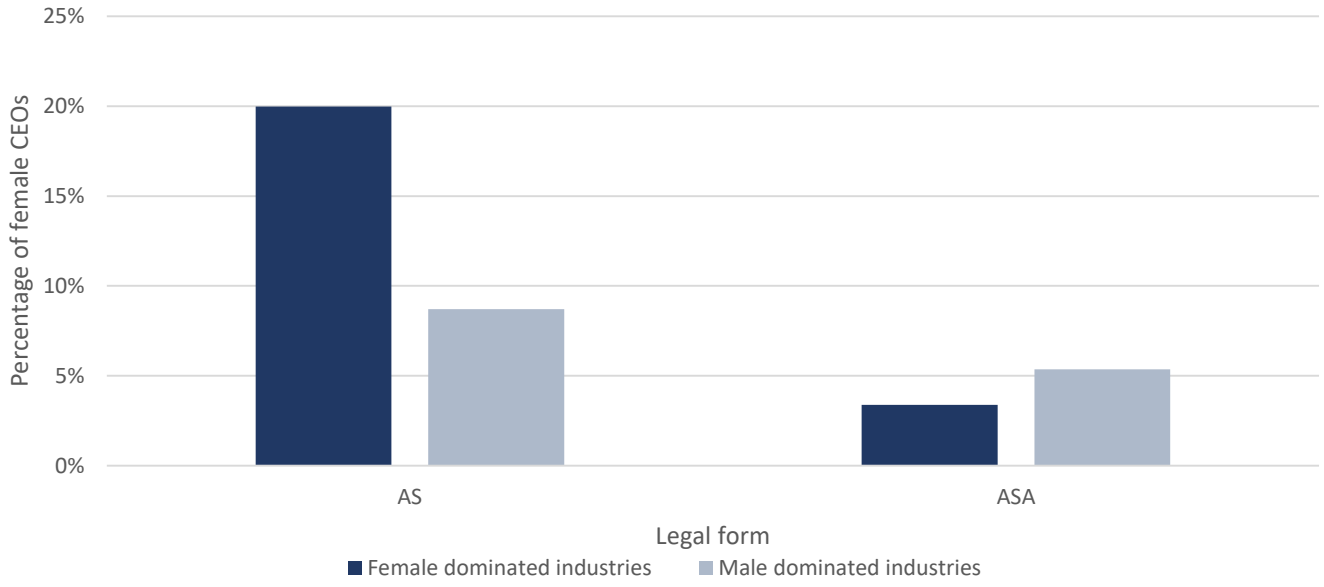


Figure 5
Percentage of female CEOs by industry and legal form

The figures show the percentage of female CEOs in companies where the workforce is dominated by women and by men for both AS and ASA companies. Figure A reports the numbers from the year 2004, while Figure B reports the numbers from 2015. In 2004, there was a higher percentage of female CEOs in female dominated industries for AS firms, while there was a higher percentage of female CEOs in male dominated industries for ASA firms. In 2015, there was a higher percentage of female CEOs in female dominated industries than male dominated industries for both types of firms. The classification of industries into female dominated industries is given in Appendix Table 12. The figures are based on data from Dataset 1.

A: Year 2004



B: Year 2015

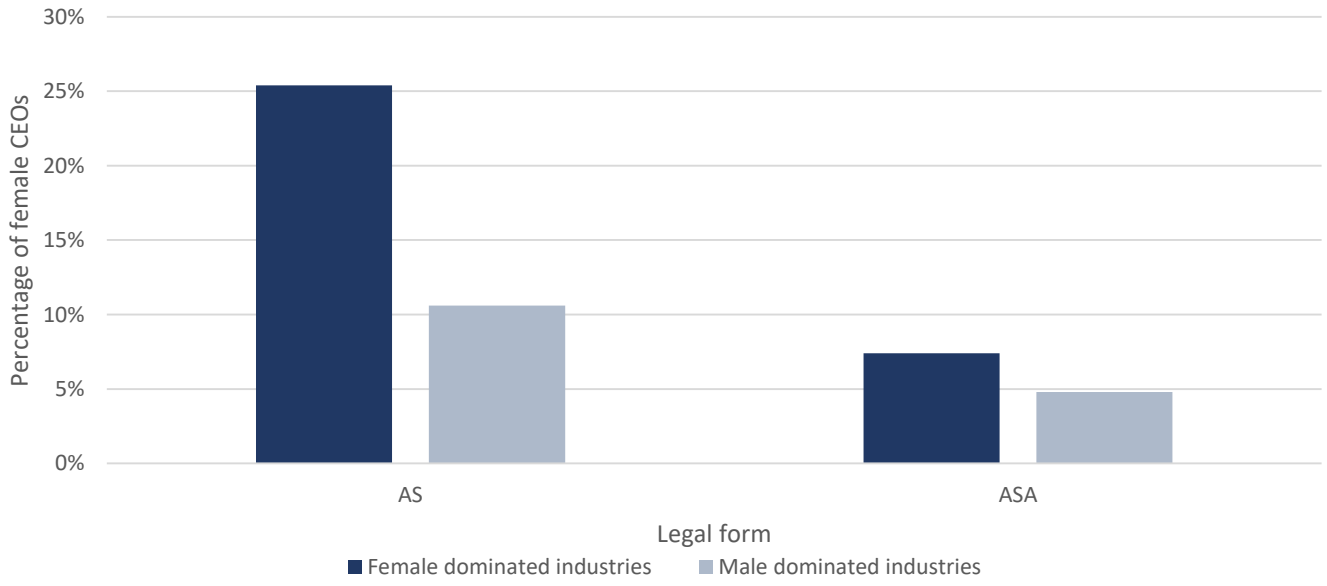
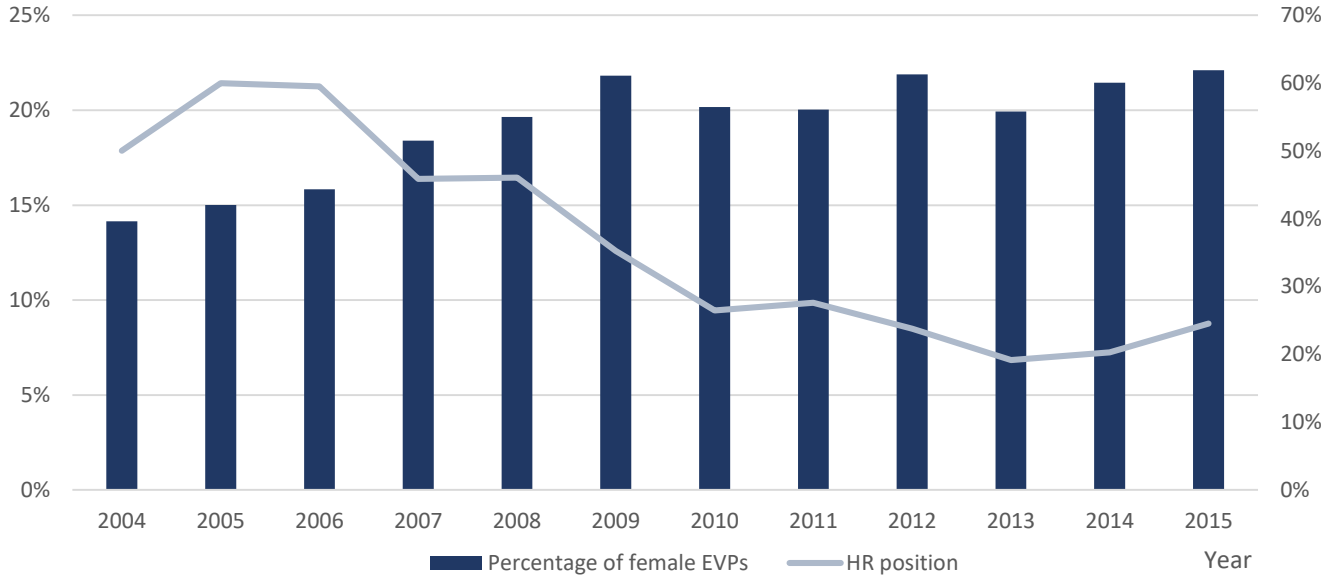


Figure 6
Percentage of female EVPs, 2004-2015

Figure A shows the percentage of female EVPs from 2004 to 2015. The figure shows that the percentage of female EVPs has increased from 14.2% in 2004 to 22.1% in 2015. While one out of two female EVPs had an HR position in 2004, only one out of four female EVPs had an HR position in 2015.

Figure B shows that female EVPs accounted for 83% of HR positions in 2004, while the male counterparts only accounted for 17%. In 2015, female EVPs accounted for 71% of HR positions, while male EVPs accounted for 29%. The data in Figure 6A and 6B is based on the case study of the ten largest ASA firms.

A: Female EVPs and their positions



B: Female proportion in HR position

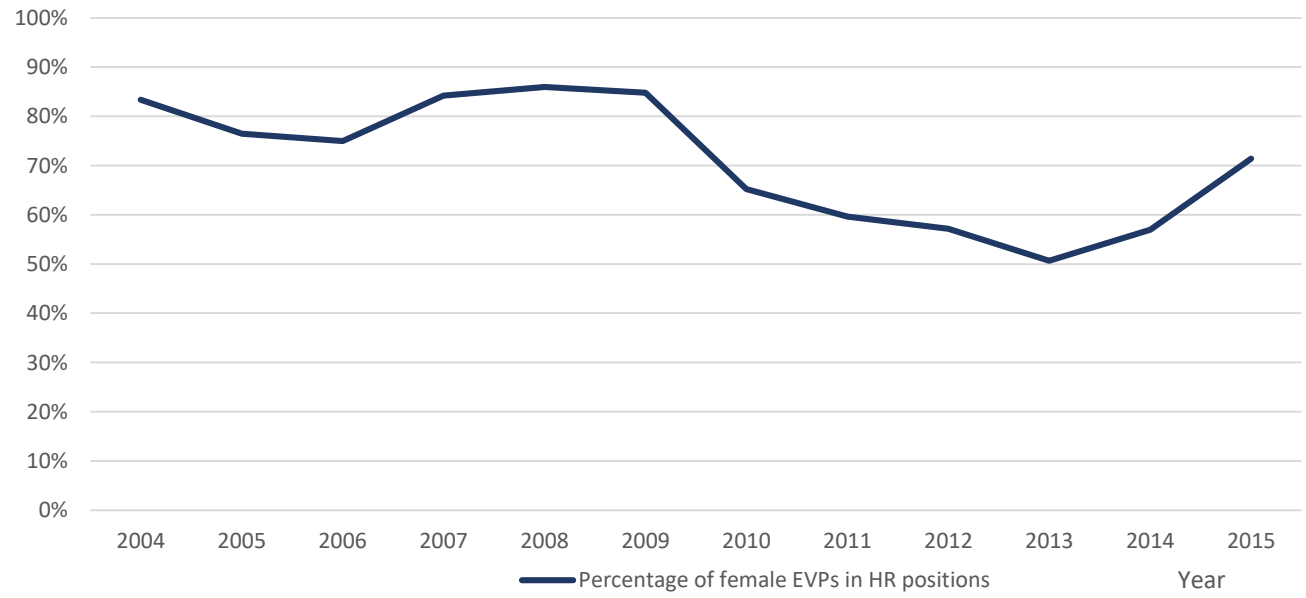
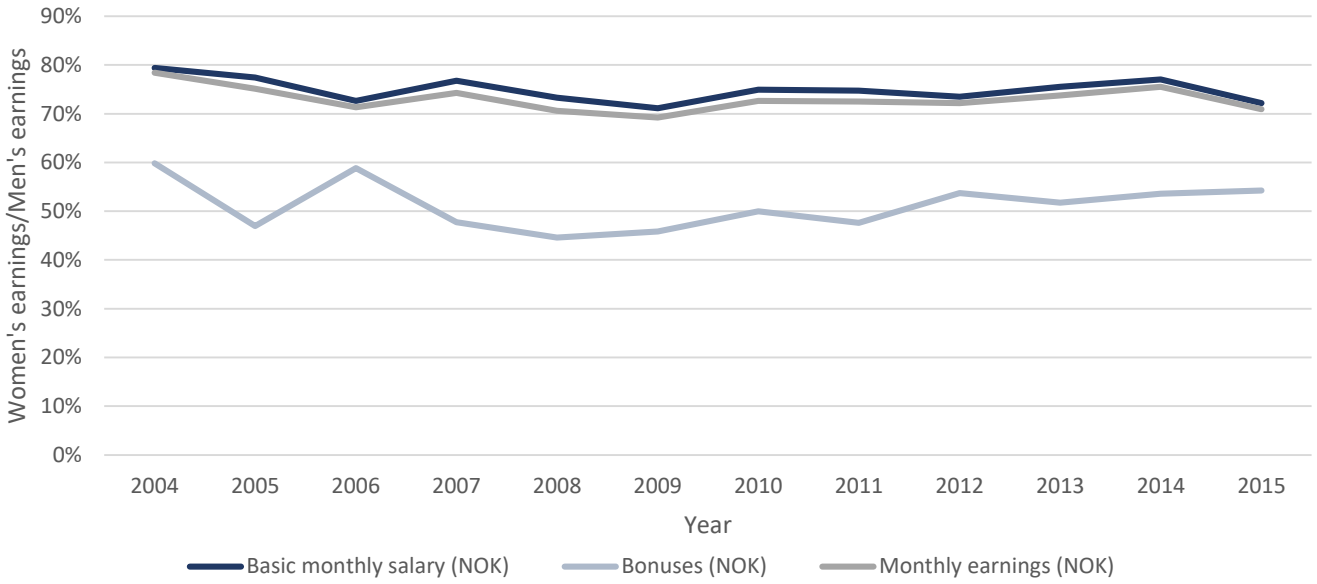


Figure 7
Gender wage gap among CEOs, 2004-2015

The figures show the gender wage gap among CEOs given as women's earnings as a percentage of men's earnings. Figure 7A shows that the gender wage gap in basic monthly salary and monthly earnings have increased during the period from 79% to 72% and 78% to 71%, respectively. The gender wage gap in bonuses, overtime pay and variable additional allowance has been fluctuating during the period, see Figure 7A and 7B. Overall, the gender wage gap among CEOs has increased during the period. The figures are based on data from Dataset 2.

A: Basic monthly salary (NOK), Bonuses (NOK) and Monthly earnings (NOK)



B: Overtime pay (NOK) and Variable additional allowances (NOK)

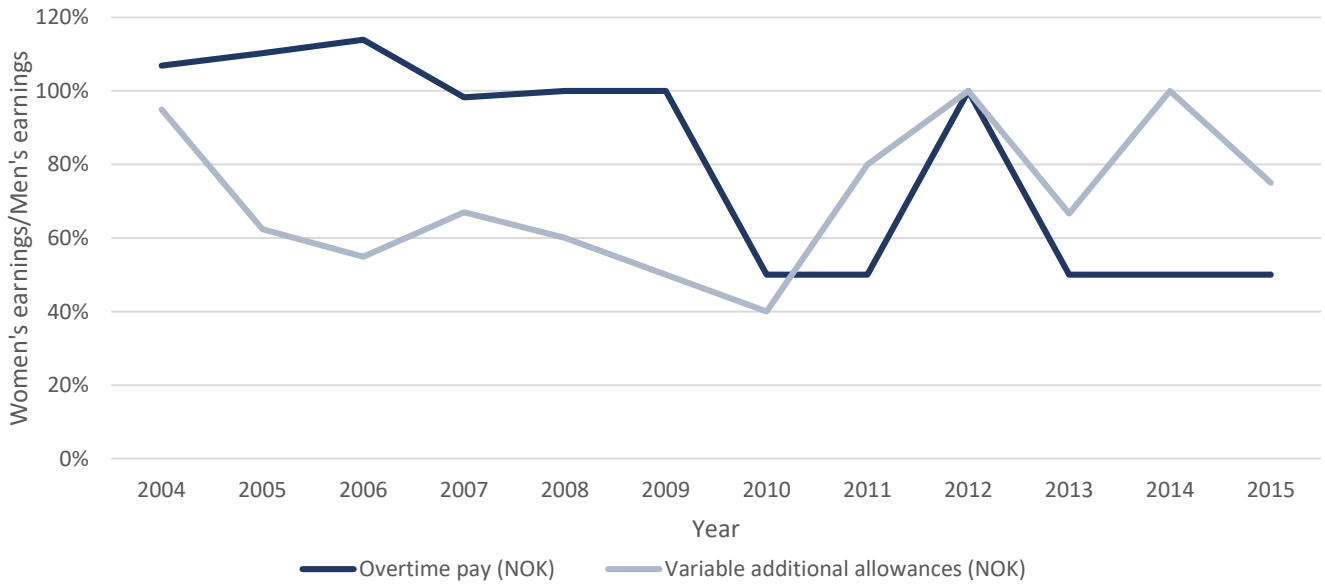


Figure 8
Gender wage gap among EVPs, 2004-2015

The figure shows the gender wage gap among EVPs given as women's earnings as a percentage of men's earnings. The gender wage gap in fixed salary and bonuses has decreased during the period. In 2015, the gender wage gap was 87.1% in fixed salary and 71.2% in bonuses. As mentioned earlier, there are a lot of missing remuneration data in 2004 and 2005. The figure is based on data from Dataset 3.

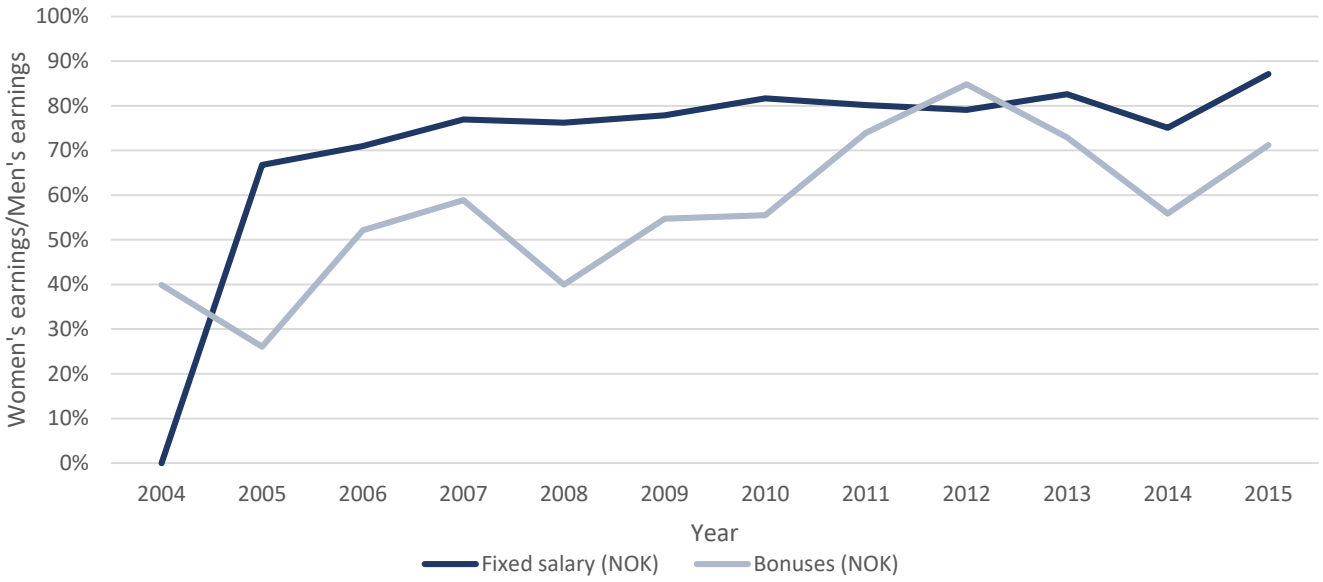


Figure 9
Overview of the most important dates in this study

The figure shows the most important dates in this study, as well as the event window. In 2003, Norway passed the boardroom quota law on a voluntary basis requiring 40% representation of each gender on ASA boards. The law became compulsory in January 2006. The law gave ASA firms two years to comply by January 2008.

The time between 2004 and 2007 is defined as the pre-quota period in this study, while the time between 2008 and 2015 is defined as the post-quota period. Furthermore, the post-quota period in this study is divided into two periods: 2008-2011 and 2012-2015.

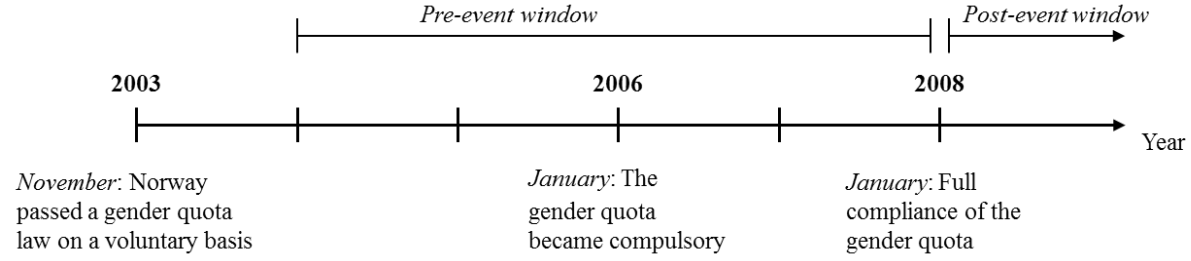


Table 1
Number of CEOs by legal form, 2004-2015

The table presents the number of CEOs in AS and ASA companies from 2004 to 2015. There is a greater number of CEOs in AS firms than ASA firms. The number of CEOs in ASA firms has been more than halved during the period, while it has almost doubled for AS firms. This is because the number of ASA firms has dropped, while the number of AS firms has increased during this period (Store norske leksikon, 2015). Data is gathered from Statistics Norway (2016).

Year	*CEOs AS*	*CEOs ASA*
2004	125 614	543
2005	129 397	505
2006	137 486	487
2007	155 047	497
2008	164 042	474
2009	169 725	407
2010	170 896	354
2011	172 210	335
2012	176 577	308
2013	189 883	274
2014	200 683	251
2015	210 240	236

Table 2
Percentage of female CEOs without interaction terms

The table provides the regression results from equation (2) without interaction terms. The dependent variable is the percentage of female CEOs. The regression is conducted in order to investigate the relationship between the dependent variable and the explanatory variables. The regression is estimated with robust standard errors. *t* statistics are given in parentheses. Significance levels are *** 1%, **5%, *10%.

Dependent variable: Percentage of female CEOs	(1)	(2)	(3)	(4)
$Post_{2008\text{-}2015}$	0.0171***	0.0171***		
	(2.85)	(2.85)		
ASA	-0.0838***	-0.0838***	-0.0828***	-0.0828***
	(-14.35)	(-14.35)	(-14.17)	(-14.17)
Femaledom	0.120***	0.120***	0.120***	0.120***
	(17.68)	(17.68)	(18.05)	(18.05)
Mediumsize	0.0429***		0.0430***	0.0430***
	(6.84)		(6.92)	(6.92)
Bigsize	-0.0299***	-0.0728***	-0.0297***	-0.0297***
	(-5.07)	(-12.76)	(-5.10)	(-5.10)
Smallsize		-0.0429***		
		(-6.84)		
$Post_{2008\text{-}2011}$			0.00930	
			(1.31)	
$Post_{2012\text{-}2015}$			0.0240***	0.0147**
			(3.48)	(2.05)
$Pre_{2004\text{-}2007}$				-0.00930
				(-1.31)
Constant	0.0661***	0.109***	0.0659***	0.0752***
	(11.02)	(17.27)	(10.97)	(12.47)
Adjusted R-squared	0.429	0.429	0.432	0.432
Observations	2752	2752	2752	2752

Table 3
Percentage of female CEOs with the three-way interaction term

The table reports the coefficient estimates of equation (2). The dependent variable is the percentage of female CEOs. The three-way interaction term in equation (2) is the variable of interest, which is interpreted in Table 4. *t* statistics are reported in parentheses and significance levels are indicated by ***1%, **5%, *10%.

Dependent variable: Percentage of female CEOs	(1)
$Post_{2008\text{-}2015}$	0.00267
	(0.33)
ASA	0.00351
	(0.22)
Femaledom	0.112***
	(11.08)
Mediumsize	0.0299***
	(3.18)
Bigsize	-0.0487***
	(-5.24)
$Post_{2008\text{-}2015}$ASA	0.00166
	(0.07)
Femaledom$Post_{2008\text{-}2015}$	0.0116
	(0.88)
FemaledomASA	-0.133***
	(-10.03)
Mediumsize$Post_{2008\text{-}2015}$	0.0180
	(1.47)
MediumsizeASA	-0.0753***
	(-4.51)
Bigsize$Post_{2008\text{-}2015}$	0.0248**
	(2.08)
BigsizeASA	-0.0114
	(-0.67)
Femaledom$Post_{2008\text{-}2015}$ASA	0.0257
	(1.36)
Mediumsize$Post_{2008\text{-}2015}$ASA	-0.0203
	(-0.88)
Bigsize$Post_{2008\text{-}2015}$ASA	0.00337
	(0.13)
Constant	0.0766***
	(12.30)
Adjusted R-squared	0.430
Observations	2752

Table 4
Interpretation of the three-way interaction term

The table reports the interpretation of the three-way interaction term based on the procedure presented by Dawson and Richter (2006). The procedure is generalized to test the differences in *Percentage of female CEOs* between AS and ASA firms, depending on different values of *Post* and *Controls*. The interpretation of the three-way interaction term is described in more detail in Appendix 11.1. Significance levels are indicated by ***1%, **5%, *10%.

Dependent variable: Percentage of female CEOs	*The effect of going from $Pre_{2004\text{-}2007}$ to $Post_{2008\text{-}2015}$*		*The effect of going from $Pre_{2004\text{-}2007}$ to $Post_{2008\text{-}2011}$*		*The effect of going from $Pre_{2004\text{-}2007}$ to $Post_{2012\text{-}2015}$*		*The effect of going from $Post_{2008\text{-}2011}$ to $Post_{2012\text{-}2015}$*	
Given combinations of the controls	(1)		(2)		(3)		(4)	
	Coeff.	*t*	*Coeff.*	*t*	*Coeff.*	*t*	*Coeff.*	*t*
Mediumsize=1 & *Femaledom*=1	0.007	0.44	0.016	0.87	0.002	0.08	0.014	0.60
Bigsize=1 & *Femaledom*=1	0.031	1.43	0.046*	1.73	0.018	0.61	0.028	0.78
Smallsize=1 & *Femaledom*=1	0.027	1.24	0.027	1.12	0.034	1.17	-0.007	-0.22
Mediumsize=1 & *Femaledom*=0	-0.019	-1.44	-0.014	-0.95	-0.022	-1.37	0.008	0.44
Bigsize=1 & *Femaledom*=0	0.005	0.34	0.016	0.85	-0.006	-0.31	0.022	0.95
Smallsize=1 & *Femaledom*=0	0.002	0.07	-0.002	-0.11	0.010	0.30	-0.013	-0.38
Adjusted R^2	0.430		0.427		0.440		0.432	
Observations	2,752		1,848		1,836		1,820	

Table 5
Percentage of female CEOs aggregated on a year-level

The table reports the regression from equation (1). The percentage of female CEOs is the dependent variable. The data used in this regression is aggregated from firm-groups to years. The regression is estimated with robust standard errors. *t* statistics are in parentheses and significance levels are indicated by ***1%, **5%, *10%.

Dependent variable: Percentage of female CEOs	(1)	(2)	(3)
$Post_{2008\text{-}2015}$	0.0128***		
	(4.27)		
ASA	-0.0973***	-0.0973***	-0.0856***
	(-25.62)	(-24.31)	(-16.47)
$Post_{2008\text{-}2015}$ASA	0.00941		
	(1.53)		
$Post_{2008\text{-}2011}$		0.00683***	
		(3.44)	
$Post_{2012\text{-}2015}$		0.0180***	0.0112***
		(6.28)	(4.39)
$Post_{2008\text{-}2011}$ASA		0.0117*	
		(1.78)	
$Post_{2012\text{-}2015}$ASA		0.00965	-0.00202
		(1.36)	(-0.26)
$Pre_{2004\text{-}2007}$			-0.00683***
			(-3.44)
$Pre_{2004\text{-}2007}$ASA			-0.0117*
			(-1.78)
Constant	0.134***	0.134***	0.141***
	(83.93)	(79.63)	(134.20)
Adjusted R-squared	0.565	0.852	0.852
Observations	24	24	24

Table 6
Percentage of female EVPs

The table reports the coefficient estimates of equation (3). The dependent variable is the percentage of female EVPs in the C-suite. The regression is conducted with *AverageWage*, *AverageAge* and firm dummies as controls. The regression includes ten firm dummies, where Norwegian Air Shuttle ASA is in the base group. *t* statistics are reported in parentheses. Significance levels are indicated by ***1%, **5%, *10%.

Dependent variable: Percentage of female EVPs	(1)	(2)	(3)
$Post_{2008\text{-}2015}$	0.0516**		
	(2.02)		
AverageWage	1.53e-08	1.21e-08	1.21e-08
	(1.40)	(1.03)	(1.03)
AverageAge	-0.0180***	-0.0180***	-0.0180***
	(-4.36)	(-4.31)	(-4.31)
$Post_{2008\text{-}2011}$		0.0462*	
		(1.81)	
$Post_{2012\text{-}2015}$		0.0643**	0.0181
		(2.12)	(0.94)
$Pre_{2004\text{-}2007}$			-0.0462*
			(-1.81)
Constant	1.060***	1.067***	1.113***
	(5.14)	(5.09)	(5.11)
Firm dummies	Yes	Yes	Yes
Adjusted R-squared	0.473	0.472	0.472
Observations	120	120	120

Table 7
CEO remuneration without the interaction term

The table reports the regression of CEO remuneration based on equation (4) without the interaction term. The dependent variable is the logarithm of wage. The results are given for different types of wage; *Basic monthly salary*, *Monthly earnings*, *Bonuses*, *Overtime pay* and *Variable additional allowance*. *t* statistics are given in parentheses and stars indicate the significance levels: ***1%, **5%, *10%.

A: Post-quota period is given as 2008-2015

Dependent variable: log(CEO Wage)	(1) Basic monthly salary	(2) Monthly earnings	(3) Bonuses	(4) Overtime pay	(5) Variable additional allowances
Female	-0.289***	-0.314***	-0.661***	-0.345***	-0.368***
	(-12.95)	(-13.80)	(-12.39)	(-2.88)	(-3.28)
$Post_{2008-2015}$	0.202***	0.203***	0.230**	0.183	0.102
	(8.64)	(7.54)	(2.43)	(1.36)	(1.47)
Constant	10.94***	11.02***	8.419***	4.997***	6.075***
	(538.80)	(435.25)	(86.77)	(41.61)	(134.69)
Adjusted R-Squared	0.898	0.902	0.813	0.224	0.338
Observations	24	24	24	24	24

B: Post-quota period is divided into two periods (2008-2011 and 2012-2015)

Dependent variable: log(CEO Wage)	(1) Basic monthly salary	(2) Monthly earnings	(3) Bonuses	(4) Overtime pay	(5) Variable additional allowances
Female	-0.293***	-0.317***	-0.662***	-0.335***	-0.374***
	(-17.79)	(-18.27)	(-12.32)	(-2.91)	(-3.42)
$Post_{2008-2011}$	0.159***	0.162***	0.221*	0.297**	0.0279
	(6.60)	(5.68)	(2.04)	(2.39)	(0.37)
$Post_{2012-2015}$	0.239***	0.237***	0.237**	0.0866	0.164
	(11.57)	(9.48)	(2.52)	(0.52)	(1.58)
Constant	10.94***	11.02***	8.419***	4.995***	6.076***
	(530.74)	(427.15)	(84.69)	(40.81)	(133.25)
Adjusted R-squared	0.946	0.939	0.805	0.282	0.361
Observations	24	24	24	24	24

Table 8
CEO remuneration with the interaction term

The table reports the coefficient estimates of equation (4) including the interaction term. The dependent variable is the logarithm of different types of wage; *Basic monthly salary*, *Monthly earnings*, *Bonuses*, *Overtime pay* and *Variable additional allowance*. *t* statistics are in parentheses and significance levels are indicated by ***1%, **5%, *10%.

A: Post-quota period is given as 2008-2015

Dependent variable: log(CEO Wage)	(1) Basic monthly salary	(2) Monthly earnings	(3) Bonuses	(4) Overtime pay	(5) Variable additional allowances
Female	-0.266***	-0.289***	-0.608***	0.0565	-0.404***
	(-8.90)	(-8.31)	(-3.93)	(0.34)	(-4.20)
$Post_{2008-2015}$	0.209***	0.210***	0.245*	0.297*	0.0912
	(7.13)	(6.18)	(2.05)	(1.89)	(1.16)
$FemalePost_{2008-2015}$	-0.0304	-0.0329	-0.0695	-0.529**	0.0478
	(-0.74)	(-0.73)	(-0.43)	(-2.50)	(0.27)
Constant	10.93***	11.02***	8.409***	4.917***	6.082***
	(463.34)	(369.21)	(73.05)	(37.53)	(136.27)
Adjusted R-squared	0.894	0.898	0.806	0.304	0.307
Observations	24	24	24	24	24

B: Post-quota period is divided into two periods (2008-2011 and 2012-2015)

Dependent variable: log(CEO Wage)	(1) Basic monthly salary	(2) Monthly earnings	(3) Bonuses	(4) Overtime pay	(5) Variable additional allowances
Female	-0.266***	-0.289***	-0.608***	0.0565	-0.404***
	(-8.44)	(-7.88)	(-3.73)	(0.32)	(-3.99)
$Post_{2008-2011}$	0.167***	0.173***	0.254*	0.382**	0.0738
	(5.50)	(4.74)	(1.82)	(2.76)	(0.99)
$Post_{2012-2015}$	0.246***	0.243***	0.237*	0.223	0.107
	(9.46)	(7.51)	(1.92)	(1.04)	(0.84)
$FemalePost_{2008-2011}$	-0.0401	-0.0492	-0.146	-0.418	-0.183
	(-0.88)	(-0.97)	(-0.76)	(-1.57)	(-0.87)
$FemalePost_{2012-2015}$	-0.0316	-0.0288	-0.0145	-0.591**	0.205
	(-0.79)	(-0.66)	(-0.09)	(-2.46)	(0.91)
Constant	10.93***	11.02***	8.409***	4.917***	6.082***
	(439.56)	(350.27)	(69.30)	(35.61)	(129.28)
Adjusted R-squared	0.924	0.935	0.792	0.342	0.391
Observations	24	24	24	24	24

Table 9
Fixed salary for EVPs

The table reports the coefficient estimates of equation (5). The dependent variable is the logarithm of fixed salary. Firm dummies are included in the regression with Norwegian Air Shuttle ASA in the base group. The joint effect of *Age* and *Age-squared* is tested using an F-test, see Table 9B. *t* statistics are in parentheses and significance levels are indicated by ***1%, **5%, *10%.

A: Regression

Dependent variable: log(Fixed Salary)	(1)	(2)	(3)	(4)
Female	-0.162***	-0.160***	-0.169***	-0.178***
	(-5.94)	(-3.38)	(-3.63)	(-5.14)
HR	-0.213***	-0.214***	-0.206***	-0.206***
	(-7.27)	(-7.12)	(-7.37)	(-7.37)
Communication	-0.0744	-0.0745	-0.0744	-0.0744
	(-1.41)	(-1.40)	(-1.61)	(-1.61)
Age	0.0462**	0.0463**	0.0420*	0.0420*
	(2.07)	(2.06)	(1.95)	(1.95)
Age2	-0.000324	-0.000325	-0.000287	-0.000287
	(-1.43)	(-1.43)	(-1.31)	(-1.31)
$Post_{2008-2015}$	0.208***	0.208***		
	(10.62)	(9.35)		
$FemalePost_{2008-2015}$		-0.00250		
		(-0.05)		
$Post_{2008-2011}$			0.127***	
			(5.26)	
$Post_{2012-2015}$			0.275***	0.148***
			(10.87)	(6.56)
$FemalePost_{2008-2011}$			-0.00964	
			(-0.20)	
$FemalePost_{2012-2015}$			0.0170	0.0267
			(0.35)	(0.70)
$Pre_{2004-2007}$				-0.127***
				(-5.26)
$FemalePre_{2004-2007}$				0.00964
				(0.20)
Constant	12.51***	12.50***	12.62***	12.74***
	(23.52)	(23.22)	(24.44)	(24.70)
Firm dummies	Yes	Yes	Yes	Yes
Adjusted R-squared	0.554	0.553	0.587	0.587
Observations	835	835	835	835

B: F-test

Age+Age2=0	(1)	(2)	(3)	(4)
F-statistic	4.32	4.26	3.81	3.81
Prob>F	0.0379**	0.0393**	0.0512*	0.0512*

Table 10
Bonuses for EVPs

The table reports the coefficient estimates of equation (5) using the logarithm of bonuses as the dependent variable. The joint effect of *Age* and *Age-squared* is tested below using an F-test, see Table 10B. *t* statistics are in parentheses. Stars indicates significance levels: ***1%, **5%, *10%.

A: Regression

Dependent variable: Log(Bonuses)	(1)	(2)	(3)	(4)
Female	-0.312***	-0.313*	-0.336**	-0.461***
	(-3.45)	(-1.95)	(-2.07)	(-3.80)
HR	-0.188*	-0.188*	-0.158*	-0.158*
	(-1.95)	(-1.91)	(-1.65)	(-1.65)
Communication	-0.319	-0.319	-0.311	-0.311
	(-1.29)	(-1.29)	(-1.37)	(-1.37)
Age	-0.0246	-0.0246	-0.0296	-0.0296
	(-0.29)	(-0.29)	(-0.35)	(-0.35)
Age2	0.000435	0.000436	0.000479	0.000479
	(0.52)	(0.51)	(0.56)	(0.56)
$Post_{2008-2015}$	0.296***	0.296***		
	(4.52)	(3.99)		
$FemalePost_{2008-2015}$		0.000819		
		(0.01)		
$Post_{2008-2011}$			0.225***	
			(2.64)	
$Post_{2012-2015}$			0.352***	0.127*
			(4.41)	(1.75)
$FemalePost_{2008-2011}$			-0.126	
			(-0.71)	
$FemalePost_{2012-2015}$			0.110	0.235*
			(0.62)	(1.69)
$Pre_{2004-2007}$				-0.225***
				(-2.64)
$FemalePre_{2004-2007}$				0.126
				(0.71)
Constant	12.77***	12.77***	12.96***	13.18***
	(5.61)	(5.55)	(5.72)	(5.84)
Firm dummies	Yes	Yes	Yes	Yes
Adjusted R-squared	0.218	0.216	0.227	0.227
Observations	665	665	665	665

B: F-test

Age+Age2=0	(1)	(2)	(3)	(4)
F-statistic	0.08	0.08	0.12	0.12
Prob>F	0.7718	0.7742	0.7290	0.7290

11. APPENDIX

Table 11
Mapping the industries in SIC2002 to the industrial classification of SIC2007

The table shows how the industries in SIC2002 are mapped to the industries in SIC2007 (marked in bold). I have grouped the different industries in SIC2002 to the industry classification of SIC2007 based on assumptions.

Accommodation and food service activities
Hotels and restaurants

Activities of extraterritorial organisations and bodies
Extra-territorial organizations and bodies

Activities of household as employers; undifferentiated goods- and services-producing activities of households for own account
Activities of households with employed persons

Administrative and support service activities
Renting of machinery and equipment without operator and of personal and household goods
Other business activities

Agriculture, forestry and fishing
Agriculture, hunting and related service activities
Forestry, logging and related service activities
Fishing, fish farming and related service activities

Arts, entertainment and recreation
Recreational, cultural and sporting activities

Construction
Construction

Education
Education

Electricity, gas, steam and air conditioning supply
Electricity, gas, steam and hot water supply

Financial and insurance activities
Financial intermediation, except insurance and pension funding
Insurance and pension funding, except compulsory social security
Activities auxiliary to financial intermediation

Human health and social work activities
Health and social work

Information and communication
Publishing, printing and reproduction of recorded media

Manufacturing
Manufacture of food products and beverages
Manufacture of tobacco products
Manufacture of textiles
Manufacture of wearing apparel, dressing and dyeing of fur
Tanning and dressing of leather, manufacture of luggage, handbags, saddlery, harness and footwear
Manufacture of wood and of products of wood and cork, except furniture, manufacture of articles of straw and plaiting materials
Manufacture of pulp, paper and paper products
Manufacture of coke, refined petroleum products and nuclear fuel

Manufacture of chemicals and chemical products
Manufacture of rubber and plastic products
Manufacture of other non-metallic mineral products
Manufacture of basic metals
Manufacture of fabricated metal products, except machinery and equipment
Manufacture of machinery and equipment n.e.c.
Manufacture of office machinery and computers
Manufacture of electrical machinery and apparatus n.e.c.
Manufacture of radio, television and communication equipment and apparatus
Manufacture of medical, precision and optical instruments, watches and clocks
Manufacture of motor vehicles, trailers and semi-trailers
Manufacture of other transport equipment
Manufacture of furniture, manufacturing n.e.c.

Mining and quarrying

Mining of coal and lignite, extraction of peat
Extraction of crude petroleum and natural gas, service activities incidental to oil and gas extraction excluding surveying
Mining of uranium and thorium ores
Mining of metal ores
Other mining and quarrying

Other service activities

Activities of membership organizations n.e.c.
Other service activities

Professional, scientific and technical activities

Computers and related activities
Research and development

Public administration and defence; compulsory social security

Public administration and defence, compulsory social security

Real estate activities

Real estate activities

Total

Total

Transportation and storage

Land transport; transport via pipelines
Water transport
Air transport
Supporting and auxiliary transport activities, activities of travel agencies
Post and telecommunications

Unspecified

Unspecified

Water supply; sewerage, waste management and remediation activities

Recycling
Collection, purification and distribution of water
Sewage and refuse disposal, sanitation and similar activities

Wholesale and retail trade; repair of motor vehicles and motorcycles

Sale, maintenance and repair of motor vehicles and motorcycles, retail sale of automotive fuel
Wholesale trade and commission trade, except of motor vehicles and motorcycles
Retail trade, except of motor vehicles and motorcycles; Repair of personal and household goods

Table 12
Female dominated industries

The table shows the average proportion of all women in the workforce by industry. The data is provided by Statistics Norway from 2004 to 2015. The time period and the industry classification in this table are in accordance with Dataset 1.

I have calculated the average proportion of females working within each industry. In total, the female labor force participation rate in the period 2004-2015 was 47.15%. Industries with female labor force participation rate over 47.15% are therefore *relatively* dominated by women. In absolute terms, industries with female participation rate over 50% are female dominated. Female dominated industries are marked with *Yes* in the table below.

In this paper, I have defined *female dominated industries* as industries where the female labor force participation rate is over 47.15%. Industries that are not female dominated are defined as male dominated industries.

Industry (SIC2007)	**Average female proportion 2004-2015**	**>50%**	**>47.15%**
Other service activities	65.54%	Yes	Yes
Mining and quarrying	19.69%		
Construction	7.87%		
Electricity, gas, steam and air conditioning supply	22.83%		
Professional, scientific and technical activities	38.30%		
Financial and insurance activities	49.17%		Yes
Administrative and support service activities	43.42%		
Human health and social work activities	81.64%	Yes	Yes
Manufacturing	23.42%		
Information and communication	31.54%		
Activities of extraterritorial organisations and bodies	64.59%	Yes	Yes
Agriculture, forestry and fishing	23.56%		
Arts, entertainment and recreation	49.28%		Yes
Activities of household as employers	50.52%	Yes	Yes
Public administration and defence; compulsory social security	48.70%		Yes
Real estate activities	34.49%		
Accommodation and food service activities	60.66%	Yes	Yes
Transportation and storage	22.78%		
Education	64.92%	Yes	Yes
Unspecified	54.05%	Yes	Yes
Water supply; sewerage, waste management and remediation activities	16.14%		
Wholesale and retail trade; repair of motor vehicles and motorcycles	47.92%		Yes
Total	**47.15%**		

11.1 The three-way interaction term

The multiple regression in equation (2) in section 7.1.1 includes a three-way interaction term. The three-way interaction term involves an interplay of several variables. The interpretation of this term is more complex than the common two-way interaction term. In this section, I will present a mathematical explanation on how the three-way interaction term can be interpreted, following Dawson and Richter (2006).

First of all, equation (2) is written as follows:

$$Percentage\ of\ female\ CEOs_{it} = \beta_0 + \beta_1 ASA_i + \beta_2 Post_t + \beta_3 ASA_i \times Post_t + \beta_4 Controls_i + \\ + \beta_5 Controls_i \times Post_t + \beta_6 Controls_i \times ASA_i + \beta_7 \times Controls_i \times Post_t \times ASA_i + \varepsilon_{it}$$

The multiple regression presented above includes a three-way interaction term captured by the coefficient β_7. One way to interpret the three-way interaction term involves plotting the relationship between *ASA* and *Percentage of female CEOs* at high and low values of *Post* and *Controls*. This is illustrated in Figure 10. The procedure is then generalized to test the effect of *ASA* on *Percentage of female CEOs* depending on different values of *Post* and *Controls*. To examine this, I will test if the difference in simple slopes of *Percentage of female CEOs* on *ASA* at combinations of high and low values of *Post* and *Controls* differ significantly from zero, illustrated as (s) in Figure 10.

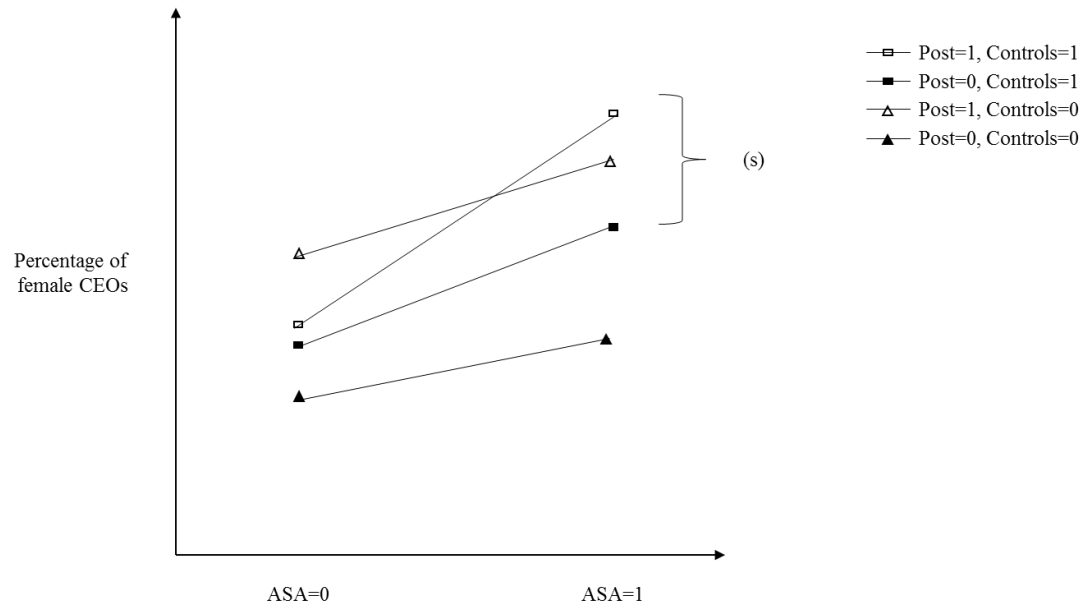


Figure 10: Illustration of the three-way interaction term

Further, equation (2) presented above can be rewritten as follows:

$$Percentage\ female\ CEOs_{it} = (\beta_0 + \beta_2 Post_t + \beta_4 Controls_i + \beta_5 Controls_i \times Post_t) + (\beta_1 + \beta_3 Post_t + \beta_6 Controls_i + \beta_7 \times Controls_i \times Post_t) \times ASA_i + \varepsilon_{it}$$

The first set of parentheses represents the interception of *Percentage of female CEOs* against *ASA* in Figure 10, while the second set of parentheses represents the slope. Recall that *Controls* and *Post* are dummies, which take the value of one or zero. Thus, there are four conditions that describe the relationship between the *Percentage of female CEOs* and *ASA*: (1) *Post*=1 and *Controls*=1, (2) *Post*=1 and *Controls*=0, (3) *Post*=0 and *Controls*=1, and (4) *Post*=0 and *Controls*=0. The slopes of these four lines can be written as:

(1) $\beta_1 + \beta_3 Post_{=1} + \beta_6 Controls_{=1} + \beta_7 \times Controls_{=1} \times Post_{=1}$
(2) $\beta_1 + \beta_3 Post_{=1} + \beta_6 Controls_{=0} + \beta_7 \times Controls_{=0} \times Post_{=1}$
(3) $\beta_1 + \beta_3 Post_{=0} + \beta_6 Controls_{=1} + \beta_7 \times Controls_{=1} \times Post_{=0}$
(4) $\beta_1 + \beta_3 Post_{=0} + \beta_6 Controls_{=0} + \beta_7 \times Controls_{=0} \times Post_{=0}$

In this study, I will investigate the effect of the quota by testing if the *Percentage of female CEOs* has increased more for ASA firms than for AS firms when going from pre-quota period to post-quota period. Therefore, I need to investigate the difference in simple slopes of *Percentage of female CEOs* on *ASA* when going from *Post*=0 to *Post*=1. Consequently, it is the difference between slope (1) and (3) and the difference between slope (2) and (4) that are of interest in this study, holding *Controls*=1 and *Controls*=0 constant respectively. The difference between each pair of slopes is given Table 4.

Furthermore, *Controls* includes dummies for female dominated industries and size groups. *Femaledom* is a dummy variable taking the value of one if the industry is female dominated and zero otherwise. The size groups include three dummy variables: *Smallsize*, *Mediumsize* and *Bigsize*. Hence, there are six different combinations of the *Controls*, given in Table 4.

11.2 List of variables

Variable name	Description
Age	Independent variable. Variable regarding the age of an EVP for a given year.
ASA	Independent variable. Dummy variable regarding the legal form of the firm. The variable takes the value of 1 if the firm is an ASA firm, while it takes the value of 0 if the firm is an AS firm.
AverageAge	Independent variable. Variable regarding the average age for EVPs in the C-suite within a firm for a specific year.
AverageWage	Independent variable. Variable regarding the average wage for EVPs in the C-suite within a firm for a specific year.
Basic monthly salary	Dependent variable. This type of wage is fixed and paid monthly.
Bigsize	Independent variable. Dummy variable regarding the size of the firm where the CEO works. It takes the value of 1 if the firm is big sized, and zero otherwise. Big sized firm is defined as a firm with 50 and more employees.
Bonuses	Dependent variable. This type of wage includes allowances that do not relate to specific duties. Payments are made irregularly. Bonuses are a calculated average per month for CEOs. The bonuses for EVPs are paid yearly.
Communication	Independent variable. Dummy variable regarding the position of an EVP. It takes the value of 1 if the EVP works with communication, 0 otherwise.
Female	Independent variable. Dummy variable regarding the gender of the CEO or the EVP. The variable takes the value of 1 if the CEO/EVP is female, 0 otherwise.
Femaledom	Independent variable. Dummy variable regarding the industry where the CEO works. It takes the value of 1 if the industry is female dominated, and 0 if the industry is male dominated. The classification of industries is described Appendix Table 12.
Firm	Independent variables. *Firm* is a set of ten firm dummies of the ten ASA companies mentioned in section 5.3.1.
Fixed salary	Dependent variable. This wage is a fixed amount and paid yearly.
HR	Independent variable. Dummy variable regarding the position of an EVP. It takes the value of 1 if the EVP has an HR and similar staff position, 0 otherwise.
Mediumsize	Independent variable. Dummy variable regarding the size of the firm where the CEO works. It takes the value of 1 if the firm is a medium sized company, and zero otherwise. Medium sized firm is defined as a firm with 1-49 employees.
Monthly earnings	Dependent variable. This type of wage includes basic monthly salary, variable additional allowances and bonuses. This type of wage is paid monthly.

Overtime pay	Dependent variable. This type of wage includes pay that compensates for work performed in addition to contractual working hours.
Percentage of female CEOs	Dependent variable. Variable regarding the percentage of female CEOs.
Percentage of female EVPs	Dependent variable. Variable regarding the percentage of female EVPs in the C-suite.
$Post_{2008\text{-}2011}$	Independent variable. Dummy variable regarding the post-quota period. It takes the value of 1 if the year is within the time period 2008 until 2011, 0 otherwise.
$Post_{2008\text{-}2015}$	Independent variable. Dummy variable regarding the post-quota period. It takes the value of 1 if the year is within the time period 2008 until 2015, 0 otherwise.
$Post_{2012\text{-}2015}$	Independent variable. Dummy variable regarding the post-quota period. It takes the value of 1 if the year is within the time period 2012 until 2015, 0 otherwise.
$Pre_{2004\text{-}2007}$	Independent variable. Dummy variable regarding the pre-quota period. It takes the value of 1 if the year is within the time period 2004 until 2007, 0 otherwise.
Smallsize	Independent variable. Dummy variable regarding the size of the firm where the CEO works. It takes the value of 1 if the firm is small sized, and zero otherwise. Small sized firm is defined as a firm with no employees.
Variable additional allowances	Dependent variable. This type of wage includes additions associated with special tasks. This item is not paid on a regular basis.