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Master Thesis

Gender Diversity on the Board of Directors and CEO Compensation in Norway

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Abstract

In 2003, Norway passed a gender balance law requiring public limited companies to have at least 40% of each gender represented on the board by 2008. This paper contributes to the understanding of the effects of increased gender diversity among the board of directors on CEO compensation in Norwegian public limited companies. Our results show that there is no significant relationship between gender diversity on boards and CEO compensation from 2000 to 2015. However, there was a temporary increase in CEO compensation in the time period from 2008 to 2009, right after the gender balance law was implemented. Furthermore, we found that the implications were stronger for companies that had to face larger board restructuring. These findings indicate that it was not gender diversity itself that caused the short-term increase in CEO compensation but rather the large change in the board composition caused by the gender balance law.

1. Detailed Introduction

Over the years, executive compensation and board diversity have been subjects of debate. The discussion is mostly centered around the high CEO compensation and the low proportion of women on boards and in top management positions. The purpose of this research is to understand the impact of gender diversity among the board of directors on CEO compensation in Norwegian public limited companies (referred to as public companies, registered as ASA) from 2000 to 2015. Norway is of special interest because of the high gender diversity on boards and the high focus on small pay differentials between executive and employee compensation. Since the board of directors are responsible for determining the CEO compensation, we aim to analyze if the increased gender diversity has impacted the board's decision making in relation to the CEO compensation.

Norway is one of the most gender equal countries in the world (The World Economic Forum, 2017) and was the first country to introduce gender quotas on the board of directors. The main objective of the gender balance law (GBL) is to enhance gender equality in decision making positions (Ministry of Children and Equality, 2007). In accordance with the GBL, at least 40% of both genders must be represented on the board of directors in all public companies. This law was announced in 2002, passed in 2003, and implemented in 2006 with a grace period until 2008 (Bøhren & Staubo, 2014, p. 153). When the law was passed, only 7% of the board members in Norwegian public companies were women (Appendix 1). To reach the required gender quota, public companies had to increase the percentage of women drastically. As a result, the GBL had a substantial impact on the gender diversity on corporate boards and will therefore be central to the analyzes in this paper.

CEO wages grow faster than the wage growth in general. Reports from the Norwegian Technical Calculation Committee for Wage Settlements (TBU) show that the yearly CEO wage growth from 1995 to 2013 was on average 6.4%, while the general wage growth in the same period was on average 4.5% (Gitmark, 2015). Even though the gap between CEO compensation and average employee compensation is debated as large in Norway (Gitmark, 2015), this gap is among the lowest in the world. Research shows that the compensation gap between the average worker and the CEO is 1:4 in Norway, while it is considerably larger in

other countries such as United Kingdom and Singapore where the compensation gaps are 1:24 and 1:37, respectively (Grenness, 2011). The difference could be explained by the compressed compensation structure, extensive welfare system and regulated tax system in Norway (Gitmark, 2015).

This paper examines the association between gender diversity among the board of directors and the CEO compensation. Research within the field of both board diversity and CEO compensation is extensive, however there is limited research addressing the relationship examined in this paper. In 2016, the New York Times presented results from an analysis of the CEO pay in 2015 of 100 large US companies. This analysis conducted by Equilar, a compensation research company in California, indicated that having more women on boards give a higher compensation for the CEO (Morgenson, 2016). However, this analysis only examined the CEO compensation in 2015 and does not control for other factors that could affect CEO compensation. As a result, this analysis does not necessarily prove cause and effect. Our study aims to investigate the relationship between gender diversity on the board and CEO compensation further by examining a longer time period and controlling for other determinants of CEO compensation.

Conducting a similar analysis on a sample of public companies in Norway is of great interest for several reasons. First, there are few papers addressing the relationship between gender diversity on the board and CEO compensation, and such analysis has not been conducted in Norway before. Second, this paper improves previous research by offering a longitudinal approach to examine the link between gender diversity on boards and CEO compensation over a 15-year period. Finally, it will add value to the understanding of the effects of a regulated gender representation on boards on CEO compensation and anticipate the effects of a relatively high percentage of women on boards through the GBL. Therefore, our empirical study represents value to policymakers and regulators, and allows them to understand the effects of gender diversity on boards in relation to CEO compensation.

To better understand the impact of gender diversity on the board of directors on CEO compensation, we analyzed a large data sample of Norwegian companies over the time period from 2000 to 2015. First, we analyzed the short-term effects

of the GBL conducting a difference-in-difference analysis. This approach allows us to compare public companies, which are exposed to the GBL, to private limited liability companies (referred to as private companies, registered as AS) that are not exposed to the law. The results reveal that the GBL had a true effect on the CEO compensation. To further investigate the relationship between gender diversity on the board and CEO compensation, we estimated two panel data regression models. The results show that there was no significant relationship between gender diversity on boards and CEO compensation from 2000 to 2015. To examine the effects of gender diversity in more depth, we divided the time period into three parts, the pre-quota period (2000-2007), the quota period (2008-2009) and the post-quota period (2010-2015) and conducted the same analysis. The results only show a significantly positive association between gender diversity among the board of directors and CEO compensation in the quota period. This indicates that increased gender diversity only resulted in a temporary increase in CEO compensation. Lastly, two additional analyzes were conducted to support our arguments. The first analysis was conducted on companies with no gender diversity before the GBL was implemented. The second analysis examined the difference between companies that have been operating before the GBL was implemented and companies established after the GBL came into force. The findings indicate that companies facing greater board restructuring were more affected by the GBL in relation to CEO compensation. The results are robust to the various measures of gender diversity as well as to the inclusion of company and time fixed effects.

This paper starts by reviewing previously conducted literature on the topic in section 2. We will further address theory on gender diversity and how CEO compensation is determined in section 3. Section 4 presents the panel data regression models that will be used to investigate the research question and provides a description of the regression variables. Section 5 describes the methodology, and section 6 provides information about the data and descriptive statistics. Results and discussion are presented in section 7 and we raise awareness regarding the limitations of our master thesis in section 8. Finally, we summarize and conclude in section 9.

2. Literature Review

In recent years, several studies have analyzed the relationship between CEO compensation and company performance, as well as the association to other determinants of CEO compensation such as company size, board size, and CEO tenure. These studies provide valuable insight on aspects of CEO compensation and board characteristics. To our knowledge, there has not been any direct empirical evidence on the relationship between gender diversity on boards and CEO compensation in Norway. However, a few studies in the US have examined this relationship. The literature review therefore focuses on the two most relevant research papers written by Adams and Ferreira (2009) and Bugeja, Matolcsy, and Spiropoulos (2016).

Larger diversity on the board may increase the boards legitimacy (Burke & Mattis, 2013). In addition, Adams and Ferreira (2009) found that male directors have less attendance problems the more gender diverse the board is and suggest that gender diverse boards allocate more effort to monitoring. Barua, Davidson, Rama, and Thiruvadi (2010) argue that female directors are more likely to comply with the ethical values and regulations of the company. Furthermore, Konrad, Kramer, and Erkut (2008) found that women raise tougher questions when determining the compensation of the CEO and thus prompt a greater discussion of the compensation contract. On the other hand, Smith, Smith, and Verner (2006) found that more diverse boards could cause coordination problems and experience more conflict. These contradicting results imply that researchers are uncertain about the effect of gender diversity on the board's decision making.

Adams and Ferreira (2009) studied the association between gender diversity on boards and the level of CEO compensation using an unbalanced panel data set of 1,939 US-listed companies over the period from 1996 to 2003. They found no significant relationship. This is consistent with their expectations as only 25% of the companies in their data set have more than one female director and are thus less involved in setting the CEO compensation. A more recent study conducted by Bugeja et al. (2016), examining the period from 2002 to 2009, found similar results. Nevertheless, they found that gender diverse variables have a negative and significant relationship with bonus payment. However, this analysis is of limited value as only approximately half of the companies they studied did not award

bonus to the CEO. The association is tested with an ordinary least-squares model controlling for economic and governance characteristics of the company with clustered standard errors on company level.

Bugeja et al. (2016) also examined the association between gender diverse compensation committees and CEO compensation in US-listed companies. They focused on the compensation committee rather than the board, as it is the compensation committee of companies in their data set that negotiates and determines the CEO compensation level. Their research found that there is a negative relationship between gender diverse compensation committees and the CEO compensation level. They suggest that gender diverse compensation committees may be a way of reducing excess compensations levels. However, a limitation of their research is that there is only on average 11% women in the compensation committees in their sample (Bugeja et al., 2016).

In our analysis we will pay special attention to endogeneity concerns that may affect the validity of the results. This is important since there is a great chance of omitted unobservable company characteristics when analyzing gender diversity and CEO compensation. While Bugeja et al. (2016) found no presence of endogeneity with the Durbin-Wu-Hausman test, Adams and Ferreira (2009) found presence of endogeneity. In addition to including control variables, Adams and Ferreira (2009) addressed the endogeneity issue by including fixed effects. In our analysis, we will use a panel data model with fixed effects to control for unobservable heterogeneity in the data. The endogeneity issue is also addressed by including control variables and conducting a difference-in-difference analysis.

While both gender diversity and CEO compensation have received a great deal of attention in recent years, limited empirical research is conducted on the association between gender diversity and CEO compensation. Most research focus on the relationship between gender diversity on boards and financial performance. In addition, these studies focus on US companies, with fewer women on boards. Our research complements previous research by providing a comprehensive analysis on companies that have a greater amount of gender diversity among the board of directors. Furthermore, US companies are typically larger than Norwegian companies and thus often have larger boards, resulting in a higher

CEO compensation. It is therefore interesting to examine the association in smaller companies. In addition, the level of CEO compensation varies considerably across nations. Norway is on top on equal compensation in the world (Grenness, 2011), and the results may therefore differ from previous research conducted on US companies. The results from our analysis will contribute to the understanding of the effect of gender diversity among the board of directors on the determination of CEO compensation.

3. Theory

This paper examines the association between gender diversity on boards and the CEO compensation in Norwegian public companies. Diversity on boards is defined as the proportion of women on boards, and CEO compensation is defined as the total compensation received by the top executive. The theoretical framework is based on aspects around corporate governance, the principal-agent theory, the managerial power theory, and the human capital theory. These executive compensation theories suggest several factors that can be expected to affect executive compensation and are therefore essential for explaining the association between diversity among board members and the CEO compensation. We will also look at CEO compensation and gender diversity on the board of directors in Norway.

3.1. CEO Compensation in Norway

In Norway, the board of directors decide the compensation of the company's CEO. The Norwegian law of public limited companies §6-16a state that the board of directors are responsible of preparing a statement on the determination of compensation and other remuneration to the CEO (Allmennaksjeloven, 2006). Some directors choose to delegate this task to compensation committees, although the directors still have the overall responsibility for determining the CEO compensation.

3.2. Corporate Governance

Central to corporate governance is how companies are directed and controlled (Cadbury, 1992). Shleifer and Vishny (1997) define corporate governance as the method in which suppliers of finance to corporations guarantee themselves a

return on their investments. The board of directors play an important role in controlling and monitoring management (Fama & Jensen, 1983).

3.3. The Principal-Agent Theory

The principal-agent theory assumes that both parties act in their own self-interest (Jensen & Meckling, 1976). This theory asserts the relationship between a principal and an agent, where the principal engages the agent in particular tasks. An agency problem arises when an agent (e.g. CEO) has goals which is unaligned with those of a principal (e.g. shareholders). Such conflicts are likely to arise when important decision agents have no financial interest in the results of their decisions (Fama & Jensen, 1983). The CEO is in charge of the daily operations of the company and has a fiduciary responsibility on behalf of the shareholders. Even though it is in the best interest of the CEO to maximize his own utility, he is expected to make decisions that maximize shareholder value.

The board of directors are seen as important to overcome agency problems between CEOs and shareholders (Adams & Ferreira, 2009, p. 306). The directors are most often elected by the shareholders[1] to ensure that the daily operation is in line with the shareholders best interests. The board function as an intermediary between the CEO and the shareholders, as the board is the governing body of the corporation on behalf of the owners. The main duty of the board of directors is to approve important strategic and financial decisions, and function as a counsel and monitor of the CEO. They also have the ability to replace executives that do not act in line with the shareholders best interests. Thus, the board of directors can reduce agency problems through extensive monitoring, increased incentive alignment, and active participation in decision making (Adams & Ferreira, 2009).

Within the boardroom, there can be a conflict of interest between the CEO and the directors creating agency problems (Hermalin & Weisbach, 2017). The CEO is incentivized to maintain a good relationship with the board to ensure his job position and high-level income. Since the CEO often play an important role in re-nominating directors, this also applies to the board of directors if they wish to stay on the board. Therefore, both the CEO and the board of directors have incentives

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[1] According to the Norwegian law of public limited companies §6-4, employees can also have the right to choose representatives on the board under some circumstances (Allmennaksjeloven, 1999).

to give generous salaries and perks, higher than what would be preferred by the shareholders (Hermalin & Weisbach, 2001).

Agency theory argue that executives are likely to neglect their responsibilities and act in their self-interest unless there is a good disciplinary-incentive-reward scheme based on maximizing the shareholder utility. The board of directors can reduce the agency problem by creating an effective compensation system to recruit, retain, and motivate the executives (Firth, Chr, Ropstad, & Sjo, 1996).

3.4. The Managerial Power Theory

Examining the large body of empirical research on CEO compensation, authors argue that managerial power can explain significant characteristics of the CEO compensation landscape (Randøy & Skalpe, 2010). Managerial power theory focus on a different link between the agency problem and CEO compensation. Under this approach, CEO compensation is not only seen as an instrument for addressing the agency problem, but also as a part of the agency problem itself (Bebchuk & Fried, 2003).

This theory emphasizes the balance of power between the top management and the board. High-level CEOs have the power to create unequal negotiating power. In addition, owners may lack incentives and ability to limit the negotiation power of the CEO in large companies or in companies with weak ownership. This may lead to market inefficiencies resulting in excessive compensation that is unrelated to performance (Bebchuk, Fried, & Walker, 2002). Therefore, researchers argue that this should be taken into consideration when devising CEO compensation arrangements.

3.5. The Human Capital Theory

Human capital is the totality of human experience (Merriam-Webster, 2017). When applying it to determining the CEO compensation, it is the sum of skills and knowledge gained from education and experience that create economic value (Schultz, 1961). The human capital theory works under the assumption of economic rationality, a market where owners and directors have the ability to reward the most valuable CEO. According to this theory, excellence and expertise should be rewarded in form of higher compensation (Randøy & Skalpe, 2007).

3.6. Gender Diversity on the Board

Boardroom diversity can be defined as the heterogeneity in the composition of the board, and can be interpreted by taking gender, age, ethnicity, educational background and professional qualifications of the directors into account. In this paper, we will focus on gender diversity. For many years, Norway has been among the top countries when it comes to gender equality and was the first country to mandate gender balance in the board of directors (Bøhren & Staubo, 2014). The quota was implemented to enhance gender equality in decision making positions (Ministry of Children and Equality, 2007).

The GBL was announced by the Parliament of Norway in 2002, passed in 2003, and implemented in 2006 with an implementation period of two years, ending in January 2008 (Bøhren & Staubo, 2014). Companies that failed to comply with the quota was punished with liquidation (Randøy, Thomsen, & Oxelheim, 2006). The GBL requires both genders to be represented with at least 40%[2] on the board of directors in all public companies (Allmennaksjeloven, 2003). This law has increased the share of women on the boards of public companies in Norway from almost zero to just above 40% (Gitmark, 2015).

4. Model Estimation

To analyze the relationship between gender diversity on boards and CEO compensation, the following multiple regression models are estimated. Since board size is highly significantly correlated (0.51) with company size, the variables may measure similar aspects of the CEO compensation and lead to multicollinearity. Including both variables in the regression model could involve some degree of redundancy. Therefore, a second regression model is tested without the company size variable.

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[2] According to the Norwegian law of public limited companies §6-11a, the 40% gender quota only apply to boards with more than nine members. For smaller boards, the GBL specify the minimum number of directors of each gender. If the board has two or three members, both genders must be represented. If the board has four or five members, each gender must be represented with at least two members. At least three of each gender must be represented if the board has six to eight members, while boards with nine members must consist of at least four of each gender. These restrictions imply that the quota varies between 33% and 50%.

(1) CEO Compensation$_{it}$
$$= \alpha + \beta_1 \text{Diversity}_{it} + \beta_2 \text{Financial Performance}_{it}$$
$$+ \beta_3 \text{Company Size}_{it} + \beta_4 \text{Board Size}_{it} + \beta_5 \text{Company Age}_{it}$$
$$+ \beta_6 \text{CEO Tenure}_{it} + \beta_7 \text{CEO Ownership}_{it} + \beta_8 \text{CEO Age}_{it}$$
$$+ \beta_9 \text{CEO Gender}_{it} + \varepsilon_{it}$$

(2) CEO Compensation$_{it}$
$$= \alpha + \beta_1 \text{Diversity}_{it} + \beta_2 \text{Financial Performance}_{it} + \beta_3 \text{Board Size}_{it}$$
$$+ \beta_4 \text{Company Age}_{it} + \beta_5 \text{CEO Tenure}_{it} + \beta_6 \text{CEO Ownership}_{it}$$
$$+ \beta_7 \text{CEO Age}_{it} + \beta_8 \text{CEO Gender}_{it} + \varepsilon_{it}$$

The dependent variable in the regression models is CEO Compensation for company i in year t. The independent variable in the regression models is Diversity which is measured by %Women, Blau's Index and D_Div. The control variables are Financial Performance, Company Size, Board Size, Company Age, CEO Tenure, CEO Ownership, CEO Age and CEO Gender. The variables will be explained in more detail in the following section.

4.1. Measure of CEO Compensation

CEO compensation is the dependent variable and is measured by the natural logarithm of CEO compensation to reduce heteroscedasticity (Finkelstein & Hambrick, 1989). The CEO compensation in our data set is the total compensation reported to the Brønnøysund Register Center. It includes base compensation, bonus payments, benefits and pension. Base compensation is the fixed amount of money the CEO is paid for performing the job, while bonus is usually a once a year payment that is rewarded to the CEO when the company reaches agreed upon goals. Furthermore, benefits may include insurance, company car and cell phone. Every year there is also a fixed amount of money for pension (Gitmark, 2015).

4.2. Proxies for Gender Diversity

In this analysis gender diversity will be measured in three ways to increase the robustness of the results. First, the percentage of women on the board of directors is used to measure the level of gender diversity. The percentage is calculated by taking the number of female directors over the total number of board directors.

$$(3) \ \%\text{Women}_{it} = \frac{\text{Female Directors}_{it}}{\text{Total Number of Directors}_{it}}$$

Second, we include another commonly used measure of diversity called Blau's Index. The index values range from 0 to a maximum of 0.5, which occurs when the board consists of an equal number of women and men (Campbell & Mínguez-Vera, 2007). This measure is calculated as follows:

$$(4) \ \text{Blau's Index}_{it} = 1 - \sum_{i=1}^{k} p_i^2$$

Where p_i is the proportion of board members in each of the i categories, and k is the total number of board directors.

Lastly, a dummy variable, D_Div, is used to examine the difference in CEO compensation of companies with heterogeneous and homogeneous boards, without taking the level of gender diversity into consideration. The dummy variable takes the value 1 if both genders are represented on the board of directors, and 0 otherwise. Because of the GBL, both genders must be represented on the board of directors after 2008, and this diversity measure is therefore only useful until this law came into force.

Previous research regarding gender diversity on boards and CEO compensation reveal conflicting results. The Equilar analysis found a positive association (Morgenson, 2016), while Bugeja et al. (2016) found a negative relationship. On the other hand, Adams and Ferreira (2009) found no significant relationship. Due to ambiguous results, we have no specific expectations of the direction of the relationship.

4.3. Company-Specific Control Variables

Based on previous research we have identified a number of company-specific factors that are likely to affect CEO compensation. We include control variables to account for these effects.

4.3.1. Financial Performance

Similar to previous research on CEO compensation and corporate governance, return on assets (ROA) is used to measure financial performance (Boyd, 1994; Finkelstein & Hambrick, 1989, 1996; Jensen & Murphy, 1990). ROA is calculated by dividing earnings before interest and taxes (EBIT) in a given period on the total value of its assets. This is argued to be a good measure of financial performance as it indicates the company's ability to generate return on its assets. Previous research has found a significantly positive relationship between CEO compensation and ROA (Antle & Smith, 1986; Tosi, Werner, Katz, & Gomez-Mejia, 2000). A positive association is therefore expected.

4.3.2. Company Size

Company size is included as a control variable since larger companies often have larger boards and pay higher CEO compensation. Company size is measured through the book value of total assets (Tosi et al., 2000). The natural logarithm of total assets is used to measure company size to smooth the high variability of the variables. Most studies found a positive relationship between company size and CEO compensation (Firth et al., 1996; Tosi et al., 2000). Thus, we expect a positive association.

4.3.3. Board Size

Board size is the total number of directors on the board at year-end. Holthausen and Larcker (1993) and Core, Holthausen, and Larcker (1999) found a positive association between board size and CEO compensation. A positive relationship is therefore expected.

4.3.4. Company Age

Company age is seen as an essential corporate governance measure in relation to valuation and is therefore included as a control variable (Morck, Shleifer, & Vishny, 1988). Company age is measured as the number of years since the company was established. Due to different life cycle stages between companies, we have no specific expectations about the relationship.

4.4. CEO-Specific Control Variables

4.4.1. CEO Tenure

The CEO tenure is the number of years the CEO has been in the position. Hill and Phan (1991) argued for CEO tenure as a factor of CEO power. The longer the tenure, the more influence the CEO will have on the board of directors. Finkelstein and Hambrick (1989) found a concave relationship, while Hogan and McPheters (1980) found a positive and linear relationship. Furthermore, Randøy and Nielsen (2002) found a significantly negative relationship, suggesting that the CEO has more bargaining power in the beginning of the employment, and weaker the longer the CEO has been in the position. Since previous research present ambiguous results, no specific association is expected.

4.4.2. CEO Ownership

CEO ownership is measured by a dummy variable which takes the value of 1 if the CEO owns between 5% and 50% of the total equity, and 0 otherwise. We use the same approach as Randøy and Nielsen (2002) since CEO ownership is not normally distributed and 80% of the CEOs own less than 5% of the total equity. Attaway (2000) and Randøy and Nielsen (2002) found CEO ownership to have a negative relationship with CEO compensation. Allen (1981) argued that the CEO might hold back on the compensation when he has a considerable number of shares in the company to avoid dissident shareholders. Hence, we expect CEO ownership to have a negative relationship with CEO compensation.

4.4.3. CEO Age

Since it is difficult to measure skills and competence, CEO age is used as an indicator of seniority and experience. In line with the human capital theory, we predict CEO age to have a positive relationship with CEO compensation.

4.4.4. CEO Gender

CEO gender is measured by a dummy variable which takes the value of 1 if the CEO is a woman, and 0 if the CEO is a man. In Norway, male CEOs receive a higher compensation compared to female CEOs (Gunnes, 2018). Thus, we expect a negative relationship between CEO gender and CEO compensation.

5. Methodology

To estimate the relationship between gender diversity and CEO compensation we use a difference-in-difference analysis and a panel data model analysis. The analyzes are conducted in STATA. First, our hypothesis is tested with a difference-in-difference estimation. This analysis is performed to test how the GBL affected the CEO compensation in Norwegian public companies. By comparing public companies and private companies, we are able to examine if the gender quota had a short-term effect on CEO compensation in public companies. To analyze our results further, we use two panel data regression models. These models are powerful in controlling for potential endogeneity problems caused by unobservable heterogeneity (Campbell & Mínguez-Vera, 2008), and is appropriate for data sets containing multiple companies across multiple time periods (Wooldridge, 2010). As the number of time periods available differs between companies, our data set is an unbalanced panel (Arellano & Bond, 1991).

5.1. Difference-in-Difference Analysis

The difference-in-difference approach makes it possible to test if the CEO compensation in public companies differ from the CEO compensation in private companies, that are not subjected to the GBL. The results from the difference-in-difference analysis will increase the robustness of the regression analyzes since the panel data regression models may have failed to exclude other exogenous compensation determinants that are unrelated to the number of women on boards. To account for this possible effect, we compare the CEO compensation for the Norwegian public and private companies using a difference-in-difference approach. The event group is the public companies and the control group is the private companies. As all public companies had to comply with the GBL in 2008, the pre-event period is 2000-2007 and the post-event period is 2008-2015.

For the difference-in-difference approach to be valid, the trend in the CEO compensation must be similar for the treatment group and the control group in the pre-event period. This requirement is fulfilled since the average trend in CEO compensation were similar for public and private companies from 2000 to 2007 (Appendix 2).

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The difference-in-difference statistic is $D = \Delta_{Public} - \Delta_{Private}$, where Δ_{Public} is the difference between the CEO compensation of public companies in the post-event period and the pre-event period, respectively. Similarly, $\Delta_{Private}$ is the difference between the CEO compensation in the private companies in the two periods. D is estimated by the following model:

(5) $\text{CEO Compensation}_{it} = \beta_0 + \beta_1 EG_i + \beta_2 PE_t + \beta_3 EG_i * PE_t + \varepsilon_{it},$

where $\text{CEO Compensation}_{it}$ is the number of companies in group i at time t. EG_i is a dummy variable which takes the value of 1 if the company is in the event group and 0 if the company is in the non-event control group. Consequently, the dummy variable PE_t is 1 if t is in the post-event period, and 0 if t is in the pre-event period.

The estimator of D is the ordinary least squares estimate of β_3 in model (5). This coefficient reflects the effect on the CEO compensation if the observation is a public company in the event period.

5.2. Panel Data Model Analysis

5.2.1. Company Fixed Effects

Company fixed effects can be estimated if the sources of unobserved heterogeneity vary cross-sectionally, but not over time. For example, some companies in our sample may require specific management skills that are counted for in the regression model. The company-specific intercept in the fixed effects regression model incorporate the additional compensation needed to hire a manager with these skills.[3]

A Hausman test is used to decide whether a fixed effects model or a random effects model is appropriate for our regression models. This test identifies if there is a correlation between the unobservable heterogeneity and the explanatory variables in the model. The null hypothesis is that the appropriate model is a random effects model and the alternative hypothesis is that the appropriate model

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[3] Since the company fixed effects automatically deal with omitted-variable bias that may otherwise occur from ignoring industry effects, we have chosen to use company fixed effects rather than industry fixed effects.

is a fixed effects model. Since the p-value is zero, we reject the null hypothesis that there is no correlation between the unobservable heterogeneity and the explanatory variables (Appendix 3). Hence, fixed effects are appropriate for both models.

5.2.2. Time Fixed Effects

Time fixed effects control for omitted variables that vary over time but are constant across companies. Since our data set is over a long period of time, there are likely to be economic fluctuations that affect all the companies in the sample. Time fixed effects deals with macro shocks like tax rate changes, interest rate increase or decrease, and change in government spending. For instance, it is likely to assume that the companies in our sample were affected by the financial crisis from 2007 to 2008.

We test whether we should include time fixed effects in our panel data models by including a dummy for year in the regression and test whether the dummy coefficients for all years are jointly equal to zero. The results are not significant for model (1), revealing that time fixed effects should not be included. On the other hand, the results for model (2) are significant and time fixed effects should therefore be included in this model (Appendix 4).

5.2.3. Robust Standard Errors

When clustering the standard errors of CEO compensation, the errors are allowed to be correlated within clusters but uncorrelated with those that are not in the same cluster. Compensation for a specific company is likely to be correlated over time and companies within the same industry often have the same compensation level (Kostiuk, 1990). The observations of companies within the same industry may therefore not be independent. Hence, the standard errors should be clustered on industry level rather than company level. However, a significant amount of the companies in our data set change industry during the period studied. As a result, we are unable to cluster on industry level. A fixed effects model with robust standard errors clustered on the company level is therefore used in the analysis.

6. Data and Descriptive Statistics

6.1. Data

The data set is retrieved from the Centre for Corporate Governance Research (CCGR) in February 2018. The data set consists of 3,011,983 observations of Norwegian public and private companies over the period from 2000 to 2015. In line with common practice, companies operating with financial and insurance activities are removed from the data sample. In addition, to avoid distortion from large outliers, CEO compensation and ROA are winsorized at the 1% and 99% tails. Since public companies are obligated to have at least three board members after 2010, we require the board size to be larger or equal to three after this law came into force.[4] Lastly, missing values and misreported values such as negative CEO compensation are also removed from the data sample. After these adjustments the data sample consists of 503,146 observations, where 3,578 of the observations are public companies and 499,568 are private companies.

6.2. Descriptive Statistics

6.2.1. Characteristics of CEO Compensation and Diversity Per Year

Table 1 shows the number of public companies, the average CEO compensation and the average gender diversity of the companies in our data sample over the time period from 2000 to 2015. The number of public companies has declined every year[5] from a maximum of 387 companies in 2000 to a minimum of 107 companies in 2015. A study conducted by Bøhren and Staubo (2014) found that companies may have responded to the GBL by changing their organizational form, which can explain the substantial decrease in Norwegian public companies in the time period studied.

Since 2000, the average CEO compensation, adjusted for inflation, has increased with 83%, from NOK 1,516,516 in 2000 to NOK 2,777,112 in 2015. Furthermore, the diversity on corporate boards has increased substantially from 4.49% in 2000 to 41.78% in 2015, which is an increase in gender diversity of strikingly 832%. The increase in diversity has been largest in the years following the announcement

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[4] According to the Norwegian law of public limited companies §6-1 (Allmennaksjeloven, 2010).
[5] Except for 2009-2010, where the number of companies increased.

of the GBL in 2002 until the law came into force in 2008. From 2008 the average diversity has been stable around 40%.

Table 1: Characteristics of Public Companies Per Year

Year	Number of Companies	CEO Compensation	Diversity
2000	387	1,516,516	4.49%
2001	355	1,572,995	6.22%
2002	333	1,688,615	7.03%
2003	314	1,714,504	7.35%
2004	294	1,916,656	16.33%
2005	269	1,878,833	14.24%
2006	255	2,125,070	20.71%
2007	225	2,302,734	33.41%
2008	181	2,552,805	41.39%
2009	157	2,494,578	39.43%
2010	163	2,667,326	40.03%
2011	161	2,905,747	42.18%
2012	142	2,839,812	40.61%
2013	122	3,138,035	39.03%
2014	113	2,861,046	41.17%
2015	107	2,777,112	41.78%

This table provides the number of public companies, the average CEO compensation and the average diversity per year. CEO compensation is adjusted for inflation. Diversity is measured as the percentage of women on corporate boards.

6.2.2. Summary Statistics

Table 2 shows the mean, standard deviation, median, minimum and maximum value and number of observations of the dependent variable, the independent variables, the company specific and CEO specific control variables.

Table 2: Summary Statistics for Public Companies

	Mean	Std. Dev.	Median	Minimum	Maximum	No. of Obs.
Dependent Variable						
CEO Compensation	1,777,332	1,553,483	1,292,500	58,000	10,900,000	3,578
Independent Variables						
% Women	21.51%	0.194	22.22%	0%	100%	3,561
Blau's Index	0.262	0.218	0.346	0.000	0.500	3,561
D_Div	0.615	0.487	1.000	0.000	1.000	3,578
Company Specific Control Variables						
Financial Performance	0.496	0.618	0.220	0.000	3.395	3,578
Company Size	19.084	2.247	18.965	11.314	27.014	3,578
Board Size	5.408	1.760	5.000	3.000	11.000	3,561
Company Age	19.917	29.595	9.000	0.000	168.000	3,432
CEO Specific Control Variables						
CEO Tenure	4.752	3.794	4.000	1.000	21.000	3,437
CEO Ownership	0.164	0.370	0.000	0.000	1.000	3,578
CEO Age	46.737	7.886	47.000	23.000	74.000	3,471
CEO Gender (Female)	0.049	0.215	0.000	0.000	1.000	3,471

This table provides summary statistics for the dependent variable, the independent variables as well as the company specific and CEO specific control variables for Norwegian public companies. The mean value, the standard deviation, the median, the minimum and maximum values are shown in column 2-6. Column 7 shows the number of observations for the variables. The data sample consists of public companies in the period from 2000 to 2015 that are not operating with financial and insurance activities. Financial performance and CEO compensation are winsorized at the 1% and 99% tails. Appendix 5 defines the variables.

6.2.3. Correlation

Table 3 shows the Pearson correlation matrix between the variables. Company size is positively and significantly correlated (0.33-0.35) with gender diversity at the 5% level. Therefore, larger companies seem to have a higher gender diversity than smaller companies. CEO ownership is negatively and significantly correlated (-0.20) with CEO compensation, suggesting that company ownership is correlated with lower compensation. CEO gender is also negatively and significantly correlated (-0.03) with CEO compensation. This indicates that female CEOs are rewarded a slightly lower compensation. Company size and board size are significantly and positively correlated (0.51), indicating that larger companies have larger boards. Because of the high and significant correlation between company size and board size, a second regression model, model (2), is estimated without the company size variable as explained in section 4.

Table 3: Pearson's Correlation Matrix

	CEO Compensation	%Women	Blau's Index	D_Div	Financial Performance	Company Size	Board Size	Company Age	CEO Tenure	CEO Ownership	CEO Age	CEO Gender
CEO Compensation	1.000											
%Women	0.346*	1.000										
Blau's Index	0.353*	0.961*	1.000									
D_Div	0.334*	0.880*	0.955*	1.000								
Financial Performance	-0.153*	-0.162*	-0.157*	-0.140*	1.000							
Company Size	0.582*	0.334*	0.350*	0.353	-0.424*	1.000						
Board Size	0.361*	0.200*	0.235*	0.204*	-0.123*	0.506*	1.000					
Company Age	0.281*	0.153*	0.174*	0.179*	-0.145*	0.421*	0.306*	1.000				
CEO Tenure	0.164*	0.088*	0.093*	0.085*	-0.036*	0.172*	0.050*	0.276*	1.000			
CEO Ownership	-0.195*	-0.065*	-0.071*	-0.093*	0.163*	-0.219*	-0.217*	-0.082*	0.117*	1.000		
CEO Age	0.185*	0.235*	0.231*	0.217*	-0.129*	0.240*	0.188*	0.223*	0.324*	0.004	1.000	
CEO Gender	-0.033*	0.115*	0.108*	0.098*	-0.012*	0.029*	-0.057*	0.062*	-0.007	-0.020*	-0.037*	1.000

This table presents the Pearson's correlation coefficients for the dependent, independent and control variables of public companies in the period from 2000 to 2015. Significance at the 5% level or lower is indicated by *. The variables are defined in appendix 5.

7. Results and Discussion

7.1. Difference-in-Difference Results

The difference-in-difference analysis is conducted to test if the CEO
compensation in public companies is different from the CEO compensation in
private companies, that are not subjected to the GBL. The results reveal the
impact of the GBL on CEO compensation. Table 4 presents the results from the
difference-in-difference analysis.

Table 4: Difference-in-Difference Results

	Estimate
EG	0.306***
	(0.004)
PE	1.174***
	(0.027)
D	0.250***
	(0.046)
Adjusted R^2	0.372
Number of Observations	503,146

This table presents the estimates of the difference-in-difference equation defined in model (5) of the main text. The
sample period is 2000-2015, where the pre-event period is 2000-2007 and the post-event period is 2008-2015.
Companies operating with financial and insurance activities are excluded from the sample. CEO compensation is
winsorized at 1% and 99% tails. EG is a dummy variable which takes the value of 1 if the company is in the event
group and 0 if the company is in the non-event control group. Furthermore, the dummy variable PE is 1 if the
company is in the post-event period, and 0 if the company is in the pre-event period. The difference-in-difference
coefficient (D) reflects the effect on the CEO compensation if the observation is a public company (rather than a
private company) in the event period (rather than in the non-event period).

The results show that the difference-in-difference coefficient (D) is significantly
positive. Thus, an increase in CEO compensation is unique for companies
subjected to the GBL. This implies that the high gender diversity in public
companies caused by the GBL, results in a higher CEO compensation in the post-
event period from 2008-2015. In the following section, we analyze this
relationship further with the panel data models that we presented in section 4. We
will analyze determinants of CEO compensation as well as justifying the
robustness of the results.

7.2. Regression Results and Discussion

The main results from estimating the panel data regressions are presented in table
5. The predicted direction of the relationship is presented in column 2 and the
coefficient estimates are presented in column 3-8.

Table 5: Main Results

Independent Variables	Prediction	CEO Compensation					
		Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
%Women	+/-	0.001	0.001				
		(0.001)	(0.001)				
Blau's Index	+/-			0.001	0.001		
				(0.001)	(0.001)		
D_Div	+/-					0.029	0.041
						(0.037)	(0.040)
Financial Performance	+	0.194***	0.079**	0.195***	0.079**	0.195***	0.076**
		(0.034)	(0.035)	(0.036)	(0.035)	(0.036)	(0.035)
Company Size	+	0.218***		0.219***		0.219***	
		(0.025)		(0.025)		(0.036)	
Board Size	+	0.031*	0.059***	0.031*	0.059***	0.031*	0.058***
		(0.018)	(0.019)	(0.018)	(0.019)	(0.108)	(0.192)
Company Age	+/-	0.040***	0.049***	0.041***	0.050***	0.041***	0.051***
		(0.006)	(0.008)	(0.006)	(0.007)	(0.006)	(0.007)
CEO Tenure	+/-	0.010**	0.014***	0.010**	0.014***	0.010**	0.014***
		(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
CEO Ownership	-	-0.095**	-0.137***	-0.094**	-0.136***	-0.094**	-0.135***
		(0.046)	(0.049)	(0.046)	(0.049)	(0.046)	(0.049)
CEO Age	+	0.003	0.004	0.003	0.004	0.004	0.004
		(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
CEO Gender (Female)	+/-	-0.192*	-0.133	-0.190*	-0.130	-0.189*	-0.130
		(0.093)	(0.106)	(0.115)	(0.106)	(0.114)	(0.106)
Constant		8.632***	12.365***	8.612***	12.358***	8.599***	12.348***
		(0.448)	(0.191)	(0.448)	(0.189)	(0.443)	(0.186)
Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes
Time Effects		No	Yes	No	Yes	No	Yes
Adjusted R²		0.224	0.176	0.224	0.176	0.224	0.176
Number of Observations		3,214	3,214	3,214	3,214	3,214	3,214
Number of Companies		740	740	740	740	740	740

This table presents the estimated coefficients of the diversity measures and the control variables. The regression models are specified in model (1) and model (2) of the main text. Model (1) include all the control variables. Model (2) exclude the company size variable due to high correlation with the board size variable. Including both variables in the regression model could involve some degree of redundancy. The predicted signs of the coefficients are presented in column 2. For each model and measure of gender diversity, we report the coefficient estimates, the standard errors (in parenthesis) and the significance level where 1%, 5% and 10% significance level are denoted by ***, ** and * , respectively. The data sample consists of Norwegian public companies in the period from 2000 to 2015. Companies operating with financial and insurance activities are excluded from the sample. Financial performance and CEO compensation are winsorized at the 1% and 99% tails. Appendix 5 defines the variables.

7.2.1. Main Results

The results show that diversity on boards is not significantly related to CEO compensation in the time period from 2000 to 2015 for any of the three measures of diversity. The results are found to be robust to different measures of diversity and different models for CEO compensation. Nevertheless, we suspect that gender diversity may have had an impact on CEO compensation towards 2008, when the GBL became mandatory. Therefore, we will further analyze the relationship between gender diversity on boards and CEO compensation by examining different time periods in section 7.3.

7.2.2. Other Determinants of CEO Compensation

The findings support our prediction of a positive relationship between financial performance and diversity. This is in accordance with agency theory suggesting that the CEO should be rewarded for their contribution to the company's good financial performance.

As expected, board size and CEO compensation have a positive association. This result is in line with the findings of previous research showing that smaller boards may be more successful in reducing agency costs (Randøy & Nielsen, 2002). In addition, previous research documents that larger boards often experience coordination problems which may reduce the effectiveness of board monitoring, resulting in higher CEO compensation (Lin, Kuo, & Wang, 2013). This is consistent with managerial power theory.

Larger companies are often more complex and difficult to manage and thus require a larger board and higher competence of management skills, which may explain the high correlation (0.51) between board size and company size.[6] As predicted, we find a positive relationship between company size and CEO compensation. In line with previous studies, we find company size to be the most important determinant of CEO compensation (Tosi et al., 2000). Managerial power theory claims that risk averse managers prefer to link compensation to company size since it is a good indicator of the amount of responsibility the position holds.[7]

In model (1), we find company size to have the largest effect on CEO compensation. When excluding company size in model (2), the significance level of board size improves from 10% to 1% and the coefficient almost doubles from 0.031 to 0.059. Larger boards often have a greater amount of coordination problems than smaller boards which may give the CEO more negotiating power. Hence, the managerial power theory is a possible explanation of the positive relationship between board size and CEO compensation.

The regression results show that company age is positively associated with CEO compensation. As shown in section 6.2.3, company age is significantly correlated with both company size (0.42) and board size (0.31), suggesting that company size increases over time and thus the CEO compensation rises accordingly.

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[6] Table 3 in section 6.2.3.
[7] This paragraph only accounts for model (1), as model (2) does not include company size.

CEO tenure is positively related to CEO compensation, suggesting that the longer a CEO has been in the position, the more influence he has on the board of directors (Hill & Phan, 1991). In line with human capital theory, longer tenure gives the CEO more work-related experience and competence, and should therefore be rewarded with higher CEO compensation. In addition, managerial power theory argues that longer tenure gives the CEO more bargaining power which may increase the CEO compensation.

As predicted, CEO ownership is negatively related to CEO compensation. This could indicate that the CEO is rewarded with shares in the company when the CEO compensation is lower. Jensen and Meckling (1976) supports this argument and claim that CEO ownership may lead to a reduction in agency costs and better alignment of interests between executives and owners.

CEO age is not statistically significant for any of the models. We are therefore not able to evaluate the relationship between CEO age and CEO compensation. In addition, CEO gender is only significant at the 10% level when using Blau's Index and D_Div as measures of gender diversity. This indicates that female CEOs receive lower CEO compensation than male CEOs.

7.3. Gender Diversity and CEO Compensation in Different Time Periods

To more closely examine the link between gender diversity on boards and CEO compensation, we study the time period when the law was enacted and compare it with the time periods before and after. As the GBL became mandatory to all public companies in 2008, the periods are divided into the pre-quota period (2000-2007), quota period (2008-2009) and post-quota period (2010-2015). The gender diversity measure D_Div is excluded from this part of the analysis since boards are heterogenous after the law was put into place. Table 6 presents the regression results from the different time periods. The coefficient estimates for the pre-quota period, quota period and post-quota period are presented in columns 2-5, 6-9 and 10-14, respectively.

Table 6: Regression Results - Different Time Periods

	CEO Compensation											
	2000-2007				2008-2009				2010-2015			
Independent Variables	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
%Women	0.000	0.000			0.031***	0.027***			-0.001	0.001		
	(0.001)	(0.001)			(0.010)	(0.009)			(0.005)	(0.004)		
Blau's Index			0.000	0.000			0.097**	0.092**			-0.001	0.002
			(0.001)	(0.001)			(0.038)	(0.038)			(0.006)	(0.006)
Financial Performance	0.167***	0.060	0.167***	0.060	0.489*	0.362	0.511**	0.398	0.285*	0.159	0.285*	0.161
	(0.037)	(0.037)	(0.037)	(0.037	(0.252)	(0.273)	(0.253)	(0.271)	(0.150)	(0.153)	(0.150)	(0.151)
Company Size	0.226***		0.227***		0.370***		0.327***		0.225***		0.225***	
	(0.028)		(0.028)		(0.133)		(0.124)		(0.084)		(0.084)	
Board Size	0.005*	0.037*	0.006	0.038*	0.141	0.143	0.163*	0.165*	0.078*	0.083**	0.077*	0.079*
	(0.020)	(0.022)	(0.020)	(0.022)	(0.089)	(0.092)	(0.088)	(0.092)	(0.040)	(0.041)	(0.043)	(0.044)
Company Age	0.054***	0.092***	0.056***	0.093***	0.057	0.044	0.051	0.042	0.014	0.013	0.014	0.012
	(0.008)	(0.009)	(0.008)	(0.009)	(0.041)	(0.043)	(0.041)	(0.041)	(0.019)	(0.022)	(0.019)	(0.022)
CEO Tenure	0.004	0.008	0.004	0.014	0.009	0.014	0.014	0.017	0.018*	0.021*	0.018*	0.021*
	(0.006)	(0.006)	(0.006)	(0.005)	(0.015)	(0.016)	(0.015)	(0.015)	(0.010)	(0.011)	(0.010)	(0.011)
CEO Ownership	-0.076	-0.127**	-0.076	-0.127**	0.219	0.251	0.127	0.163	-0.031	-0.056	-0.032	-0.059
	(0.052)	(0.059)	(0.052)	(0.059)	(0.178)	(0.169)	(0.164)	(0.154)	(0.098)	(0.096)	(0.098)	(0.097)
CEO Age	0.004	0.006*	0.004	0.006*	0.022	0.018	0.014	0.011	0.001	0.002	0.001	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.021)	(0.022)	(0.014)	(0.015)	(0.007)	(0.007)	(0.007)	(0.007)
CEO Gender (Female)	-0.076*	-0.178	-0.214*	-0.176	0.080	0.093	-0.143	-0.110	-0.857	-0.543	-0.850	-0.545
	(0.052)	(0.126)	(0.114)	(0.126)	(0.318)	(0.325)	(0.267)	(0.275)	(0.524)	(0.481)	(0.521)	(0.478)
Constant	8.329***	11.721***	8.291***	11.700***	2.489	10.430***	0.468	7.485***	9.086***	13.438***	9.087***	13.422***
	(0.515)	(0.240)	(0.513)	(0.237)	(3.486)	(1.467)	(4.063)	(2.472)	(1.583)	(0.649)	(1.586)	(0.651)
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Effects	No	Yes	No	Yes	No	No	No	No	No	Yes	No	Yes
Adjusted R²	0.216	0.166	0.216	0.166	0.224	0.181	0.280	0.236	0.073	0.027	0.073	0.028
Number of Observations	2,193	2,193	2,193	2,193	335	335	335	335	686	686	686	686
Number of Companies	654	654	654	654	207	207	207	207	239	239	239	239

This table presents the estimated coefficients of the diversity measures and the control variables for public companies in the pre-quota period (2000-2007), quota period (2008-2009) and post-quota period (2010-2015). The regression models are specified in model (1) and model (2) of the main text. Model (1) include all the control variables. Model (2) exclude the company size variable due to high correlation with the board size variable. Including both variables in the regression model could involve some degree of redundancy. For each model and measure of gender diversity, we report the coefficient estimates, the standard errors (in parenthesis) and the significance level where 1%, 5% and 10% level of significance is denoted by ***, ** and * , respectively. Companies operating with financial and insurance activities are excluded from the sample. Financial performance and CEO compensation are winsorized at the 1% and 99% tails. Appendix 5 defines the variables.

We find that diversity is not significant for any of the diversity measures in the pre-quota period and post-quota period. On the other hand, diversity is significant at the 1% level for %Women and at the 5% level for Blau's Index in the quota period. In this period, a one percentage increase in the percentage of women on the board of directors increased the CEO compensation with 2.76% to 3.16%. Blau's Index shows a similar association.

As diversity is only significant in the quota period, these results indicate that having more women on boards only had a temporary effect on CEO compensation. The number of female directors increased with 197% (from 139 to 413 seats) from the GBL was passed in 2003, until the law became mandatory in 2008. This shows that the GBL caused a substantial shock to the company's board composition and may be an explanatory factor of the temporary effect (Ahern & Dittmar, 2012).

Previous research found that the large demand for female directors made it challenging to design boards with the same qualities as the pre-quota boards (Ahern & Dittmar, 2012; Bøhren & Staubo, 2014). This indicate that the entering female directors were different than the male directors in the pre-quota period. For instance, we find that the female directors were on average around 3 years younger than the male directors. In addition, previous research shows that the new female directors had less CEO experience. Studies conducted by Ahern and Dittmar (2012) shows that only 31% of the entering females had CEO experience, compared to 69% of the retained male directors. According to Bøhren and Staubo (2013) a significant amount of companies changed organizational form because of the GBL which substantiates that finding the most suitable female directors was difficult (Bertrand, Black, Jensen, & Lleras-Muney, 2014).

Stockholders aim to design optimal boards. Since there was no gender restriction in the pre-quota period, companies were able to choose directors with the desired qualities without taking gender into consideration. It is therefore not clear whether female and male directors were different with respect to their opinions, competence and values in this period since they were chosen under the same criteria. Hence, gender diversity may not affect the CEO compensation which is in

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line with our results showing that diversity on the board of directors is not significantly related to CEO compensation in the pre-quota period. The significant relationship between gender diversity and CEO compensation in the quota period could be explained by the imposed gender quota in the boardroom that limited the pool of director candidates. Therefore, the regulatory shock through the GBL may have affected the company's ability to find the optimal board of directors. This is in accordance with findings of previous research conducted by Ahern and Dittmar (2012) and Bøhren and Staubo (2014). As a result, the change in the composition of the board may have led to inefficiency in the boardroom and thus explain the significant relationship between gender diversity and CEO compensation in 2008 and 2009. In the post-quota period, companies have had more time since the law was enacted to find the most suitable female directors for the board positions. In addition, female directors have had more time and opportunities to gain the desired director experience. Therefore, boards may be closer to their optimal board composition and operate more efficiently than they did in the quota period. This could explain the insignificant relationship between gender diversity and CEO compensation in this period.

We argue that it may not be the gender diversity that causes the higher CEO compensation in the quota period, but rather the large change in the board composition caused by the GBL. In line with previous research, we expect companies that have to make more changes to their board composition to be more affected by the GBL (Ahern & Dittmar, 2012; Bøhren & Staubo, 2014). To support our arguments, we conduct two additional analyzes. The first analysis is presented in section 7.4 and examines the CEO compensation in companies with no gender diversity before the GBL was implemented. The second analysis is presented in section 7.5 and examines the gender diversity and CEO compensation in new companies compared to old companies.

7.4. CEO Compensation in Companies With no Gender Diversity Before the GBL was Implemented

Ahern and Dittmar (2012) found that board size did not change as a result of the gender quota. They found that instead of increasing board size by adding female directors, companies replaced male directors with female directors to comply with the quota. Companies that had a greater percentage of female directors on the

board before 2006 had to make less changes to the board composition to comply with the quota than companies with a smaller percentage of female directors. We therefore expect companies with little diversity among the board of directors to have larger costs of complying with the GBL. Thus, we examine if gender diversity on boards had a larger effect on CEO compensation for companies with no gender diversity on boards before the law came into effect.[8]

Table 7 presents the regression results for the different time periods. The coefficient estimates for the pre-quota period, quota period and post-quota period are presented in column 2-3, 4-5 and 6-7, respectively.

Table 7: Regression Results - Companies With no Diversity Before the GBL was Implemented

	CEO Compensation					
	2000-2007		2008-2009		2010-2015	
Independent Variables	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
% Women	-0.001	-0.014	0.062***	0.062***	0.027**	0.033**
	(0.002)	(0.003)	(0.011)	(0.013)	(0.012)	(0.013)
Financial Performance	0.154**	-0.031	-1.088	-1.341*	0.315	0.196
	(0.068)	(0.074)	(0.732)	(0.714)	(0.263)	(0.240)
Company Size	0.306***		0.306*		0.200	
	(0.053)		(0.165)		(0.160)	
Board Size	0.015	0.050	0.865***	0.902***	0.314**	0.330**
	(0.032)	(0.037)	(0.134)	(0.111)	(0.122)	(0.130)
Company Age	0.030	0.072***	-0.002	0.024	0.067	0.072
	(0.019)	(0.022)	(0.060)	(0.065)	(0.053)	(0.056)
CEO Tenure	0.009	0.017	-0.047	-0.034	0.025	0.031*
	(0.015)	0.016	(0.031)	(0.029)	(0.019)	(0.018)
CEO Ownership	-0.057	-0.141	omitted	omitted	-0.178	-0.167
	(0.077)	(0.100)			(0.152)	(0.158)
CEO Age	0.000	0.002	0.012	0.006	-0.008	-0.009
	(0.007)	(0.008)	(0.020)	(0.021)	(0.022)	(0.021)
CEO Gender (Female)	-0.023	0.046	omitted	omitted	-1.539	-1.128
	(0.114)	(0.133)			(0.249)	(0.301)
Constant	7.654***	12.574***	1.629	7.168***	6.620**	10.120***
	(0.936)	(0.458)	(4.100)	(2.226)	(2.744)	(1.463)
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Effects	No	Yes	No	Yes	No	Yes
Adjusted R²	0.240	0.150	0.709	0.685	0.266	0.245
Number of Observations	543	543	64	64	117	117
Number of Companies	123	123	41	41	36	36

This table presents the estimated coefficients for public companies with no diversity before 2006 in the pre-quota period (2000-2007), quota period (2008-2009) and post-quota period (2010-2015). The regression models are specified in model (1) and model (2) of the main text. Model (1) include all the control variables. Model (2) exclude the company size variable due to high correlation with the board size variable. Including both variables in the regression model could involve some degree of redundancy. For each model and measure of gender diversity, we report the coefficient estimates, the standard errors (in parenthesis) and the significance level where 1%, 5% and 10% level of significance is denoted by ***, ** and *, respectively. Companies operating with financial and insurance activities are excluded from the sample. Financial performance and CEO compensation are winsorized at the 1% and 99% tails. Some variables are omitted as they do not vary over the specified sample period. Appendix 5 defines the variables.

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[8] The companies with no gender diversity on boards before the law was implemented are defined as the companies with no female directors on the board until 2006.

The results show that diversity is not significantly related to CEO compensation in the pre-quota period, which is in line with the results from the analysis conducted in section 7.3. On the other hand, gender diversity had a positive and significant impact on CEO compensation in the quota period. In this period, an increase in board diversity yielded an increase in CEO compensation of 6.40% for companies with no gender diversity on the board before the GBL was implemented. Thus, the impact of diversity is stronger for companies that had no female directors before 2006. The results show that gender diversity also had a positive and significant effect on CEO compensation in the post-quota period, contradicting the results from the analysis in section 7.3. These findings support the argument that companies facing greater board restructuring were more affected by the GBL, and faced significant repercussions of the law in the post-quota period.

7.5. Gender Diversity and CEO Compensation in New Companies Versus Old Companies

Finding potential board of director candidates and designing the optimal board can be a challenging and time-consuming process. This logic suggests that older companies will be more affected by the GBL than younger companies, that entered after the GBL was implemented. Older companies with a longer learning history may have been closer to the company's value-maximizing board composition than companies with no learning history before the GBL was implemented (Bøhren & Staubo, 2013). Companies that entered after the GBL was implemented had to comply with the quota from the very beginning, and did not have to make changes to their board composition by replacing male directors with female directors. Thus, we examine if the relationship between board diversity and CEO compensation differ between new companies and old companies. Old companies are defined as companies that entered before the GBL was implemented in 2006, while new companies are defined as companies that entered after the GBL was implemented.[9]

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[9] The law came into force on January 1st 2006 with immediate effect for newly established public limited companies, while public limited companies registered before the law came into force were given a transitional period of two years, with full effect from January 1st 2008 (Allmennaksjeloven, 2003).

Table 8 presents the regression results from the quota period. The coefficient estimates for old companies are presented in column 2 and 3, and the coefficient estimates for new companies are presented in column 4 and 5.

Table 8: Regression Results - New Companies Versus Old Companies in the Quota Period

	CEO Compensation			
	Company Age > 10		Company Age ≤ 10	
Independent Variables	Model 1	Model 2	Model 1	Model 2
%Women	0.039***	0.036***	-0.000	0.002
	(0.11)	(0.011)	(0.021)	(0.019)
Financial Performance	0.345	0.284	2.628	2.739
	(0.232)	(0.280)	(2.417)	(2.476)
Company Size	0.356**		-0.104	
	(0.139)		(0.338)	
Board Size	0.252**	0.250**	0.096	0.108
	(0.112)	(0.116)	(0.149)	(0.152)
Company Age	0.012	0.001	1.295	1.290
	(0.045)	(0.116)	(2.232)	(2.206)
CEO Tenure	0.004	0.009	-1.124	-1.119
	(0.014)	(0.015)	(2.142)	(2.116)
CEO Ownership	0.110	0.134	0.127	0.078
	(0.203)	(0.203)	(0.371)	(0.322)
CEO Age	0.024	0.020	0.023	0.027
	(0.021)	(0.022)	(0.029)	(0.029)
CEO Gender (Female)	omitted	omitted	-2.051	-2.008
			(4.203)	(4.118)
Constant	2.615	10.280***	14.089*	11.768***
	(3.383)	(1.664)	(7.266)	(1.318)
Fixed Effects	Yes	Yes	Yes	Yes
Time Effects	No	Yes	No	Yes
Adjusted R²	0.339	0.280	0.410	0.423
Number of Observations	246	246	51	51
Number of Companies	149	149	33	33

This table presents the estimated coefficients for public companies that have operated for more than 10 years (old companies) and companies that have operated for less than, or equal to 10 years (new companies) for the quota period (2008-2009). The regression models are specified in model (1) and model (2) of the main text. Model (1) include all the control variables. Model (2) exclude the company size variable due to high correlation with the board size variable. Including both variables in the regression model could involve some degree of redundancy. For each model and measure of gender diversity, we report the coefficient estimates, the standard errors (in parenthesis) and the significance level where 1%, 5% and 10% level of significance is denoted by ***, ** and *, respectively. Companies operating with financial and insurance activities are excluded from the sample. Financial performance and CEO compensation are winsorized at the 1% and 99% tails. Some variables are omitted as they do not vary over the specified sample period. Appendix 5 defines the variables.

We find that the results are positive and significant for old companies. On the other hand, diversity is not significant for new companies that entered after the law came into force in 2006. In the quota period, a number of the old companies had to go through changes in the board composition to comply with the GBL, while new companies did not have to go through the same restructuring process. New companies could design the best possible board with respect to the law from the beginning. This shows that the companies which were forced to restructure the board and deviate from their optimal board composition were more affected by the GBL in relation to the CEO compensation. Even though old and new

companies had the same limited pool of women to choose from, our results indicate that the benefits of avoiding restructuring and deviating from the current board composition are larger than the challenge of finding the most suitable female directors.

7.6. Robustness

To ensure robustness of our results, we defined three different proxies for gender diversity and included them in the relevant models. The diversity proxies yielded the same results throughout the research and thus strengthen the validity of the findings. In addition, we estimated two different panel data regression models. Model (1) include company fixed effects and all the control variables that we find relevant for the analysis. Since company size and board size are highly correlated, including both variables in the regression model could involve some degree of redundancy and lead to multicollinearity. Therefore, model (2) include all the relevant variables except for the company size variable, and is robust to the inclusion of both company and time fixed effects. Both models use clustered standard errors on company level to make sure that these are correctly calculated. Finally, we ran two additional analyzes yielding results that supported the main findings for the different time periods in section 7.3.

7.7. Endogeneity

When analyzing the effect of gender diversity among the board of directors on CEO compensation, endogeneity concerns arise because of omitted unobservable company characteristics (Adams & Ferreira, 2009). Omitted variables lead to correlation between the CEO compensation variable and the residual term in the model. To address the endogeneity issue, we include several control variables in both regression models. Furthermore, we use panel data methodology with company and time fixed effects to control for potential endogeneity problems caused by unobservable heterogeneity that are constant over time for each company. Additionally, the difference-in-difference analysis deal with the endogeneity issue by removing unobservable fixed effects that have similar variation for public and private companies over time. Nevertheless, we are not able to remove unobservable effects that are not similar over time. With these methods we are able to address the endogeneity problem to some degree.

8. Limitations

We have not addressed the issue of reverse causality that gender diversity on the board affects the level of CEO compensation, and that CEO compensation impacts whether there are women or men on the board. We believe that this is not an issue in our analysis as the companies in our sample are required to have at least 40% of each gender represented on the board. Because of this restriction, it is unlikely that the CEO compensation affects whether the board members are female or male. Furthermore, the sample size used in the analyzes conducted on the quota period is small, reducing the statistical power of the results. In addition, we do not have data on long-term CEO compensation such as stock options or stock grants. This can result in an underestimation of compensation (Finkelstein & Hambrick, 1989; Gitmark, 2015). As a result, we may not be able to reveal the true relationship between CEO compensation and the explanatory variables. However, in Norway a relatively small part of the CEO's total compensation is stock options or stock grants and thus our results are still relevant (Randøy & Nielsen, 2002).

9. Conclusion

This paper studies the relationship between gender diversity on the board of directors and CEO compensation in Norwegian public companies. Through a difference-in-difference analysis we found that the GBL had a true effect on CEO compensation. To further analyze the relationship between gender diversity on the board and CEO compensation, we used two panel data regression models with company and time fixed effects. The results reveal that there was no significant relationship between gender diversity on the board and CEO compensation in the time period from 2000 to 2015. To examine the relationship further, we divided the time period into the pre-quota period (2000-2007), the quota period (2008-2009) and the post-quota period (2010-2015). The results show that there was only a significant and positive association between gender diversity and CEO compensation in the quota period from 2008 to 2009. Therefore, an increase in gender diversity on the board of directors only caused a temporary increase in CEO compensation. The association is robust to different measures of gender diversity and inclusion of fixed effects.

The short-term increase in CEO compensation is consistent with both theory and existing empirics on how regulatory shocks affect the optimal board composition (Ahern & Dittmar, 2012; Bøhren & Staubo, 2014). Our results indicate that it is not gender diversity that causes the higher CEO compensation but rather the large change in the board composition caused by the GBL. We find evidence that the short-term implications were stronger for companies that had to face larger board restructuring. The increase in CEO compensation in the quota period was stronger for companies with no women on the board before 2006. In addition, similar results were found for companies operating before the GBL was implemented.

Since our results only reveal a temporary relationship between gender diversity and CEO compensation, increased diversity on boards does not seem to have a long-term effect on CEO compensation. Consequently, gender diversity on the board does not appear to affect the decision making of the board in relation to CEO compensation.

It would be interesting for further research to examine the effects of gender diversity on boards in private companies where there are no gender restrictions as our paper only examined public companies. In addition, it may be incorrect to draw conclusions to other countries based on our results. Due to Norway's unique characteristics regarding high gender equality and small pay differentials, these results could be country specific. It would therefore be interesting to examine if similar results are identified in other countries.

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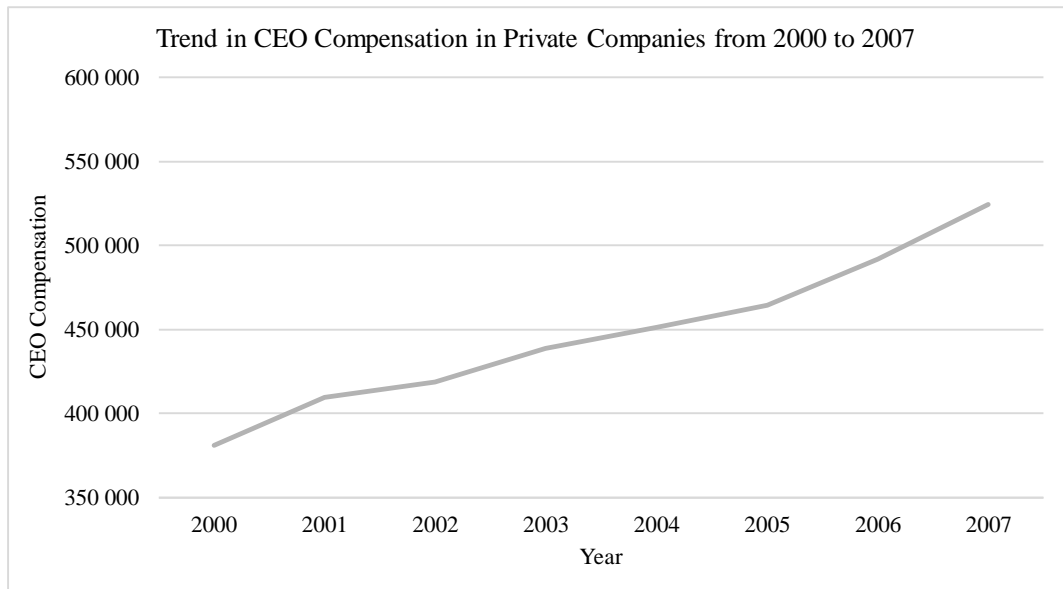Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*: MIT press.

11. Appendix

Appendix 1: Diversity from 2000 to 2015
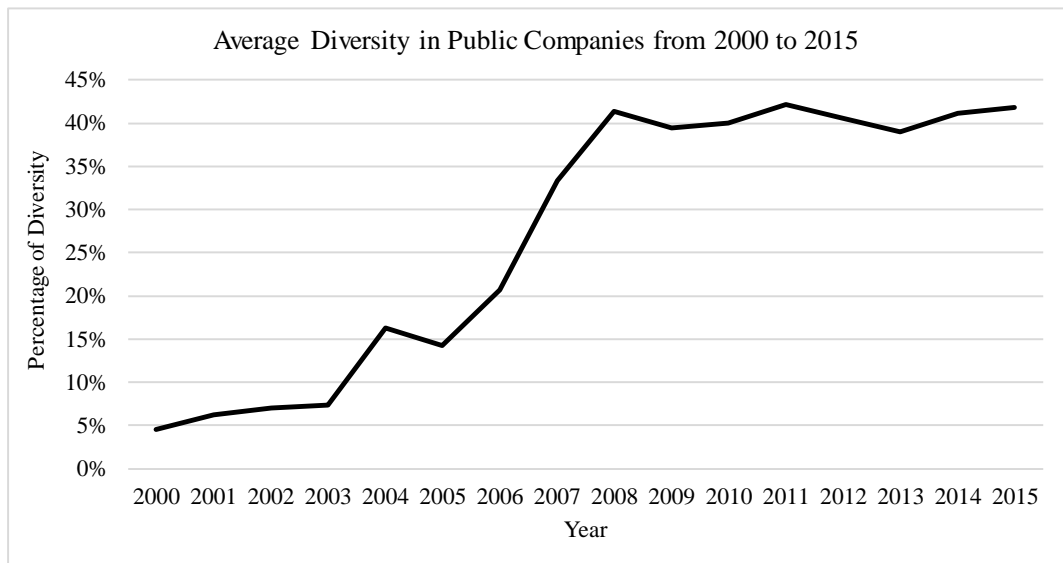
Appendix 2: Trend in CEO Compensation from 2000 to 2007

Trend in CEO Compensation in Private Companies from 2000 to 2007
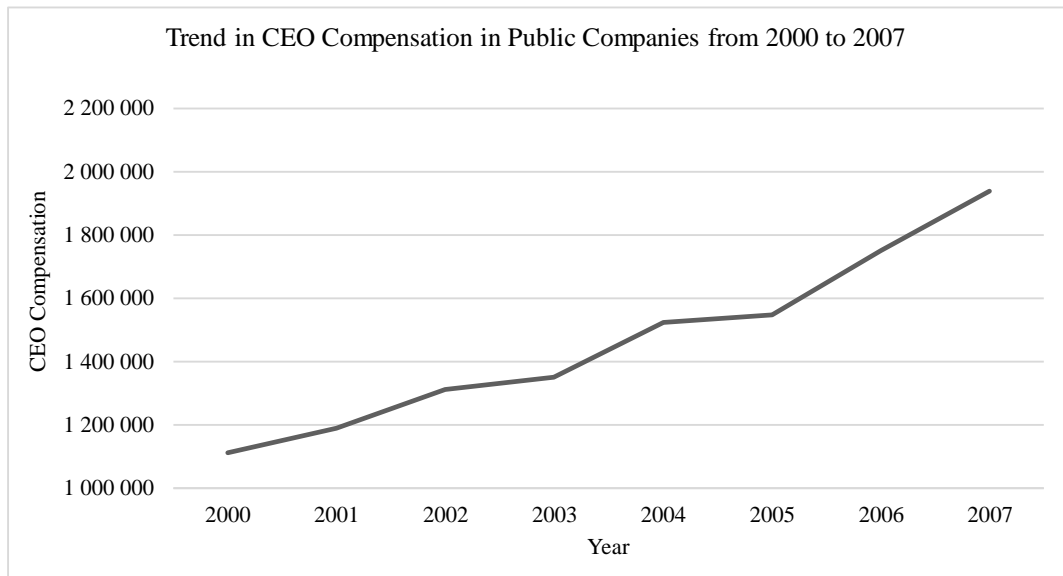
Appendix 3: The Hausman Test for Fixed Versus Random Effects

Diversity Measure	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
%Women	0.000	0.000				
Blau's Index			0.000	0.000		
D_Div					0.000	0.000

This table presents the results from the Hausman test for fixed versus random effects. The p-value of 0.000 indicates that fixed effects should be included in both models for all diversity measures.

Appendix 4: Test for Time Fixed Effects

Diversity measure	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
%Women	0.074	0.042				
Blau's Index			0.071	0.046		
D_Div					0.073	0.041

This table presents the results from the test for time fixed effects. Time fixed effects should be included if the p-value is smaller than 0.05. We find that time fixed effects should be included in model (1) for all the diversity measures but not for model (2).

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Appendix 5: Empirical Variables

Variable	Definition
Dependent Variable	
CEO Compensation	The natural logarithm of CEO compensation.
Independent Variable	
%Women	The fraction of female directors among the board of directors.
Blau's Index	Diversity index which ranges from 0 to 0.5, where 0.5 indicates an equal number of women and men on the board.
D_Div	Dummy variable which equals 1 if the board is heteregenous and 0 if the board is homogenous in terms of gender diversity.
Company Specific Control Variables	
Financial Performance	The return on assets (ROA).
Company Size	The natural logarithm of the book value of total assets.
Board Size	The total number of directors on the board at year-end.
Company Age	The number of years since the firm was founded.
CEO Specific Control Variables	
CEO Tenure	The number of years the CEO has been in the position.
CEO Ownership	Dummy variable which equals 1 if the CEO owns between 5% and 50% of the total equity and 0 otherwise.
CEO Age	The age of the CEO.
CEO Gender	Dummy variable which equals 1 if the CEO is a woman and 0 if the CEO is a man.

This table defines the variables used in the emperical analysis.