HØGSKOLEN I OSLO
OG AKERSHUS

Hans-Christian Opsund (s190664)

Does Mandatory Gender Diversity on Boards of Directors Affect Firms?

Empirical evidence from Norwegian PLCs

Master dissertation in Business Administration

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Sammendrag

Denne oppgaven undersøker effektene av økt kvinneandel i norske styrer på selskapets lønnsomhet, selskapets risiko, og avlønning til de ansatte. Hovedfokuset i oppgaven er på forskjellige perioder i lovgivningsprosessen som krever en viss representasjon av hvert kjønn. Funnene i eksisterende litteratur er motstridene om hvordan kvinner i styre påvirker selskapet. Hvis kvinner besitter egenskaper som komplementerer eksisterende styrer, vil de ha en positive påvirkning, men den effekten vil forsvinne hvis de nyansatte kvinnene mangler de nødvendige erfaringene og kvalifikasjonene som assosieres med styremedlemmer. Fra et lønnsomhetsperspektiv, fant denne oppgaven ingen klar sammenheng mellom kvinneandel og finansiell avkastning. Fra et forretningsperspektiv, viser denne oppgaven at en økning i kvinneandelen reduserer finansiell risiko og øker andelen selskapet lønner sine ansatte. Dette kan være forbundet med at kvinner er mer opptatt av sine omgivelser, fremfor å fokusere på kortsiktige virkninger.

Nøkkelord: Kvinnelig styremedlem, Diversitet, Lønnsomhet, Finansiell Risiko, Interessenter.

Abstract

This dissertation investigates the impact gender diversity has on firm performance, financial risk, and employee compensation over different stages in developing the Gender Balance Law. Findings in existing literature are contradicting on contributions derived from an increasing share of female directors. Women bring additional value if they possess qualities attributable for the boards, however mandating a minimum representation of each gender may be harmful if female directors lack the necessary experience and qualifications to fulfill these roles. From a firm performance perspective, this dissertation finds no clear relationship between an increased diversity and the corresponding returns. From a business perspective, I find evidence that an increased share of female directors reduce financial risk and increase the portion of employee compensation. This may related to women being more aware of their surroundings, rather than focus on short-term effects.

Keywords: Female directors, Diversity, Firm Performance, Financial Risk, Stakeholder-orientation, GBL.

Preface

This dissertation is a final project in order to complete a Master of Science in Business and Administration at Oslo and Akershus University College of Applied Sciences, Faculty of Social Science.

The development of this dissertation have been demanding and, at times, frustrating. After conversations with Øystein Støm, I decided to change my topic to a socially oriented issue that was both interesting and relevant. To find an appropriate approach has been decisive for the overall structure of my dissertation. I tried several different procedures, and conducted numerous analysis before settling on an approach I think measures the phenomenon I wanted to investigate.

Working on this dissertation have provided me with better understanding of solving practical issues with a theoretical and analytical approach. Completion of this project have been both educational and rewarding. I learned to cope with unexpected challenges during my research, and not be too suspended in minor obstacles.

I will like to thank Øystein Strøm for his guidance and supervision. He has offered support throughout the entire process from idea until final product. The constructive criticism he provided helped improve this project in several aspects. He also provided me with data from Brønnøysundregisteret, and he was a decisive mentor in the completion of this dissertation. In addition, I will like to thank Knut Nygaard for providing me with data from Oslo Stock Exchange, Oslo and Akershus University College for giving me the necessary prerequisites to complete an independent research, and Gro Nyhus for support and encouragement during my research.

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Hans-Christian Opsund

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1. Introduction

This dissertation investigates the effect of gender diverse boards of directors on firm performance, employee compensation and the financial risk for Public Limited Companies (PLC) listed on the Oslo Stock Exchange in Norway. The rationale behind this research is to find justification for mandating gender diversity in boards of directors. Firstly, gender equality is firmly entrenched in Norwegian society and have been for a long time. In February 2002, The Minister of Trade, Ansgar Gabrielsen, was quoted saying he was sick and tired of the "boys club" not incorporating women on their boards. He continued by saying people would be surprised by the radical means he would push through to see this happen (VG nett[1]). In January 2006, Norway became the first country in the world to mandate all Public Limited Companies to have a minimum representation of each gender on their board of directors.

The background for the Gender Balance Law (GBL) stems from public hearings on gender equality in 1999 and 2001. The first law suggestion was for all government owned companies to have a minimum representation of 40% of each gender and to recommend the same target ratio for all PLCs by mid-2005. If the desired target ratio was reached within the deadline, further legislation would be unnecessary.

In the years that followed, the representation of women on boards nearly doubled to 18% in 2005 (see figure 1) but was still far away from the targeted ratio and the government decides to put the new law into effect, forcing PLCs to comply or liquidate their businesses. The sanction that non-compliance led to liquidation came as a surprise since prior to this date non-compliance had no specified sanction and was most likely associated with fines. Nevertheless, all PLCs registered after January 1st 2006 was forced to accommodate to the new GBL, and existing firms were given a two-year transition period to comply.

A third option for existing PLCs was to change their organizational form away from PLC to a less regulated form like LTD[2]. The GBL do not affect LTDs and may be a preferred change rather than changing board structures. Bøhren and Staubo (2014) find a significant change in the number of PLCs after the law was mandated. Not only did companies withdraw, but also fewer companies chose to enter that organizational form. Public limited companies appeared

[1] http://www.vg.no/nyheter/innenriks/moekk-lei-gutteklubben-grei/a/3024189/

[2] Public limited liability companies (PLC) and limited liability companies (Ltd) is the two organizational forms a company can choose with limited liability in Norway. They are regulated by two different Company Acts – Limited Companies Act (Aksjeloven) and Public Limited Liability Act (Allmennaksjeloven)

TABLE 1

Important dates in the development of GBL

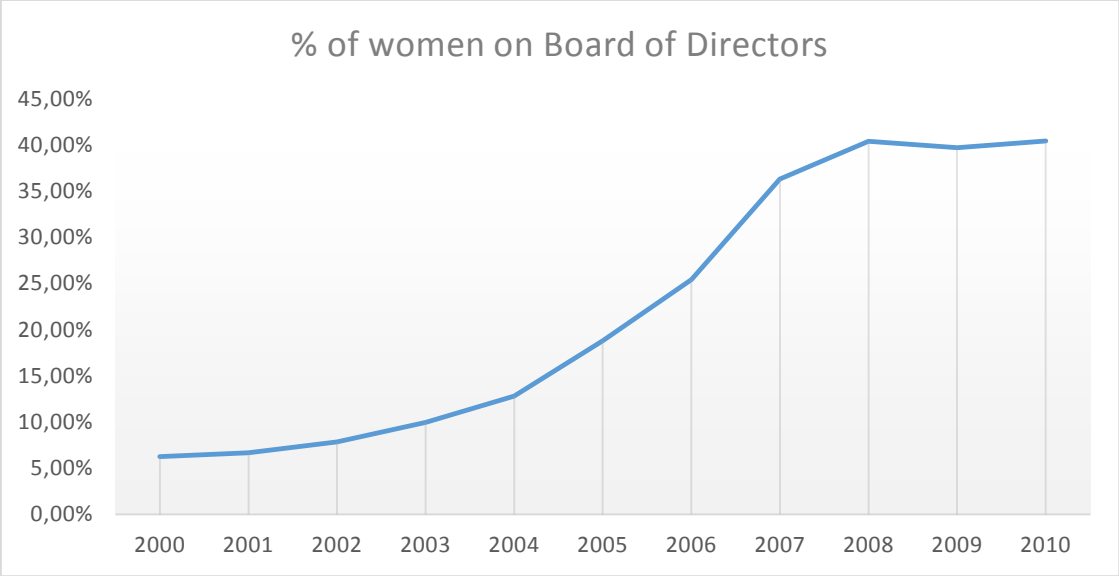
Important dates	Event
October 1999	First public hearing on the gender equality act from 1978
July 2001	Second public hearing with proposal that all government owned companies and public limited liability companies to have a gender representation of 40%
July 22nd 2002	Ansar Gabrielsen made a public statement warning companies to increase their gender representation on board of directors
June 2003	The law proposal became effective for all government owned companies and voluntarily compliance for PLCs
July 2005	Reassessment of the current situation and mandatory compliance was decided
January 1st 2006	Full compliance for PLCs registered after this date, and two years transition period for existing PLCs
January 1st 2008	Full compliance for all PLCs

less attractive after the reform was mandated, and a possible explanation for this may be that the benefits associated with PLC are offset by a greater cost of changing board structures.

Secondly, the percentage of women directors in the years prior to the compliance periods was historically low. Having a stable representation of women below 9% might be as argued by Terjesen and Singh (2008) be because females have had trouble acquiring the necessary experience associated with directors. This view is consistent with Strøm (2014), who finds no systematical discrimination in the years preceding the law. Rather, he argue that the underrepresentation of women is because they do not pursue the necessary education or career-paths leading to directorships. This gap in qualification will produce a few competent women that are highly sought after, the so-called "golden-skirts". Farrell and Hersch (2005)

FIGURE 1

Evolution of female representatives on Board of Directors in Norwegian PLCs



argue that these women tend to serve on boards of better performing firms, which in turn may cause a positive effect on performance.

There are several countries looking to improve their gender equality. For Norway to be the first country in the world to mandate such a huge reform puts them at the forefront of gender equality in firms and will act as a natural experiment for other countries to study.

On November 4th 2012, the European Union approved a draft law that sets an objective of 40% female nonexecutive directors for their members (Adams and Kirchmaier, 2013). In addition, countries such as Spain, Iceland and France have made recommendations for their boards to increase their female representation to the same ratio by 2013, 2015, and 2017, respectively (Campbell and Mínquez-Vega, 2008; Ahern and Dittmar, 2012). These countries have opted for the softer approach of "comply or explain" rather than mandating. However, Dale-Olsen, Schøne and Verner (2013) say that mandating forced quotas ensure that the desired outcome is more easily reached compared to quota recommendation. Figure 1 shows a significant increase in female directors as a result of the gender balance law in the period between 2003-2008, before stabilizing around 40%.

Terjesen and Singh (2008) investigate the presence of female representatives on corporate boards in 43 different countries in order to provide explanatory description of the environmental context. They find that countries with higher female representation on boards

are more likely to have women in senior management as well as more equal pay. They say that in addition to individual firm level factors, underlying conditions in the national environment can contribute to the female representation of women on boards. Countries with a longer tradition of women's political representation are less likely to have high levels of female board members. Scandinavian countries have had a long representation of women in government, and Norway had their first female prime minister in 1981. With the first female prime minister, Norway had a subsequently increase over the next periods of women holding important seats in government and advocating equal rights in the community (Adams and Kirchmaier, 2013). However, this do not appear to transcend into the corporate world. Terjesen and Singh (2008) present a possible explanation that this may be because early adopters of females in government might become complacent and stagnant in further promoting females in the corporate sector.

In their agenda to address the underrepresentation of female board members in Europe, Adams and Kirchmaier (2013) quote The European Commission stating:

"*One of the ways of improving Europe's competitiveness is the equal representation of women and men in economic decision-making positions, which contributes to a more productive and innovative working environment and helps improve performance. In addition, there is an increasing body of research showing that gender diversity pays off and that there is a positive correlation between women in leadership and business performance."* -The European Commission (2012 b, pp.10)

If business performance were positively correlating with an increased gender diversity, that would make opposing arguments less valid, and people opposing the law would appear stubborn and foolish. Their desire to keep their "boys-club" will be at the expense of better performance. However, the forced quotas will create upheaval in the current governance system, and one of the main criticism of the GBL was that it is too ambitious, and that there are not enough qualified candidates to occupy the directorships. Which in turn may result in spreading top candidates too thinly over too many boards (Goergen, 2012), or too many underqualified women directors. When female directors lack the experience of their male counterparts, this will result in a substantial cost for shareholders. This dissertation found no conclusive evidence that mandating greater gender diversity leads to better financial performance. It did on the other hand find that when the new law became mandatory the greater diversity had a negative relationship with firm performance, indicating that firms adapted to the corporate board structures most suited for their own agenda prior legislation.

The statement from the European Commission that equal representation in economic-decision making process can help improve the working environment can be tied to the different characteristics women possess compared to men (Ahern and Dittmar, 2012; Tutchell and Edmonds, 2013). Especially in the aftermath of recent financial crises, new regulations can be seen as preventive measures for future governance in the same manner that existing regulations are inspired by earlier governance scandals. Adding women with different preferences than men contributes to boards making sounder decisions and take less risk. This dissertation finds a significant correlation between females and the different preference measurements examined. The amount of financial risk a firm has adopted is negatively associated with a percentage of women directors. Whereas the stakeholder (employee) awareness is positively correlated with a greater ratio of women. This suggest that females differ from men in their motives for decision-making.

Gender diversity is an interesting topic with many different aspects, whether it is from a social perspective or financial perspective. The purpose of this dissertation is to attempt to uncover some underlying effects of greater gender diversity on board of directors to broaden the scope of understanding the consequences of the Gender Balance Law.

The rest of the dissertation is organized with section 2 giving a brief introduction of what Public Limited Companies are in Norway and the impact the reform has had for the organizational form. It also review existing literature about gender diversity in boards of directors and hypothesis development. Section 3 describes my data and explains the methodology used. Section 4 provides the models and results. Section 5 is testing my results for robustness, and section 6 makes concluding remarks.

2. Background and hypothesis development

2.1. Public Limited Companies (PLC) in Norway

2.1.1. Limited liability companies in Norway

A law was passed in Norway at year-end 1995/96 stipulating firms with limited liability to be divided into two organizational forms – *Public Limited Companies (PLC)* and *Limited Companies (LTD).* Prior to this separation, no official distinction was made for companies with limited liabilities. The reasoning for the classification was The EEA Agreement[3] with the European Union mandating Norwegian Corporate Law to adapt its policies to accommodate the European standards. As one of the last industrialized countries to distinguish between limited liability companies, The Norwegian Company Law was subsequently divided into two separate Acts, with different regulations and requirements to govern these new organizational forms (Bråthen, 2009 pp.13-15).

One of the requirements that separates the two organizational forms is the demand for startup equity. Where LTDs only need NOK 30,000[4], PLCs are required of having NOK 1 mill of startup equity. Moreover, Limited Companies are considered small since their shareholders are usually private and few in numbers, whereas Public Limited Companies are considered big, with a vast number of shareholders. The issue of shareholders is one of the major topics when discussing the differences between the organizational forms. PLCs are considered to have greater minority shareholder protection, with better transparency due to more reporting requirements. They are also the only ones given the opportunity to list on the Oslo Stock Exchange (OSE).

Another important distinction is in the regulation of the company board of directors. The balance of power in PLCs are subject to rigid requirements, where, depending on characteristics such as size, number of employees and gender, the composition of boards are less freely exercised compared to LTDs. For example, the CEO of a PLC is prohibited from holding a directorship on the board he serves. Furthermore, companies with a certain amount of employees are required to have employee representatives on their boards, as well as represented by both genders. Norway has a two-tier system that governs the company but the Norwegian model permits companies to opt for a structure that resembles the one-tier

[3] The EEA Agreement (EØS-avtalen) is an agreement between the European Free Trade Association (EFTA) and the European Union (EU) that allows EFTA members to participate in the EU's internal markets without being a member of the union. In addition to regulate trading, the agreement also stipulates economic conditions between the two organizations.

[4] Over my research period the equity requirement was NOK 100 000, but was lowered to NOK 30 000 in 2013.

system[5]. The Company Act for PLCs states that a corporate assembly is formed unless special circumstances allows companies to abstain from them[6]. Nevertheless, companies with more than 200 employees have to establish a corporate assembly.

2.1.2. The Gender Balance Law

The Gender Balance law (GBL) stems from proposition no. 97 in 2002-2003, where the Norwegian Government proposed that board of directors of all stated owned corporations should have a minimum representation of approximately 40% of each gender.

The background for the proposition comes from a public hearing in 1999, when the Norwegian government wanted to overhaul the gender equality act from 1978 that specifies a minimum of 40% of each genders is represented on committees appointed by a public body. The initial suggestion was for boards of all listed firms, with four or more members, to have at least 25% of each gender. Following the initial suggestion, the government increased their target ratio to 40% and proposed the quota to be incorporated into corporate law instead of the gender equality law. The government kept encouraging gender equality in the following years before the Norwegian Parliament made a law proposal for voluntarily compliance in June 2003 for companies to reach a target ratio of 40% by July 1st 2005. If the target ratio was reached within the deadline, this would make a new law unnecessary[7]. By April 2008, all PLCs had complied and no firms had to liquidate their businesses (Nygaard, 2011).

It should be highlighted that the GBL does not mandate a minimum of 40% representation of both genders for all board of directors. The law only stipulates how many shareholder-elected representatives of each gender is present on boards, depending on board size and gender diversity amongst the employees[8]. For simplification, the number of gender representation at different levels are presented in table 2 based on board size. We see that firms with three directors are only required one director of each gender, and boards with eight directors only need three directors of each gender. Both of these have target ratios below 40%. Furthermore, other firm characteristics may cause firms to have lower gender-representation. For example, firms with 31-50 employees and four board members are required to have one employee-

[5] SEEurope is a project conducted by an internationally composed network of researchers under the leadership of the European Trade Union Institute for Reasearch, Education and Health, and Safety (ETUI-REHS, Brussels). http://www.seeurope-network.org/homepages/seeurope/countries/norway.html,

[6] Public limited liability act (Allmennakseloven) § 6-35.

[7] Odelstinget Proposition no. 97 2002-2003

[8] Firms with less than 20% gender diversity amongst its employees at the time of director-appointment is not required to accommodate the requirements for gender representation for 4-8 board members. Public limited liability act (Allmennaksjeloven) § 6-11 a. (2).

TABLE 2

Gender Representation depending on Board size

Board size	Gender representation
3	1
4-5	2
6-8	3
9	4
9<	40%

represented director. The law only require one of the three directors chosen by the owners to be of each gender, whilst the employee representative can be chosen freely, giving a possible ratio of 25%.

Given the possibly legal gender-representations on boards presents implications by investigating purely the target ratio of 40%. It will not capture the full effect of how firms comply with the GBL and broader board characteristics should, preferably, be incorporated when analyzing the law.

2.1.2.1. The effect of GBL on organizational forms

The regulatory shift requires firms to change their board structures away from previously optimal structures. There is a significant difference in firms choosing to exit from their original organizational form. Non-listed firms had a 49% decrease over the period 2002-2008, while listed firms had an increase of 11% over the same period (Bøhren and Staubo, 2014). They argue that the cost for listed firms to exit is higher than for unlisted firms and the benefits gained exceeds the cost of changing organizational form. Non-listed firms are usually smaller and have a higher ownership concentration that benefit from dependent directors and their ability to produce good advice. Bøhren and Staubo (2014) also find firm characteristics relating to exiting firms, such as profitable, small, young, and non-listed. Moreover, these firms tended to have strong owners and few female directors prior to the gender law.

The GBL also saw an increase in the average fraction of independent directors from 46% to 67% (Bøhren and Staubo, 2014). This growth in independent directors may impair the boards' advisory role over management (Bøhren and Strøm, 2010). Bøhren and Staubo (2014) argue that the firms needing independent directors the most, and who pursue diversity would adopt

to the law earlier than firms needing advice would. A main reason for these early adopting firms may be that they consider the pool of qualified women to be smaller and want to acquire the most qualified women before competitors appoint them.

2.2. Literature and hypothesis

Existing evidence on the composition and responsibilities of board of directors is conflicting and most scholars disagree on the effect gender diversity has for the corporation. In corporate finance, a common belief is that the board of directors' main objective is to maximize the wealth of its shareholders through responsibilities such as monitoring and advising, controlling the interest of principal and agent, and improving decision-making effectiveness (Fama and Jensen, 1983; Bøhren and Strøm, 2010). For more women to enter the boardroom, may disrupt these responsibilities and change the tradeoff in which the board is currently operating.

In the literature, female directors are considered outsiders, and if the proportion of outside directors or independent directorships increase, evidence suggests that this will bring along an improvement of the boards supervising and controlling mission, but at the cost of slower decision-making, less firm specific advice, and increased conflict (Lau and Murnighan, 1998; Bøhren and Strøm, 2010). This change in dynamic can benefit the owners if the current board structure chosen is to maximize the private benefits of the management rather than firm value (Demsetz and Lehn, 1985). If this is the case, then imposing legal constraints on board structures will increase value and reduce agency cost. On the other hand, if the board composition is to maximize firm value, then imposing regulations will lead to a decline in value since it will prohibit the board of directors to perform optimally.

From a firm performance perspective, Ahern and Dittmar (2012) find that a mandated female representation on boards have a substantial decline in firm value. Other researchers (Shrader, Blackburn and Iles, 1997; Adams and Ferreira, 2009; Bøhren and Strøm, 2010) confirm this negative relationship when they investigate the effect gender diversity has on firm performance over different sample data. The performance measure used to detect this relationship is the market-based measure Tobin's Q. It is a shared belief among scholars that this is an adequate measure to uncover any relation between gender diversity and firm performance (Dale-Olsen et al., 2013). Ahern and Dittmar (2012) argue the negative effect may be because the different characteristics new female directors bring compared to their male counterparts. They continue by considering that there is other aspects to the decline in performance such as how the retained male directors behave differently after the appointment

of new female directors, that women have different preferences than men, or that the quota have disrupted boards' operations.

Campbell and Mínguez-Vera (2008) find a significant positive impact of greater gender diversity for their analysis of non-financial firms listed in Madrid during the period 1995-2000. They argue that the benefits from female directors are greater than the cost of adding them. Srinidhi, Ferdinand and Tsui (2011) argue that there is a positive association between gender diverse boards and higher earnings quality. They find that firms with female directors in auditing committees display better reporting discipline by managers when examining U.S. corporations over the period 2001-2007. This linkage could improve earnings quality by the benefit women directors bring to boards. Smith, Smith and Verner (2006) find women directors tend to have a significantly positive effect on firm performance. However, by controlling for unobservable firm-specific factors, the effect often becomes insignificant.

When it comes to the reform in Norway, Matsa and Miller (2013) compare the voluntary compliance period to the mandatory compliance period and arrive at supporting evidence that the operating performance declines while the cost increases. They argue, based on earlier research, that the newly appointed female directors increased costs because they are more altruistic and long-term oriented than male directors. Male directors are more competitive and more prone to take excessive-risk (Wilson and Altanlar, 2009).

Dale-Olsen et al. (2013) find that the impact of the reform in Norway is negligible. They argue that the insignificant impact from the reform may imply that either the short-run influence of boards is small, or that the new female directors do not bring along additional resources or perspectives compared to their male counterparts. Campbell and Mínguez-Vera (2008) argue that if women bring additional perspective to the decision-making of the board, then they can enhance shareholders value, contrary, if women are appointed as result of societal pressure for equality, then the women may have a negative impact. This is supported by Fama and Jensen (1983), who suggest that independent directors are more inclined to ask questions and thus increasing the board's ability to control and monitor management. Gender diverse boards have more informed deliberations and discuss tougher issues that are often considered uncomfortable by men (Srinidhi et al., 2011).

Bøhren and Strøm (2005; 2010) find that value creation is significantly higher at several explanatory variables, such as dependent directors, directors with outside directorships, smaller boards, and boards with a low gender diversity. Directors with outside directorships

may benefit the firm through valuable networks. In addition, they find that heterogeneous boards contribute negatively to firm performance, is more damaging in terms of decisiveness, and their ability to produce good advice reduced. Their result indicate that firms should try to achieve homogeneous boards from a financial perspective. A contradicting advice to advocates who argue that gender diversity will result in better performance.

Adams and Ferreria (2007) say that regulating the boards to have more independent directors reduces the information between the CEO and the board, hurts its advisory role, and may reduce its monitoring function. They show that independent directors have stronger monitoring incentives than dependent directors, which may hurt the stockholders. Bøhren and Staubo (2014) find that smaller and younger profitable firms with few female directors and powerful stakeholders need independent boards the least. They argue that these firms need advice from dependent directors more than the need for enhanced monitoring from independent directors. Although, the decision of a gender diverse board may be of better quality in the end (Carter, Simkins and Simpson, 2003), it can suffer from a slow decision-making process to rapid market evolvements (Hambrick, Cho and Chen, 1996, Smith et al., 2006).

Existing research shows that board regulations can improve performance if the firm suffers from high information asymmetry or if new directors possesses advantageous externalities (Hermalin and Weisbach, 2006; Nygaard, 2008). Nygaard (2008) investigates the information scores generated in a survey conducted by PWC in 2005 for all listed PLCs in Norway and shows that the direction of the impact depends on firm specific information asymmetry. He finds that firms with low information asymmetry experience a positive effect of the quota law. A reason for this can be that firms with lower information asymmetry may be striving towards trust building, a leadership-style more attributable to women (Klenke, 2003). On the other hand, firms with high information asymmetry do not share the information flow adequately enough to all parties involved. Family-owned firms or firms with high ownership concentration may not share the information with outsiders and therefore create high information asymmetry in their firms. Firms with high information asymmetry and few female directors are more likely to suffer from the law (Nygaard, 2008).

Campbell and Mínguez-Vera (2008) investigate the causal effect if women on the board influences firm performance or if the performance affect the gender composition, and find that that the direction of causality comes from gender composition to firm value, not the other

way around. A result that may conflict with arguments made by Farrell and Hersch (2005) that highly qualified women tend to choose better performing firms.

The differing evidence of the effect of gender diversity on firm performance is substantial and my first hypothesis is formed to further understand the impact a forced compliance will cause.

Hypothesis 1: Gender diverse boards of directors will significantly affect firm performance.

In addition to the effect on firm performance, there may be other benefits drawn from an increased gender diversity. First, the board of directors' main task is to supervise the company's operation and make sure they act in the best interest of the shareholders (stakeholders). The interests of shareholders are not necessarily the same as the interests of stakeholders and researchers disagree on for whom the board of directors should look after (Schleifer and Vishny, 1997; Goergen, 2012). For stakeholders such as employees, the need for appreciation can conflict with management seeking value maximization.

Schleifer and Vishny (1997) claim that the board should act on behalf of the shareholders (residual claimants), as they are the ones that incur the loss, while stakeholders are more likely to be unscathed in the event of downturn. Other researchers argue that the collective stakeholders all contribute to value creation and should be for whom the directors look after (Ireland, 1999). The differing interests make the decision on what is best governance practice a complex and challenging topic. Blindly advocating one universal governance system may be unnecessary or in worst case harmful for boards already adjusted with respects to their own agenda (Goergen, 2012; Dale-Olsen et al., 2013).

For their role on the board, Adams and Ferreira (2009) find that females are more likely to be assigned to audit-, nominating-, and corporate governance systems, and less likely to be found in compensations committees than men. They investigate what constitutes good corporate governance practices and provide evidence of the relationship between directors' compensation and diversity. One of their findings is that there is a weak positive relationship between diversity and total director pay however, they highlight that there is no clear consistency between total pay and better governance. For diversity and better corporate governance in general, Adams and Ferreira (2009) find that there is a positive relationship, whereas Strøm, D'Espallier and Mersland (2014) find the opposite.

Shrader et al. (1997) say that there is evidence that women are more relationship-oriented than men, which is consistent with Adams and Funk (2011) who find that women directors emphasizes self-transcendence rather than self-achievement. This is to say that women are more likely to make decisions in the best interest of its stakeholders. Increasing the ratio of female directors can therefore provide unforeseen effects where the wellbeing of employees becomes an important issue. For the reform in Norway, Matsa and Miller (2010) find evidence that Norwegian firms became more stakeholder-oriented after the implementation of the new GBL.

The evidence that women are more concerned about their surroundings should improve their attitude towards its stakeholders, which leads to my second hypothesis that gender diverse boards will offer more compensation to its employees.

Hypothesis 2: Firms with a higher gender diversity on their boards of directors have a greater social responsibility to its employees (stakeholders).

A second benefit drawn from gender diverse boards is female directors' risk propensity. Bøhren and Strøm (2005) say that the problem with addressing board design is that they are multidimensional by nature. The demographical differences of directors provides us with challenges to predict the full set of values board mechanisms contribute. Ahern and Dittmar (2012) find that women are not added to the existing boards following the GBL, but rather replacing men as directors. These new board structures with few retained men and new female directors could increase board independence, and hence the boards monitoring role according to common governance theory. Fama (1980) say that the number of independent directors are a reflection of the boards' monitoring ability. However, this benefit is lost if women are marginalized or given nonexecutive roles.

Females have characteristics that are more independent than the exiting men. Ahern and Dittmar (2012) find that female directors are on average younger, have less CEO experience, are more educated, and are more likely to be employed as nonexecutive managers. Furthermore, Tutchell and Edmonds (2013 pp.28) say that women are more risk averse and tend to have a greater focus on value preservation. If this is true, women will function better in a supervisory position, rather than managing the day-to-day operations, which is consistent with findings by Adams and Ferreira (2009).

Adams and Funk (2009) find that females and male directors differ in their risk attitudes. They find that, although women in general are more risk averse than men, female directors are

less. A study by Sapeinza, Zinglas and Maestripieri (2009) attributes differences in risk behavior to levels of testosterone rather than gender. In the past, board of directors have been a male dominated environment, where testosterone levels have been high and overconfident investments have been made. For females to enter the boardroom will reduce these levels, as they have naturally less testosterone. Wilson and Antanlar (2009) say that psychological literature provides evidence that men are more prone to overconfidence, which in turn may result in excessive risk taking. They investigate the relationship between gender diversity and insolvency risk for over 900 000 limited companies in 2007-2008, and find that female directors appear to reduce insolvency risk.

Schubert, Brown, Gyslar and Brachinger (1999) examine the view that women are more risk averse than men in financial decision-making. They find that the contextual setting of financial decisions is a determinant for the risk propensity taken. When faced with the same context, they find no gender difference in the risk propensity between genders. Byrnes, Miller and Schafer (1999) find evidence that men are more inclined to take gambling risks compared to women. This gender gap may transcend into men taking more risk in a competitive environment. Gysler, Kruse and Schubert (2002) find in an experimental study that when faced with uncertainty, women are more conservative investors and take less risky decisions.

Vathunyoo, Gonzalez and Hagendorff (2014) investigate the relationship between gender diversity and risk from the perspective of equity holders. They analyze the movement of stock prices for listed companies in the U.S. over a period from 1996-2006. In their reasoning for researching this relationship, they summarize studies in economic and psychology that often find women to have less appetite for risk than men. They say *"... if female directors do indeed affect firm risk, the embrace for boardroom gender diversity may alter the risk profile of firms in an unforeseen way"* pp.3. Even though they find a negative relationship between equity risk and female directors, they do not find that increasing the proportion of female directors is associated with lower risk.

Shrader et al. (1997) find that women tend to hold disadvantageous positions, with less instrumental impact for the firm. If this is the case, then there is no prior reason to expect greater gender diversity to result in better board monitoring. Which leads to my final hypothesis investigating the relationship between female directors and risk propensity.

Hypothesis 3: Firms increasing their gender diversity in the boardrooms reduces the firm's total risk profile.

3. Data and method

3.1. Descriptive statistics

The sample data used to conduct this research are Publicly Limited Companies registered at Brønnøysund Register Center[9] and on the Oslo Stock Exchange (OSE) over the period 2000-2010. The data gathered from Brønnøysund provides an overview over all board of directors for PLCs in Norway over the sample period. The OSE data, on the other hand, contains accounting information of all registered firms on the Oslo Stock Exchange from 1980-2011. These accounting figures far exceed the board information offered by Brønnøysund and a reduction in the accounting period (1999-2010) is done in order to create coherent samples. In addition, some figures are missing or cumbersome to construe due to modification in accounting practices over the period[10]. Changing from the old principles to IFRS produces a greater value relevance, where income statements are more affected by balance sheets than previously (Galåsen, 2010). She studies the effect of changing accounting practices, and concludes that accounting figures relating to earnings are less reliable because NGAAP recognizes big losses continuously rather than spreading them over numerous accounting periods.

By crosschecking the two datasets against each other, I remove non-listed PLCs and firms not registered as PLCs in Norway. Furthermore, financial firms are excluded from the sample because they are governed by different regulations. This mitigation of my data reduces annual observations, on average, from 507 to 148 firms, leads my sample firms to have an additional director each year compared to the full population, and have a higher percentage of female representatives before the law became effective (see table 3). A possible explanation for the increased gender diversity and extra board member can relate the sample boards to be more homogeneous compared to the overall population. Firms listed on the OSE are usually larger companies, with more directorships on average compared with smaller PLCs. The listed firms also follows a stricter corporate governance code of conduct. For the greater diversity prior to legislation, listed companies may be more inclined to incorporate females on their boards due to social pressure. Adams and Kirchmaier (2013) find in their research on female participation

[9] Brønnøysund Register Centre is a Norwegian government agency managing public registers for all enterprises registered in Norway.

[10] In 2005 companies listed on OSE where required to change accounting practices from Norwegian Generally Accepted Accounting Principles (NGAAP) to International Financial Reporting Standards (IFRS). Companies with listed bonds and companies applying US GAAP had the opportunity to postpone the change until 2007 (Magma, 2007 – IFRS og norske regnskapsregler).

TABLE 3

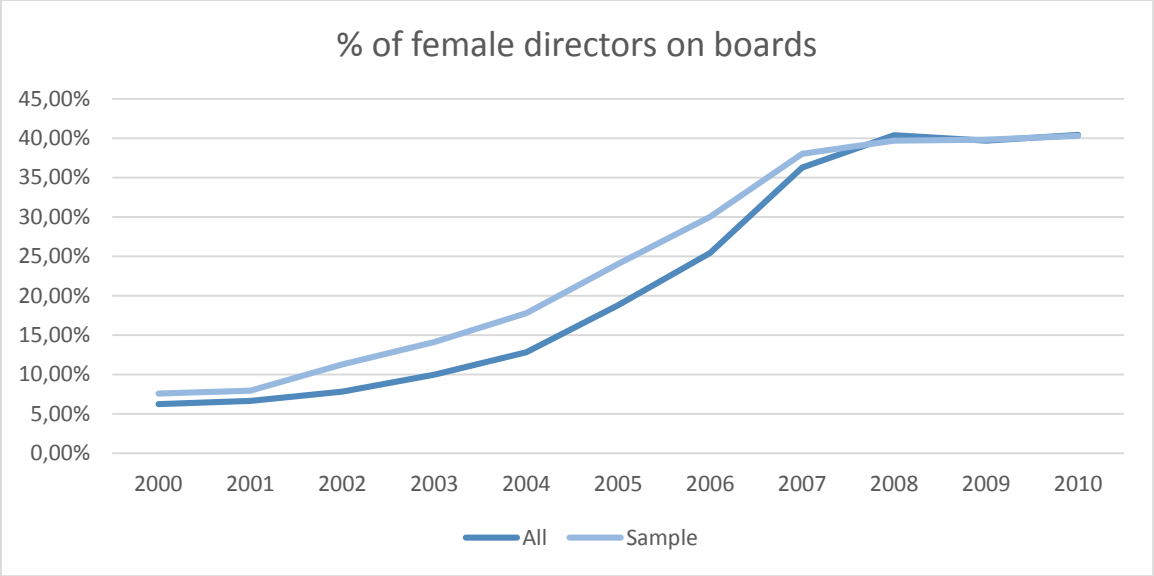
This table shows a descriptive summary of Gender Diversity for each year in my sample data.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
All											
Number of PLCs	603	631	601	556	523	495	506	484	415	362	339
Board size	5.14	5.07	5.10	5.10	5.12	5.23	5.21	5.15	5.27	5.27	5.41
Women	0.32	0.34	0.40	0.51	0.66	0.98	1.33	1.87	2.13	2.09	2.19
% of women	6.26 %	6.65 %	7.83 %	9.98 %	12.82 %	18.82 %	25.44 %	36.30 %	40.40 %	39.71 %	40.44 %
- Non-listed PLCs	382	416	396	369	314	261	259	218	163	130	108
- Non-Norwegian	50	50	53	49	60	66	75	73	71	70	69
- Financial PLC	22	20	20	17	13	13	15	16	17	17	17
Sample											
Number of PLCs	149	145	132	121	136	155	157	177	164	145	145
Board size	6.19	6.26	6.37	6.31	6.36	6.39	6.47	6.36	6.46	6.37	6.41
Women	0.47	0.50	0.72	0.89	1.13	1.54	1.94	2.42	2.57	2.54	2.59
% of women	7.59 %	7.94 %	11.30 %	14.14 %	17.80 %	24.04 %	30.02 %	38.04 %	39.72 %	39.83 %	40.32 %

Notes: This table shows the level of on Gender Diversity over the sample period for all Public Limited Companies registered in Norway, filters and the sample data used in this empirical analysis. The number of eliminated firms showed for each consecutive filter. The filters are non-listed PLCs, firms on the OSE not registered as PLCs in Norway, and financial firms.

FIGURE 2

Evolution of female representatives on Board of Directors in sample and population



in the labor force and boardroom gender diversity that companies with stricter corporate governance codes tend to have higher gender diversity than less transparent counterparts.

From figure 2 above, we see that the sample data has a more steady growth over the research period compared to the population. A reason for this can relate to Bøhren and Staubo's (2014) research into the effect the GBL has on the attractiveness of this organizational form. They find that existing PLCs chose to exit from the organizational form, and that new companies were reluctant to enter. When new companies entered, they tend to list their company on the OSE right away. Furthermore, the trend to exit were strongest amongst smaller, family-owned, and unlisted PLCs. In my data, these firms are subsequently removed, leaving only listed PLCs in my sample. As I mentioned in the literature review in section 2, the companies choosing to stay prepare themselves for a potential change in board structure. What is interesting is that the evolution of female directors have a congruent increase over the two datasets before stabilizing at 40%, and not continue to grow to an equal 50% diversity.

Table 4 offers an overview of the dispersion of the accounting and board characteristics considered. Extreme outliers in accounting changes have been removed and subsequently reducing observations for these variables. Furthermore, some firms are entering at a later stage and have no prior accounting information for comparison. For board changes, the data

TABLE 4

This table shows a descriptive summary of board specific- and accounting variables gathered for this empirical analysis.

	Mean	*Stdev*	*Median*	*Min*	*Max*	*Obs.*
No. years	7.845	3.177	9.000	1.000	11.000	1626
Board specific						
Board size	6.362	1.813	6.000	3.000	12.000	1626
BM age	50.199	4.748	50.333	33.750	69.000	1626
Diversity	0.248	0.180	0.250	0.000	0.800	1626
Financial specific						
ROA	-0.061	0.328	0.013	-4.205	1.717	1626
ROE	-0.215	4.206	0.041	-111.466	34.720	1626
Net income*	399	2924	9.471	-15915	44096	1626
Total assets*	8513	37414	1025	1.010	643000	1626
Total equity*	3240	13976	397	-859	219500	1626
Total debt*	5273	23753	586	-2841	423500	1626
Debt to Equity	2.082	15.154	1.366	439.333	225.153	1626
Wages to total assets	0.289	0.903	0.205	0.001	34.356	1545
Measurement specific						
Δ diversity	0.094	0.451	0.000	-1.000	4.000	1337
Δ ROA	-0.634	13.787	-0.312	-233.977	137.388	1465
Δ ROE	-0.721	14.519	-0.310	-269.580	137.388	1465
Δ Net income	-0.441	14.873	-0.230	-217.354	161.301	1465

** are presented in million NOK.*

Notes:
All descriptive statistic is calculated from an annually observation of each variable. "No. years" indicate how many years on average a firm is present over my sample period, and "BM age" is the average age of board members for each firm and year. "Wages to total assets" is employee compensation in the form of wages, salaries and social security.

gathered have no information prior to 2000, which leads to a significant reduction in observations of diversity change. In addition, the missing Y2000 changes in diversity makes this year detrimental for conducting my analysis and hence, my sample period for this empirical research is constrained to the period 2001-2010.

Further reduction is done in my analysis by excluding 2009 and 2010 due to the global financial crises (GFC). The global recession highly influence my accounting figures by external factors not relatable to gender diversity and can cause biased results. My final sample period will be from 2001-2008 for my base-case models in section 4.

TABLE 5

This table shows the number of firms in different diversity levels.

%	2001	2002	2003	2004	2005	2006	2007	2008
<10	95	75	55	47	33	16	4	0
10-20	31	33	36	40	44	37	8	4
20-30	12	8	14	28	32	27	25	16
30-40	6	12	12	14	25	45	88	86
40<	1	4	4	7	21	32	52	58
Obs.	145	132	121	136	155	157	177	164

Notes:
This table shows the how many firm observations that reside within different diversity percentages in my sample data. Non-listed firms, non-Norwegian firms, and financial firms are not included.

Table 5 shows an overview of the dispersion of firms with different levels of diversity in my final sample. We can see that in the beginning of my sample, 95 firms had less than 10% diversity. In the consecutive years, firms in this category had a steady decline, while firms in the top two categories had a substantial increase.

3.2. Variables used in this research

The variables applied in this research are design to capture the diversity effect imposed by the GBL. The variables included ranges from specific board characteristics and firm performance, to control variables such as size factors and risk factors. The firm specific characteristics applied is to incorporate additional explanation to the dependent variable. Examining purely the effect of gender diversity without control factors, will not possess the full explanatory effect of my dependent variable, offering a minimal R squared (<0.0001). In addition, it can generate biased results, as other factors may be more important to explain the linkage. The variables used in this dissertation is presented in table 6.

The data I have gathered do not contain any market information for the firms except market value of securities the firms have invested. This makes my research to have accounting-based measures rather than market-based measures, and my dependent proxies for my hypothesis are in the following order: *return on assets, employee compensation, and debt-to-equity.* When testing for robustness in section 5, alternative proxies is constructed from other accounting figures.

The board specific characteristics used in this research are mainly (1) diversity, which measures the percentage of women to board size, (2) change in diversity from year-to-year, (3) board size, and (4) board member age. Controlling for other board specific characteristics can prove instrumental in order to detect the gender effects. In the literature section, I mentioned that women appointed to boards differ from men in age, being on average more than eight years younger (Ahern and Dittmar, 2012). I also mentioned that larger boards are more inclined to suffer from more conflicts in the decision-making process. Controlling for these characteristics will offer a broader scope of the gender diversity relationship.

For hypothesis 1, I have used the accounting-based performance-measure return on assets (ROA). The data do not contain any market-based information to construct a reasonable proxy. The lack of market-data does not however suggest that the effect of gender diversity on firm performance cannot adequately be measured. Dale-Olsen et al. (2013) argue that there is no perfect performance measures to capture the effect of board change. They claim that both market- and accounting-based measures lack the necessary scope to include all the factors such as changes in accounting rules, anticipation of returns and psychological factors. Where altering accounting rules and short-term manipulations are disadvantages of accounting-based measures, market-based measures suffer through anticipation from information and behavioral psychology. If females are associated with weaker qualifications, then the market value will reflect their appointment on boards. Dale-Olsen et al. (2013) continue by saying even though Tobin's Q is often preferred, measuring performance by ROA will be at least as adequate to capture the diversity effect.

Hypothesis 2 have a dependent proxy designed to measure the extent of employee benefits from an accounting post in the data gathered from OSE. The total sum of employee wages, salaries and social security is a reflection of the compensation employees receive for the efforts they contribute to the firm. To compare if highly diverse firms reward their employees differently than firms with less diversity, the idea is to detect an underlying trend amongst women and the well-being of its employees. Since the total amount of employee compensation depend on the size and capital structure of the firm, it is constructed as a ratio of employee compensation to total assets. Larger firms with more employees have a greater compensation post in absolute figures.

TABLE 6

Empirical proxies in this research

Variable	Definition
Board specific	
Diversity	The percentage of female directors on board of directors
Board size	The total size of the board
Age	Average age of board members
Firm specific	
Size	Logarithmic value of total assets
Risk	Debt to equity ratio (DEQ)
Income	Logarithmic value of net income squared
Wages	Wages, salaries and social sec. divided by total assets
Performance	
ROA	Net income divided by total assets
ROE	Net income divided by total equity
Additional variables	
Δ diversity	Arithmetic change in diversity ratio from n_{-1}
Δ income	Arithmetic change in net income from n_{-1}

Notes: This table shows the empirical proxies used to conduct this research and a description of the design. They are based on annual observations of the variables.

To see if women are more risk averse than men, I will measure the financial risk associated with the firm. The dependent proxy in hypothesis 3 is the firm's debt-to equity ratio (DEQ). The idea is that this will provide a general idea of the risk profile chosen by the firm. Mao (2003) argues that leveraged firms tend to increase investments to increase risk. She discusses the risk-shifting problem first put forth by Jensen and Merkel in 1976[11] that a leveraged firm with debt obligations take greater risks in order to accommodate additional fixed costs. It is not groundbreaking that additional debt leads to additional risk for a firm's shareholders. A common conception in corporate finance is that risk averse investors seek less leveraged investments. As for the financial risk proxy, Bhandari (1988) find that risk averse investors have a positive correlation between DEQ and expected common stock returns when controlling for explanatory variables not measuring risk. I discussed how female directors possess the characteristics of risk aversion in the literature review and hence, greater gender diversity should negatively correlate with DEQ if the expected returns remain the same.

[11] Introduced by Jensen, M. and Meckling, W. in 1976: "*Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure".*

An important control for my dependent variable is firm size. The size of the firm affects the dependent variable on numerous aspects. Larger firms tend to have larger boards, generate smaller returns than small high-growth companies, and may have employee-directors represented on the board. The capital structure of the firm may also affect the size of the firm. Highly leveraged firms can increase their size indirectly through tax-shields generated from debt. The proxy designed to represent size is the logarithmic value of total assets. An additional control is designed as the logarithmic value of net income squared. For the risk control, I use the same DEQ as mentioned above.

The variables measuring change is constructed to measure the magnitude of change from one year's observation to its previous observation. The purpose of these variables is to provide a proxy for the increase (decrease) in the observation on a year-to-year basis. The change is calculated arithmetic from *t*-1 to *t*. The change in diversity acts to detect the quadratic curve of a high diversity ratio. The rationale is that benefits from high diversity is offset by an additional increase in the growth rate and vice versa.

3.3. Econometric approach

This section will focus on different statistical methods for studying the relationship between dependent variable and explanatory variables. My base-case models in section 4 will be a time fixed-effects model that assumes a constant mean over the period. This allows for variation in the cross-sectional periods due to different annual interference. To understand how fixed effects work, first you have to understand some of the background that fixed effect models derives from. The prerequisites for this will be explained in the following paragraphs.

Regression models are a useful tool to uncover if independent variables have any explanatory power for the dependent variable. These models can either be used to indicate a predictive direction and magnitude, or simply detect the causal historic relationship. In my dissertation, I am interested in how gender diversity has a causal effect on my dependent variable rather than offer any future predictions.

Ordinary Least Square (OLS) is one of the most well-known and basic regression approaches. This statistical approach consider the independent variables in a model and generates coefficients for the linear relationship between them and the phenomenon. The linear relationship in this method is where the squared differences between actual observations and predictive line is the least (Allison, 1999). Because the actual observations do not exactly reside on this linear line, a random disturbance term, ϵ, is added to the equation to capture

unobserved explanatory factors affecting the dependent variable. This error term relies on five assumptions for the relationship to be statistically valid: (1) it has a zero mean in the population, (2) the variance of the errors are constant for all values of the independent variable, (3) the errors are linearly independent of each other, (4) the error is independent of its corresponding independent variable, and (5) the error has to be normally distributed in the population (Brooks, 2008 pp.44).

If the first four assumptions hold, then OLS will be the *Best Linear Unbiased Estimator* (BLUE). Which is proven by the Gauss-Markov theorem when examining an arbitrary alternative linear unbiased estimator and finding that in all cases it has an equal or greater variance compared to OLS estimates (Brooks, 2008 pp.45). The fifth assumption is required to account for interference in the actual population from the sample estimates. The equation of an OLS model for panel data will be as followed:

Ordinary Least Squared Model

$$(A) \qquad y_{it} = \alpha + \beta_n x_{it} + \epsilon_{it}$$

where i indicate a specific unit, t denotes the time-period, and n is the corresponding coefficient to each variable. Furthermore, the y is the value for the dependent variable and x is the independent variables used to explain the relationship, β is the coefficient parameter for the magnitude of that variable, α is the intercept where the line starts, and ϵ is the error term discussed above.

The coefficient parameters produced in an OLS method gives us the magnitude of each additional increase in the independent variables. These estimates will be accompanied by standard errors. These standard errors are standardize by the difference between the coefficient and the actual observation used to calculate the model. With no standard errors, the model would produce an accurate effect of the relationship between the independent variables and the dependent variable. Conversely, high standard errors will offer a less accurate description of the relationship and will invalidate the result and hence, the causal effect may not be significant. Insignificant coefficients are less reliable since they vary more from the observation. This makes the model less generalizable to the population.

A violation of independent error assumption can reduce the validity on our results. Highly correlated explanatory variables tend to explain the same phenomenon and should not be

included in the same model. High correlation can furthermore cause a multicollinearity problem where one explanatory variable have predictive power over other explanatory variables (Kennedy, 2008). On way to detect multicollinearity is through a pairwise correlation matrix between the independent variables. Kennedy (2008, pp.196) says a high correlation value (0.8) of one of these correlation coefficients indicates a potential correlation problem. However, this correlation matrix only tests variables pairwise and not if three or more variables are used in the same model. I have presented the results from a pairwise correlation matrix in table 7 on the next page.

Another approach to detect multicollinearity is the inverse of the correlation matrix, also called *variance inflation factors* (VIF). This will allow me to see if there is a potential multicollinearity problem when more than two independent variables are utilized in the same model. The level at which this VIF coefficient should be concerned is debated and intuitive discernment should be used. However, Kennedy (2008 pp.199) says that we should be concerned if the coefficient is higher than 10. The level of my variables are far below this (see appendix 1) so multicollinearity should not be a problem[12].

Finally, since regression models generates coefficients based on BLUE of the sample, there is an issue of *goodness of fit* i.e. how well the sample model transcend over to the actual population. A common way to measure the goodness of fit is the R squared. This measure is calculated by subtracting the residual sum of squares in the regression divided by the total sum of squares in the population from 1[13]. A model with a low R squared will not offer a good explanatory description of the relationship. Adding more variables will affect the R squared, but not necessarily improve the model. Another measurement for capturing the effect of added variables is adjusted R squared. Adjusted R square adjusted to the number of explanatory variables used in the model. This is not to say it is synonymous with being a better representation. A marginal increase in adjusted R squared is rarely a determinant for including the additional variable. Moreover, R squared can be useful in financial modeling to compare different econometric techniques.

[12] There is one explanatory variables with VIF coefficient higher than 5 in one of my models, so one of the explanatory variables with a high VIF has been removed.

[13] $R^2 = 1 - \frac{SSE_{reg}}{SSE_{tot}}$

TABLE 7

This table shows pairwise Pearson correlation coefficients between the independent variables used in the different econometric models applied to this research.

	ROA	Diversity	Board size	Age	Size	Income	Risk	Wages	Δ diversity	Δ income
ROA	1.0000									
Diversity	0.0214	1.0000								
Board size	0.1346	0.1086	1.0000							
Age	0.0393	0.0743	0.0244	1.0000						
Size	0.3261	0.1916	0.4522	0.3060	1.0000					
Income	0.0232	0.2088	0.3186	0.2830	0.4354	1.0000				
Risk	-0.0279	0.0258	-0.0000	-0.0231	0.0114	0.0338	1.0000			
Wages	-0.1818	-0.1469	0.0302	-0.2821	-0.4559	-0.3042	-0.0027	1.0000		
Δ diversity	0.0477	0.3476	0.0825	-0.0055	0.0514	0.0486	-0.0202	-0.0287	1.0000	
Δ income	0.0534	0.0309	-0.0235	-0.0101	-0.0191	-0.0332	-0.0279	-0.0123	0.0186	1.0000

Notes: This table shows pairwise Pearson correlation coefficients between dependent variables in the three base-case models specified to test my hypotheses. Table 6 defines the variables, and the sample is all non-financial Norwegian PLCs listed on the Oslo Stock Exchange in the period 2000-2010.

3.3.1. Panel data

Since my sample has cross-sectional observations over time for the same entities, there may be interference not captured by pooling the entire sample together in an OLS model. Econometric methods for panel data is more powerful in controlling for unobservable heterogeneity. That is to say, the variance is not constant for each observation of the variable.

Panel data approaches allow us to research observations changing over time and cross-sectionally. For financial modelling, a changing environment is a common situation, and by combining cross-sectional and time series data one can increase the power of the test through capturing the dynamic behavior of the units in the sample. In addition, we can remove the impact of certain forms of omitted variables in the regression results, thus accounting for endogeneity (Brooks, 2008 pp.487-490).

There are three main approaches to analyzing panel data: (1) pooling, (2) fixed-effects, and (3) random effects. The simplest way to deal with panel data is to estimate a pooled regression, similar to OLS. When estimating the relationship using pooled regression, we assume the average values are constant over time and cross-sectionally for all units in the sample. Which is a strict assumption for observations of a dynamic unit. The fixed-effect approach however assumes that the average value changes over time but not cross-sectionally. It decomposes the disturbance term in an individual specific effect and in a remainder disturbance that changes over time and units. This allows the intercept to vary over the different cross-sectional periods, but assumes that they are constant over time. This is a reasonable assumption because the individual years are subject to the same environmental factors such as the imposing gender diversity requirements and change in accounting practices. Thus, the equation for a time-fixed effects model is as followed:

Time-Fixed Effects Model

$$(B.1) \qquad y_{it} = \alpha + \beta_n x_{it} + \lambda_t + v_{it}$$

where λ_t is a time-varying intercept added to capture all the variables that affect *y* over time, and v is the "remainder disturbance". The rest of the equation is defined in (A).

Since the fixed-effects model assumes that observations means change over time but not cross-sectionally, we subtract a fixed-mean for the entire sample period to allow for cross-sectional variation (Brooks, 2008 pp.493-494). A transformation of equation (B.1) can be done to avoid estimating a model containing constant time variance.

$$(B.2) \qquad y_{it} - \bar{y}_t = \beta(x_{it} - \bar{x}_t) + u_{it} - \bar{u}_t$$

The line above the variables indicate the average value of that variable, while the rest the equation is defined in (A).

The random effects model also assumes the intercept to vary for each cross-sectional unit but remains constant over time. However, the difference is that the random effects model assumes the intercept to derive from a common intercept, which is the same for all units. In addition, the random variable, ϵ, is added to measure the random deviation of each units intercept from the common intercept (Brooks, 2008 pp.498). This leads to the following equation:

Random Effects Model

$$(C) \qquad y_{it} = \alpha + \beta x_{it} + \omega_{it}\,,\ \omega_{it} = \epsilon_i + v_{it}$$

where ω is a disturbance term consisting of the random deviation of each units intercept and the individual observation error term, v. The new error term, ϵ, require the assumption that it has zero mean, is independent of v, has a constant variance and is independent of the explanatory variables. The rest of the equation is defined in (A).

This is useful as it allows us to have time-constant variables as explanatory variables. In fact, the random effects model should include as many time-constant variables as possible (Wooldridge, 2014 pp.399). This adds validity because some of my results may be dependent on time-constant factors such as the industry it operates.

To summarize, some of the main differences between the fixed-effects model and random effects model is that while the former treats the intercept as a parameter, the latter treats it as an error (Rendon, 2012). The fixed effects model updates prior information on effects, whereas the random effects models treats the prior information as final (Brooks, 2008). This makes these econometric approaches more favorable for analyzing panel data. One of the main advantages of fixed-effects and random effects is that it captures unobservable effect in my research sample. The result may not be representable from using a pure OLS approach as the data can be subject to cross-sectional variances and over time. Adjusting for these effects generally produces more reliable results and hence, a better model to uncover the causality of an increased gender diversification.

3.2.2 Robust Regression Estimators

The final econometric approach I will use when testing for robustness in section 5, is the MM-estimators first introduced by Yohai (1987). These estimators were the first to have high breakdown points and high efficiency in errors simultaneously. Whereas least square methods are considered to have high efficiency if the underlying assumptions are held, it loses its validity if violated. When we talk about the efficiency of an estimator, it is defined as the ratio of its minimum possible variance to its actual variance (Stuart, 2011 pp.9). The breakdown point, on the other hand, is a measure of the resistance of an estimator (Stuart, 2011 pp.8). By that, we mean it is the smallest fraction of contamination the regression estimator can have before it breaks down and no longer represents the data.

MM-estimates is a combination of previous techniques called M-estimator[14] and S-estimator[15]. M-estimators are the sum of which squared error terms are the weighted average of the absolute values of the errors, where the weights are their own values. The idea behind M-estimators is to use different weights, in particular to use weights that do not continue to grow in magnitude as the absolute value of the error term grows (Stuart, 2011 pp.24). A drawback with giving different weights is, although efficient, it has a low breakdown point. The S-estimators, however, form a class of high breakdown estimators of regression. In the same way that least square estimators minimizes the variance of the residual, S-estimators minimize the dispersion of the residuals. Having a high breakdown point will increase the resistance of the estimators, but at the expense of low efficiency. MM-estimators attempt to retain the robustness and resistance of S-estimation, and simultaneously gain the efficiency of M-estimators.

The MM refers to the fact that multiple M-estimation procedures performed in the computation of the estimators. Yohai (1987) introduced the MM-estimates in a three-stage process explored below by Stuart (2011 pp.28-29):

Stage 1 A high breakdown point estimator is used to fit an initial estimate, which we denote $\tilde{\beta}$. The estimator needs not to be efficient. Using this estimate the residuals, $r_i\ (\widetilde{\beta}) = y_i - x_i^T\tilde{\beta}$, are computed.

[14] First proposed by Huber (1973): "*Robust Regression: Asymptotics, Conjectures and Monte Carlo"*
[15] Introduced by Rousseeuw and Yohai (1984): "*Robust regression by means of S-estimators"*

Stage 2 Using these residuals from the robust fit and S-estimator, an M-estimate of scale with 50% breakdown point is computed. This $s(r_1(\tilde{\beta}), \ldots, r_n(\tilde{\beta}))$ is denoted s_n. The objective function used in this stage is labelled p_0.

Stage 3 The MM-estimators is now defined as an M-estimator of β using a re-descending score function, $\psi_1(u) = \frac{\partial_{p1}(u)}{\partial_u}$, and the scale estimate s_n obtained from stage 2. So a MM-estimator $\hat{\beta}$ is defined as a solution to

$$\sum_{i=1}^{n} x_{it} \psi_1 \left(\frac{y_i - x_i^T \beta}{s_n} \right) = 0 \qquad j = 1, \ldots, p.$$

The objective function p_1 associated with this score function does not have to be the same as p_0 but it must satisfy:

i) p is symmetric and continuously differentiable, and $p(0) = 0$.

ii) There exists $a > 0$ such that p is strictly increasing on [0, a] and constant on [a, ∞).

iii) $p_1(u) \leq p_0(u)$. A final solution that must be satisfied by the solution is that

$$\sum_{i-1}^{n} p_1 \left(\frac{y_i - x_i^T \hat{\beta}}{s_n} \right) \leq \left(\frac{y_i - x_i^T \hat{\beta}}{s_n} \right).$$

To summarize, the first two stages of the MM-estimation process are responsible for the estimator having high breakdown point, whilst the third stage aims for high asymptotic relative efficiency. To compare the efficiency of no-constant variance to least square method, Brooks (2008) state that the OLS estimating line will swing towards large errors, masking the fact that they are outliers. These influential outliers are potentially damaging to OLS because they are far away from the usual cluster. It is worth mentioning that the MM-estimator is perhaps now the most commonly employed robust regression technique (Stuart, 2011).

4. Models and results

I mentioned in the previous section about the benefits from panel data regression for investigating the effects in a dynamic environment. Allowing the unobservable variance in the error term to vary cross-sectionally and correlated with a constant alpha in a fixed-effects model may offer more robust results than pooling the entire sample together. This aggregated econometric approach will be used over three main periods and for the entire sample period, where the latter will be my base-case model when testing for robustness.

The three main periods I have highlighted is the periods leading up to when the government made recommendations for compliance in 2003, over the voluntary compliance period (2004-2005), and finally over the mandated compliance period (2006-2008). The rationale behind structuring the sample period into sub-periods is to detect if there is any change in the direction of the effect over different stages of legislation.

The general structure of my model will be based on a transformation of the fixed-effects model provided in section 3.3 to a demeaned model (Brooks, 2008 pp.493):

$$\ddot{y}_{it} = \alpha(\ddot{Diversity\ mechanisms})_{it} + \beta(\ddot{Controls})_{it} + \ddot{u}_{it} \begin{cases} i = 1,2,\dots,N \\ t = 1,2,\dots,T \end{cases}$$

where the double dots above the variables indicate demeaned values, i is the firm, t is the time period, u is the varying disturbance not affected by time, and α and β is the magnitude of effect that we want to estimate. The diversity mechanisms are the diversity ratio and the change in diversity ratio for each observation, and the control variables ranges from board specific to firm specific depending on my dependent variable.

Bøhren and Strøm (2010) summarize the importance of accounting for the time-series nature of data with problem caused by dependence in the residuals. This may be due to firm fixed effect or an overall shock for all firms. Such effects may introduce endogenity caused by omitted variables, which influences the regression. They go on saying the stronger these effects are the more the estimates from a pooled regression will be biased and inefficient. However, a fixed-effects estimation with robust standard errors will adjust for these unobservable firm and year effects (Bøhren and Strøm, 2010 pp. 1295).

I will justify which variables are used in each of the consecutive hypotheses in the following three sections before discussing the results.

4.1. The impact of the reform on firm performance

In section 3.2, I discuss how a company's return on asset is not a perfect measurement for isolating the effect of gender diversity however it is an adequate measure. In an effort to isolate the effect of diversity on ROA, control variables are included in the model. Board size is included as researchers have shown that larger boards will affect the board's decision-making ability (Bøhren and Strøm, 2005:2010), a key determinant for firm performance.

Financial performance is also highly linked with the associated risk. The firm's capital structure will affect the performance on several different levels. Leveraged firms pursue more high-risk investments to account for the additional fixed financial obligation they succumb (Mao, 2003). The return is also associated with the sector a firm operates in, and it is common knowledge that some sectors operate with more leverage than others. A fixed effect model cannot test for variables that are constant over time such as sector, and the risk measure will indirectly represent high-risk environments. Furthermore, normal corporate governance theory state that risky projects should generate greater payoff for the extra uncertainty associated. In addition to risk, size is an important control. Smaller high-growth firms earn excessive returns compared to large mature firms. The two controls also has a potential synergy, where additional debt will increase the total assets both through more debt and tax shields.

The income variable is included to act as an additional proxy to capture the size of operations. The change in accounting practices in 2005 put more attention to the balance sheet than the income sheet (Galåsen, 2010), which could lead to a reduction in ROA even with unchanged earnings. A final control is designed to distinguish between firms with high diversity and firms with no diversity. Firms that already have high diversity ratios may not be influenced in the same way as firms without any females.

Results

Table 8 shows the results. The results are accompanied by hetereoscedastic robust standard errors. We can see that in the period preceding government proposal, there is no significant effect of gender diversity. The insignificant effect may be because of the low diversity in general over this period. Many firms had no female directors in this period and the average diversity was about 10% for all firms.

TABLE 8

A regression model to see the relationship between firm performance and gender diversity. The performance proxy used is return on assets (ROA).

	2001-2003	2004-2005	2006-2008	2001-2008
Diversity	-0.258 (0.278)	0.511 (0.223)**	-0.324 (0.111)***	-0.272 (0.104)***
Δ diversity	0.019 (0.029)	-0.081 (0.022)***	0.074 (0.022)***	0.001 (0.000)**
Control factors				
Board size	-0.038 (0.030)	-0.025 (0.029)	0.010 (0.018)	-0.001 (0.009)
Risk	-0.000 (0.000)*	0.012 (0.010)	0.000 (0.000)	-0.000 (0.000)
Size	0.111 (0.140)	0.135 (0.073)*	0.082 (0.033)**	0.138 (0.031)***
Income	-0.061 (0.018)***	-0.004 (0.006)	-0.017 (0.007)**	-0.029 (0.006)***
Dummies				
Dummy high/low	Yes	Yes	No	Yes
Dummy year	No	No	No	Yes
R squared	0.1832	0.2751	0.1389	0.2087
Obs.	375	246	436	1057

Notes: This table shows the effect of gender diversity over different stages in the legislation from a fixed-effect technique. Dependent variable is return on assets (ROA). Statistical significance coefficients at 1%, 5% and 10% levels are marked with ***, **, and * respectively. Table 6 defines the variables, and the sample is all non-financial Norwegian PLCs listed on the Oslo Stock Exchange.

In the voluntary compliance period, the results show a positive significant relationship between gender diversity and firm performance. More firms appointed women and the overall effect of this increase led firms to benefit from improved financial performance. An increasing change ratio will however reduce this positive relationship gained from greater diversity. The negative coefficients for change in diversity implies that the scale of change should not be increased. In this period, firms are allowed to adjust gradually and in respect to their own interests. In the literature review, I discuss how the general pool of qualified women are considered smaller and that the best female directors are swept away at an early stage. The results indicate that over this period, the early adapters benefit from the "golden-skirts". However, another explanation is that good firms are the ones that appoint women in this initial adaptation stage and hence contribute to this positive relationship.

I find supporting evidence that legal constraints on board of directors will have a negative effect on boards wanting to maximize firm value (Demsetz and Lehn, 1985). We see that the positive effect produced in the voluntary compliance period turned negative as it is no longer optional for the firms. The negative significant relationship between gender diverse boards and firm performance informs us that firms suffer from forced regulations. Firms cannot choose the board composition best suited for their agenda. I did not include the high/low dummy since all firms were required to accommodate with one of the specifications.

For the entire period, gender diversity is negatively associated with firm performance. The coefficients are significant, stating that performance will not benefit from an increased diversity. This generates support for many studies finding a negative relationship. It should be mentioned however that the scope of change is positively correlated. Signifying that an increased change in diversity will offset the negative impact, and that the negative effect caused from diverse board will only sustain up to a certain level. I have adjusted for year effects by including time dummies and for firms already being gender diverse. Bøhren and Strøm (2010 pp.1295) say that the more firms relative to years in the panel, the more critical is adjustment for firm effects compared to time effects. I have 1057 observations over eight years so accounting for fixed firm effects is the more important adjustment.

Addressing these results in accordance with previous literature, I find no conclusive evidence that firms cannot benefit from gender diversity, nor that they do benefit. The positive relationship in the voluntary period indicates that there were some positive synergies produced from women on board of directors. Another possible explanation is that good firms were the early adopters. Table 9 shows the dispersion of firms with good performance in the beginning of my sample and the subsequent change in their proportions of gender diversity. We can see that firms with above average performance in 2001-2003 have significantly increased their proportion of female directors in the second period. The negative relationship over the mandating period and the full sample period may be because the legal requirements led to women being appointed as directors irrelevant of firm's needing them or not. When all firms are obliged to increase their diversity, this also applies to firms underperforming with male directors. Another explanation is that, in general, firms suffered from poorer returns over this period, even the good firms from the voluntary period. The average returns were significantly smaller in the mandated period (-3.92%) compared to the voluntary period (1.59%).

TABLE 9

This table shows the dispersion of firms with higher than average firm performance.

%	2001-2003	2004-2005	2006-2008
<10	90	19	2
10-20	38	16	4
20-30	19	25	25
30-40	4	12	43
40<	1	12	37
Obs.	152	84	111

Notes: This table shows firms with higher than average firm performance in the preceding period and the dispersion of these firms in the next period. The dispersion of 2004-2005 and 2006-2008 are based on firms with above average performance in 2001-2003 and 2004-2005, respectively. The average performance measure is return on assets.

4.2. The impact of gender diversity on employee compensation

The purpose of this model is to provide a general idea of the relationship and the impact of diversity, if any, on employee compensation. I discussed in the literature review how females are more inclined to nurture relationships and look after the wellbeing of stakeholders rather than shareholders.

Board decisions are hardly influenced by female directors alone. Other board specific characteristics are essential for how the firm rewards its employees in addition to diversity. The importance of board size is covered in section 4.1. Furthermore, the age of board members is important. Ahern and Dittmar (2012) find that the there is a difference in the age of female directors and male directors. Women were on average eight years younger than men, which makes age a potential influencing factor. Some firms may have no age difference while others have younger women pulling the average down.

Employee compensation is a debated topic. There are different schemes for firms to reward its employees, whether it is through fixed salaries, performance-based salaries, or fringe benefits. The purpose of a fair compensation is to motivate their employees to perform and add value for their efforts. In an article by Levin (2013), he finds that his employees do not consider performance-based bonuses as a part of their compensation, and subsequently act as a mean to demotivate rather than motivate. However, he argues that the right bonus-scheme can be a

useful tool if structured appropriately. The hypothesis in section 2.2 intuitively makes a greater diversity to be positively associated with the compensation offered.

In the same manner that size is an important control variable for firm performance, it has important aspect for employee compensation. Larger firms with over 200 employees are required to have employee directors, and firms with 31-200 employees are obliged to do so if at least half the employees vote for it[16]. The purpose of these employee directors is to represent other employees in the decision-making process. Furthermore, the size of the firm can be detrimental for the employee compensation ratio in terms of capital structure. Debt financing will increase the total assets but may not necessarily increase the compensation. Debt is associated with an increased risk and offering employees additional wages can be challenging in the case of failure.

The associated risk can capture the volatility of the firm in case of downturn. Having high fixed wages will increase the fixed cost of the firm. In addition, some industries have higher debt ratios than others. A firm operating in a high-risk environment can have wages and salaries tied to performance rather than fixed, whereas fixed wages and subsequent fixed costs for the firms can be used for larger mature firms. A change in a firm's net income can offer an explanatory impact of the amount of compensation received on both the cost associated and for future prospects of its employees. Where a positive change can lead to employees being rewarded with higher wages or bonuses, conversely a negative change can cause pay-cuts, no bonus, or in worst cases layoffs.

Results

Table 10 shows the results. The results are accompanied by hetereoscedastic robust standard errors. We see that there is a positive significant impact from diversity for each of my sub-periods and over the entire sample. We also see the coefficients have approximately the same size. This indicates that firms with more women on their boards have a greater compensation ratio than firms with fewer females. There is no clear indication in current literature about the relationship, but I argued in section 2.2 that women on boards are more inclined to look after the well-being of all its employees. Other stakeholders such as customers, suppliers, or the community in which it operates are not tested for in this analysis. We see that the magnitude of the coefficients in all periods are approximately the same. This indicates that the additional

[16] Some industries are exempt from this requirement; newspaper and news agencies, shipping, oil and extraction, and financial firms.

TABLE 10

A regression model to see the relationship between employee benefits and diversity, controlled for firm specific factors.

	2001-2003	2004-2005	2006-2008	All periods
Diversity	0.256 (0.140)*	0.296 (0.096)***	0.232 (0.098)**	0.236 (0.061)***
Δ diversity	-0.023 (0.008)***	0.010 (0.003)***	-0.004 (0.018)	-0.011 (0.007)
Control factors				
Board size	0.032 (0.008)***	0.035 (0.007)***	0.046 (0.002)***	0.038 (0.004)***
Age	-0.008 (0.002)***	-0.009 (0.001)***	-0.004 (0.001) ***	-0.007 (0.002)**
Δ net income	-0.000 (0.001)	-0.001 (0.000)**	0.000 (0.000)	-0.000 (0.000)
Debt to Equity	-0.000 (0.000)*	0.011 (0.004)***	0.000 (0.001)	-0.000 (0.000)
Size	-0.093 (0.005)***	-0.062 (0.003)***	-0.069 (0.003)***	-0.062 (0.005)***
Dummy high/low	Yes	Yes	No	Yes
Dummy years	No	No	No	Yes
R squared	0.3037	0.3351	0.3326	0.3566
Obs.	368	234	412	1009

Notes: This table shows the effect of gender diversity over different stages in the legislation from a fixed-effect technique. Dependent variable is employee compensation. Statistical significance coefficients at 1%, 5% and 10% levels are marked with ***, **, and * respectively. Table 6 defines the variables, and the sample is all non-financial Norwegian PLCs listed on the Oslo Stock Exchange.

women added to the boards in the following periods have not changed the effect women have on compensation. Comparing the initial period with the other periods, offers validity that female directors affect employee compensation and that it is not just attributable to the few firms with female directors. I have used the same high/low dummy covered in section 3.2 for my first two periods and over the full sample. In addition, I have used a year dummy to adjust for external shocks in any particular year for my full sample.

The effect of an increasing change in diversity do not produce significant values for all periods, nor positive values. For the initial period, leading up to the mandated law, an increased growth in diversity was negatively correlated. The growth in gender diversity over this period was not substantial nor carried out by all firms in the sample. Some firms did not appoint women on their boards at all, while others had a decrease of female directors. What

applies to observations in the initial period is that board structures are unregulated. In the mandatory period, all firms were required to change drastically. Since this premise applies to all firms over the sample, the shared gender diversity growth may have led to an insignificant coefficient for this period. However, we see that the insignificant change in diversity also applies to the full period.

There is supportive evidence that female directors influence the employee compensation ratio, and this do not change with more firm observations. The fact that women have these qualities associated with relationship- and trust-building become apparent with regard to the amount of compensation they provide. There can be other aspects affecting the amount of compensation received, such as performance-based salaries. The period has had a positive economic growth and employees may have benefitted from their firms' performance.

4.3. The impact of gender diversity on firms' risk profile

The purpose of this model is to provide a general idea of the relationship and the impact of diversity, if any, on a firm's financial risk. There are numerous other factors attributable to explain the current debt-to-equity ratio, and an array of control factors are used to account for this. I discussed how board size and age are important board specific factors to include, as they possess explanatory power for the board's decision. Larger boards tend to have more conflicts and are less flexible to changing environments, which may lead to decision inertia. Furthermore, age is associated with different risk preferences. Typical characteristics among young entrepreneurs is that they are more risk seeking compared to mature directors.

In corporate governance theory, the size of a firm may be detrimental for the capital structure chosen. Two important theories of capital structure for firms are *the trade-off theory* and *the pecking-order theory*. The trade-off theory suggests that there is a trade-off between debt and equity and that there is an optimal level of this ratio that the firms wants to obtain, while the pecking-order theory argues that the additional financing is ranked with respect to funding. Lemmon and Zender (2010) research the theorem proposed by Myers and Majluf[17] that asymmetric information is a determinant for which theory is applicable for firms. Smaller high-growth firms may have trouble obtaining debt financing because of this asymmetric information and therefore more inclined to issue equity as a source for additional growth. They also find that firms with debt constraints are more likely to issue significant amounts of

[17] Myers, S.C., and N.S. Majluf. *"Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have".* Journal of Financial Economics, 13 (1984).

equity and that firms with equity issuances grow, on average, more than non-issuers, but experience a lower return on assets compared to non-issuers. In addition, they find that equity issuers in this group have smaller debt ratios and if they had used debt for their financial deficits, their debt ratios would increase by 29%.

The return of a firm's asset can offer a good explanation of the firm's growth potential. Larger mature firms usually need less debt as they do not need additional capital for investment opportunities. This is not to say that mature firms opt away from any debt financing. Debt can offer positive benefits in addition to increased risk. Firms financing investments with debt gain a coinciding tax shield so the increased leverage has a dual effect on its total assets. The tax shield will increase the equity side of the balance sheet through higher cash flows. However, increasing debt distorts the assets towards a more risky setting.

Another important constraint on a firm's risk profile is the industry in which it operates. I mentioned that some industries are known to have a higher debt norm than others. The model cannot incorporate industry specific dummies because the method used by the fixed-effects approach. Not testing for industry specific norms can cause biased results in my model however, when testing for robustness in section 5, the base-case model offers similar results as a robust regression with industry dummies.

Results

Table 11 shows the results. The results are accompanied by hetereoscedastic robust standard errors. The dependent variable is the logarithmic value of debt-to-equity. We can see that in the initial period before, voluntary compliance was recommended, the coefficients are not significant. This can be due to the low percentage of females on board of directors. Some firms in the period preceding any official recommendation had no women directors whereas others only had a bare minimum of women on their boards. The negative direction is however supported by the rest of the periods.

In the next two periods, the analysis produces negative significant relationships between the financial risk and gender diverse board of directors. The magnitude of the coefficients are quite substantial with -1.143 and -1.292, respectively. This indicates that women are indeed more occupied with value preservation rather than pursuing risk. There is a slight increase over the two periods, where mandatory compliance has a greater diversity coefficient than voluntary compliance. This increase, although small, can be caused by external

TABLE 11

A regression model to see the relationship between the proxy as a risk measure and gender diversity, controlled for firm specific factors.

	2001-2003	2004-2005	2006-2008	All periods
Diversity	-0.250 (0.329)	-1.143 (0.118)***	-1.292 (0.282)***	-0.836 (0.243)***
Δ diversity	-0.045 (0.131)	-0.006 (0.191)	-0.045 (0.091)	-0.017 (0.071)
Control factors				
Board size	0.059 (0.029)**	0.082 (0.026)***	-0.038 (0.045)	0.028 (0.028)
Age	-0.008 (0.004)**	-0.018 (0.019)	-0.047 (0.004)***	-0.023 (0.007)***
Size	0.126 (0.019)***	0.159 (0.021)***	0.235 (0.025)***	0.177 (0.0223)***
ROA	-0.021 (0.059)	-0.071 (0.394)	-0.253 (0.007)***	-0.058 (0.060)
Dummy year	No	No	No	Yes
R squared	0.0739	0.1169	0.1291	0.0948
Obs.	366	245	431	1042

Notes: This table shows the effect of gender diversity over different stages in the legislation from a fixed-effect technique. Dependent variable is a risk proxy (Debt-to-equity). Statistical significance coefficients at 1%, 5% and 10% levels are marked with ***, **, and * respectively. Table 6 defines the variables, and the sample is all non-financial Norwegian PLCs listed on the Oslo Stock Exchange.

macroeconomic factors other than the higher diversity, such as financial distress. The global financial crises in 2008 (2007), may force companies to reduce their debt profiles to avoid the possibility of not being able to accommodate with fixed obligations.

The negative relationship is supported by a significant coefficient for the entire sample period. This is consistent with common perception about women being more risk averse compared to men. However, this is not consistent with results from the personality features proposed by Adams and Funk (2011), that female directors are less risk averse than male directors. Interpreting the change in gender diversity, the model do not produce significant values for any of the periods. A possible explanation may be that the increased (decreased) gender diversity from observation to observation do not affect the changes in the risk profile chosen by the firm, nor that an increasing diversity is contributing. The coefficients are also negative, implying that gender diversity is purely negatively associated with financial risk.

5. Robustness

5.1. Econometric approach

If you recall from section 3.3.1 about OLS regression, the variance has to be constant for standard errors across all observations i.e. $V(\epsilon_i) = \sigma^2$ for all *i*. A violation in this condition results the OLS regression to be heteroscedastic. Heteroscedasticity in the standard error variance makes the regression line no longer BLUE, where some outliers will cause interference in the best linear model. This loss in efficiency may be substantial and invalidate the results (Breusch and Pagan, 1979). Breusch and Pagan say that introducing random coefficient variation allows for a less rigid condition to the standard linear model and allows each observation different variance.

Plümper and Neumayer (2012) refer to existing research on model misspecifications that neither econometric tests nor data mining can give a sufficient guidance to specify an econometric model, which exactly duplicate the data-generating process. This makes estimates produced in these models biased and standard errors do not reveal the true nature of uncertainty. They continue by arguing that existing robustness methods used by scholars, suffer from misspecifications and insufficient quantity of robustness tests. For an estimated result to be truly robust, the interference the researcher makes with respect to tested hypothesis or predications does not materially change the estimated coefficients.

To test if my model-specifications require an additional term to intercept this interference, a Breusch-Pagan test[18] is used to detect heteroscedasticity in the OLS model. If the test proves significant, then there is a violation of the assumption regarding the error term and different approaches should be used to capture the unobserved variance. From table 12, 13, and 14, we see that the Breusch-Pagan test detects heteroscedasticity in the OLS technique (model 2) for all three hypothesis and another technique should be applied to correct this interference.

Fixed-effects (FE) and random effects (RE) models are usually applied to panel data, because they allow us to analyze observations both cross-sectional and over time. They have different advantages and disadvantages. We can only use RE if we are willing to assume that the unobserved effects is uncorrelated with all explanatory variables (Wooldridge, 2014). The RE should therefore include as many time constant variables as possible as explanatory variables. This uncorrelated condition is why we do not discard the intercept from the regression. The

[18] A test developed by T.S. Breusch and A. R. Pagan in 1979 to test for simple heteroscedasticity and random coefficient variation.

FE do not however assume the unobserved effects to be uncorrelated with the explanatory variables nor the intercept, which is why it is dropped from the regression result. Because FE allows for an arbitrary correlation between the explanatory variables and the intercept, it is usually more convincing to consider everything else unchanged. The implication with FE is that time-constant variables cannot be used.

In addition to these techniques, I have run a robust regression model with high breakdown point and high efficiency also called MM-estimates. These estimates have the properties that they are highly efficient when the errors are normally distributed and have a breakdown point of 0.5 (Yohai, 1987). The breakdown point measures the maximum fraction of outliers a sample can contain without ruining he estimates completely. Robust regression do not have the same hold amongst scholars for analyzing panel data as FE and RE have. This is not to say that robust regressions are less accurate, but an explanation can be that the calculations are more cumbersome to perform manually. However, most statistical software have packages to do this for us[19].

Testing for the significance of my base-case estimates against other estimates, the Hausman test shows that both model (2) and (3) in table 12, 13, and 14, are inconsistent with my base-case (1), which strengthen the impression of misspecification of econometric technique to explain unobservable heterogeneity.

For table 12, the alternative econometric techniques used do not produce significant values. The standard errors in model (1) and (3) are controlled for heterogeneity. Model (3) do not generate significant values whether with industry dummies or without, indicating that the variance is at firm level rather than industry level. Testing for year dummies in model (3), do however produce significant negative coefficient for gender diversity on firm performance, suggesting that the different years, experience the same environmental pressure over the time-period. We can see that the increasing change in gender diversity is significant for model (1) and (4) but with different directions. This makes the impact difficult to construe and depending on econometric technique used rather than supportive explanatory power. The effect of gender diversity has also been tested in a cross-sectional OLS analysis (see appendix 2). The cross-sectional results showed no significant values. This may be due to the few observations for each year.

[19] R package: “robust”

TABLE 12

Alternative econometric techniques for the relationship between firm performance and gender diversity

	Fixed-Effects	OLS	Random effects	Robust
	(1)	(2)	(3)	(4)
Diversity	-0.272 (0.104)***	-0.065 (0.089)	-0.688 (0.440)	0.039 (0.038)
Δ diversity	0.001 (0.000)**	-0.000 (0.000)	0.002 (0.003)	-0.000 (0.000)***
Control factors				
Board size	-0.001 (0.009)	-0.011 (0.005)**	-0.031 (0.041)	-0.001 (0.002)
Risk	-0.000 (0.000)	-0.000 (0.001)	-0.086 (0.049)*	-0.004 (0.000)***
Size	0.138 (0.031)***	0.120 (0.007)***	0.319 (0.151)**	-0.006 (0.003)**
Income	-0.029 (0.006)***	-0.037 (0.003)***	-0.105 (0.042)**	0.007 (0.001)***
Constant		-0.929 (0.073)***	-2.348 (1.506)	-0.048 (0.027)*
Dummy high/low	Yes	Yes	Yes	Yes
Dummy years	Yes	Yes	No	Yes
Dummy sector	No	Yes	Yes	No
R squared	0.2089	0.2798	0.2013	0.0492
Obs.	1057	1057	1057	1057
Hausman test		0.000	0.000	
Breuch-Pagan test		0.000		

Notes: This table shows Fixed-Effects, Ordinary Least Square (OLS), Random Effects and Robust regression for my models. The Fixed-Effects model is the base-case for the full period in table 8. The dependent variable is return on assets (ROA). Statistical significance coefficients at 1%, 5% and 10% levels are marked with ***, **, and * respectively. Table 6 defines the variables, and the sample is all non-financial Norwegian PLCs listed on the Oslo Stock Exchange.

In table 13, we see that all econometric techniques are consistent with respect to gender diversity and the change in gender diversity. The standard errors in model (1) and (3) are controlled for heterogeneity. They all show a positive relationship with more women on boards of directors with the proxy used to represent employee compensations. It seems fairly robust to different econometric approaches all signifying the same relationship. The increasing change of diversity however, appears to have a negative effect on employee compensation, although neither of the techniques produce a significant impact of a greater

TABLE 13

Alternative econometric techniques for the relationship between employee compensation and gender diversity

	Fixed-Effects	OLS	Random effects	Robust
	(1)	(2)	(3)	(4)
Diversity	0.236 (0.061)***	0.233 (0.082)***	0.114 (0.063)*	0.155 (0.070)**
Δ diversity	-0.011 (0.007)	-0.010 (0.015)	-0.006 (0.007)	-0.007 (0.013)
Control factors				
Board size	0.038 (0.004)***	0.036 (0.004)***	0.037 (0.003)***	0.048 (0.004)***
Age	-0.007 (0.002)**	-0.004 (0.002)***	-0.004 (0.002)**	0.006 (0.002)***
Δ net income	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Risk	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Size	-0.062 (0.005)***	-0.068 (0.005)***	-0.069 (0.004)***	-0.063 (0.004)***
Constant		1.162 (0.089)***	1.157 (0.098)***	1.098 (0.065)***
Dummy high/low	Yes	Yes	Yes	Yes
Dummy years	Yes	Yes	No	Yes
Dummy sector	No	Yes	Yes	No
R squared	0.3566	0.3724	0.3678	0.3069
Obs.	1009	1009	1009	1009
Hausman test		0.000	0.000	
Breuch-Pagan test		0.000		

Notes: This table shows Fixed-Effects, Ordinary Least Square (OLS), Random Effects and Robust regression for my models. The Fixed-Effects model is the base-case for the full period in table 10. The dependent variable is employee compensation. Statistical significance coefficients at 1%, 5% and 10% levels are marked with ***, **, and * respectively. Table 6 defines the variables, and the sample is all non-financial Norwegian PLCs listed on the Oslo Stock Exchange.

change. If the results are consistent across the econometric approaches the conclusion from base-case results are strengthened.

In table 14, the results are not consistent over the different econometric techniques. The standard errors in model (1) and (3) are controlled for heterogeneity. We can see that neither model (2), nor (3) have significant coefficients for diversity, and given the significant negative direction of my base-case model, this indicate that the unobservable heterogeneity

TABLE 14

Alternative econometric techniques for the relationship between financial risk and gender diversity

	Fixed-Effects	OLS	Random effects	Robust
	(1)	(2)	(3)	(4)
Diversity	-0.836 (0.243)***	-0.293 (0.377)	-0.051 (0.301)	-0.979 (0.375)***
Δ diversity	-0.017 (0.071)	-0.026 (0.068)	-0.074 (0.053)	0.078 (0.069)
Control factors				
Board size	0.028 (0.028)	0.015 (0.020)	0.013 (0.021)	0.026 (0.019)
Age	-0.023 (0.007)***	-0.029 (0.007)***	-0.030 (0.007)***	0.001 (0.007)
Size	0.177 (0.0223)***	0.122 (0.024)***	0.122 (0.027)***	0.141 (0.021)***
ROA	-0.058 (0.060)	-0.176 (0.110)	-0.210 (0.104)**	-0.015 (0.155)
Constant		0.093 (0.420)	0.127 (0.329)	-1.723 (0.364)***
Dummy high/low	No	Yes	Yes	Yes
Dummy years	Yes	Yes	No	Yes
Dummy sector	No	Yes	Yes	No
R squared	0.0948	0.1962	0.1884	0.0771
Obs.	1042	1042	1042	1042
Hausman test		0.000	0.000	
Breuch-Pagan test		0.001		

Notes: This table shows Fixed-Effects, Ordinary Least Square (OLS), Random Effects and Robust regression for my models. The Fixed-Effects model is the base-case for the full period in table 11. The dependent variable is a risk proxy (DEQ). Statistical significance coefficients at 1%, 5% and 10% levels are marked with ***, **, and * respectively. Table 6 defines the variables, and the sample is all non-financial Norwegian PLCs listed on the Oslo Stock Exchange.

varies cross-sectional and the data cannot be pooled over time. From my robust regression techniques, the high efficiency in errors and high breakdown point appear to produce reliable results. The high breakdown point gives the largest fraction of arbitrary gross errors tolerated before the sample yields unreliable results.

To summarize, we can see that, apart from table 13, that the econometric approach is instrumental for the results. The results from the effect gender diversity has on employee compensations are robust to the different econometric techniques used, offering significant

coefficients across all approaches. For the other two hypothesis, allowing unobservable effects to correlate with the independent variable and intercept produces significant results, while assuming it to be constant (model 2) or uncorrelated (model 3) produces insignificant results. To account for outliers while still produce highly efficient results (model 4) do not help explaining the relationship between gender diversity and firm performance, but it do help explain the relationship between gender diversity and financial risk.

5.2 Empirical proxies

This section investigates the empirical proxies used as dependent variables in my models. Different control variables have been tested for size and risk but have been excluded either because too high correlation with other explanatory variables, providing similar results or deemed theoretically irrelevant. The standard errors are controlled for heteroscedasticity.

Independent proxies

In order to see how firm performance relate to gender diversity I have tested a different accounting measurement, ROE. This is closely related to ROA but may be more influenced by the size and capital structure of the firm. Ideally, I would have tested for a market-based proxy such as Tobin's Q, however my data do not contain any information about market values. A highly leveraged firm will generate larger returns to their equity as they have additional money to invest. Furthermore, the amount of equity is related to the industry the firm operates. Some industries are more volatile and have fewer investment opportunities than others. Nevertheless, the results from substituting firm performance proxy generate the same results, indicating that with regards to firm performance, it is robust over the different proxies used (see table 15).

The proxy used to explain the firm's financial risk profile was the debt-to-equity ratio. Again, it would be preferred to test a market-based risk measure such as a company's beta. This would make my results more robust as it indicate supportive evidence for both accounting- and market-based proxies. Unfortunately, I was unable to obtain these beta values for a significant number of firms in my sample data so to test the robustness of my risk proxy, two different accounting measures are used. Both the total short-term debt to short-term assets and debt-to-assets produce supportive evidence for the relationship between diversity and risk. It is not surprising that the debt to assets proxy supports the findings of by my initial proxy as they are closely linked. The rationale behind using short-term debt and assets is to see how the operating risk will be affected. In table 15, only the companies' debt-to-assets ratio is shown.

TABLE 15

Robustness for my dependent proxies in the initial models with alternative dependent proxies.

	Firm Performance		Employee Compensation		Financial Risk	
	(1)	(2)	(1)	(2)	(1)	(2)
Diversity	-1.853 (1.021)*	-0.272 (0.104)***	0.236 (0.061)***	9.284 (4.739)*	-0.350 (0.139)**	-0.836 (0.243)***
Δ diversity	0.003 (0.005)	0.001 (0.000)**	-0.011 (0.007)	-0.452 (1.243)	-0.001 (0.035)	-0.017 (0.071)
Control factors						
Board size	-0.026 (0.056)	-0.001 (0.009)	0.038 (0.004)***	-0..011 (0.212)	0.009 (0.011)	0.028 (0.028)
Age			-0.007 (0.002)***	0.266 (0.129)**	-0.018 (0..005)***	-0.023 (0.007)***
Risk	-0.076 (0.039)*	-0.000 (0.000)	-0.000 (0.000)	-0.002 (0.012)		
Size	0.214 (0.171)	0.138 (0.031)***	-0.062 (0.005)***	-1.319 (0.443)	0.101 (0.013)***	0.177 (0.0223)***
Income	-0.107 (0.047)**	-0.029 (0.006)***				
ROA					-0.064 (0.044)	-0.058 (0.060)
Δ income			-0.000 (0.000)	-0.002 (0.001)		
Dummy high/low	Yes	Yes	Yes	Yes	No	No
Dummy years	Yes	Yes	Yes	Yes	Yes	Yes
R squared	0.1953	0.2089	0.2961	0.0118	0.1046	0.0948
Obs.	1057	1057	1009	1003	1056	1042

Notes: This table shows the initial models (1) and the alternative dependent proxies (2). The alternative proxy used for firm performance is return on equity (ROE), for employee compensation is wages divided by total sales, and financial risk is debt-to-assets. The missing squares are control variables not used for that model. Statistical significance coefficients at 1%, 5% and 10% levels are marked with ***, **, and * respectively. Table 6 defines the variables, and the sample is all non-financial Norwegian PLCs listed on the Oslo Stock Exchange.

My final alternative proxy to see the relationship between gender diversity and compensation is calculated as the compensation post divided by total sales. In the same manner that the other two alternative proxies are highly correlated with the initial proxies, this also uses the same accounting numerator in when designing an alternative dependent proxy. Table 15 shows that both proxies have the same relationship.

The validity of my dependent proxies should be considered. Since all my alternative proxies possess practically the same properties as the initial proxies, they all lack the necessary range to see if my hypotheses endure alterations. To properly test if the proxies used are robust to change, the construction should be independent of existing design. I mentioned that marked-based designs would be a more appropriate way to see how the relationship is consistent to detect the phenomenon, but since my data did not have any adequate information to construct proper alternative proxies, I designed them in alternative ways concerning the data I had.

Another important aspect, not covered in this dissertation, is the potential sampling selection error. The variables used are not tested for random selection and may be subject to unreliable results. Moreover, these two issues are a significant drawback in my analysis, especially for the relationship between employee compensation and gender diversity. This relationship has no theoretical backing in the current literature that signifies that employee compensation ratio will be a good measurement for how female directors reward their employees. Ideally, I would have had more information about the structure and levels of compensation to really excrete how gender diversity affects employees.

Alternative explanatory proxy

I mentioned in section 3.2 that the change in diversity was to detect the scope of diversity before it was offset by a further increasing change. The rationale was that it had similar properties as a squared diversity ratio however, we saw from the analysis that the change proxy did not possess the exact properties to detect the turning point of increased gender diversity. In this section, I have substituted the change in diversity with a squared diversity.

Since there are a significant number of firms without any female directors in several of the years in my sample, I have added a small value to all observations in order to have a coherent design[20]. The results are presented in table 16. The coefficients are accompanied by heteroscedastic standard errors.

[20] The new explanatory variable has added 0.01 in order to be squared.

TABLE 16

Alternative explanatory proxy where change in diversity is replaced with squared diversity.

	Firm Performance	Empl. Compensation	Financial Risk
Diversity	-0.510 (0.167)***	0.250 (0.086)***	-1.458 (0.551)***
Diversity^2	0.443 (0.230)*	-0.063 (0.179)	1.476 (0.707)**
Control factors			
Board size	-0.003 (0.007)	0.038 (0.004)***	0.034 (0.030)
Age		0.007 (0.002)***	-0.029 (0.009)***
change income		-0.000 (0.000)	
Risk	-0.000 (0.000)	-0.000 (0.000)	
Size	0.135 (0.029)***	-0.075 (0.005)***	0.209 (0.028)***
Income	-0.033 (0.006)***		
ROA			-0.093 (0.087)
Dummy high/low	Yes	Yes	No
Dummy years	Yes	Yes	Yes
R squared	0.2030	0.2958	0.1230
Obs.	1185	1009	1170

Notes: This table shows alternative explanatory results for my three hypothesis. The alternative model has substituted change in diversity with squared diversity plus a small value (0.01). The missing squares are control variables not used in that model. Statistical significance coefficients at 1%, 5% and 10% levels are marked with ***, **, and * respectively. Table 6 defines the variables, and the sample is all non-financial Norwegian PLCs listed on the Oslo Stock Exchange.

We can see that the coefficient for squared diversity is significant for both hypothesis 1 and 3, indicating that the effect of gender diversity has a tipping point. The magnitude of this coefficient for hypothesis 3 is greater than the negative impact gender diversity has on financial risk. This reduces the consistency in my results from my base-case model in section 4.3 indicating that the amount of females are negatively correlated with risk aversion at all levels. The high squared coefficient indicate that the current risk ratio will be moving towards more risky structures as the optimal level of diversity to risk is reached.

For hypothesis 1, there is still a negative impact of the high gender diversity ratio, although the squared coefficient is significantly high for this measurement as well. The insignificant coefficient in hypothesis 2 indicates that the amount of employee compensation and stakeholder awareness experience no significant turning point.

6. Conclusion

This dissertation analyzes the effect of gender diversity along different aspects in an empirical setting to provide any rationale for imposing legal constraints on a board of directors. Existing research usually only covers a few of the determinants for board structure and do not account for the full explanatory cause. In this research, I have focused on the effect of gender diverse boards of director to see if they have any significant impact on different measures such as firm performance, employee-awareness, and financial risk profile.

In the vast existing literature on how gender diversity affects firm performance, I have no conclusive evidence that diversity pulls in a clear direction. I do find supporting evidence in line with existing literature, that diversity is harmful for firm performance. However, I also find a positive relationship between gender diversity and firm performance over the voluntary compliance period, suggesting that females do possess qualities attributable to better performance. The positive effect in this period may be because the general pool of qualified women are still in play, and firms needing independent directors the most are quick to appointing them. Another explanation is that well-performing firms are the ones to pursue women in the voluntary compliance period and thus creating this positive relationship. We saw that firms with above average returns drastically changed the percentages of female directors on their boards.

The positive effect is however lost when forced compliance is imposed. The negative significant relationship over the mandatory period offer supportive evidence to Demsetz and Lehn (1985), who say firms not being able to choose an optimal board with respect to their own agenda will lead to a declining value. A reason for this can be the existing board members' attitude to the new female directors, appointing them to disadvantageous positions or overriding their contributions. It can also be simply because females underperform in competitive settings. Researchers find that although there is no gender gap in single-sex competitions, there is a difference when women compete across sexes.

From other business perspectives, the effect of women directors are different. The perceived idea that women are more relationship-oriented and care more about their employees generate support from my analysis. I mentioned in section 4.2 that there could be other factors affecting employee compensation, and I controlled my results with respects to some influencing factors. However, I was not able to control for the exact composition of how

employees receive benefits. Nevertheless, the result give weak support to the hypothesis that females are more attune to their employees.

I find conflicting evidence that female directors possess less risk aversion compared to men (Adams and Funk, 2011). From my analysis, the relationship between financial risk and increased gender diversity is negative. This suggests that more female directors will reduce the financial risk of a firm. It does appear however that the negative relationship only endures up to a certain level before the effect is lost. It can be that women are more risk-aware than risk averse. They do consider the opportunity of financial distress and will abstain from excessive risk-taking. This is especially important in retrospect to the recent financial crises, where excessive risk-taking and poor judgment led firms into a recession.

From a social perspective, women are less concerned with shareholder maximization. Which may contribute to firms not emphasizing short-term profits. Another social aspect, not covered in this paper is the second-run effect female directors bring to inspire the aspiration of women to pursue higher management positions and become candidates that are more suitable at a later stage. However, a study conducted by Kapital[21] in 2012 revealed that the number of women in executive positions in Norwegian PLCs had suffered a decrease in recent years (Tutchell and Edmond, 2013 pp.30).

In an overall summary of the dissertation and concluding remarks, I find no conclusive evidence from a firm performance perspective for government to mandate gender diversity in the boardrooms. The sample period in my analysis does not account for the long-term effects greater gender diversity brings to the table. Future researchers should investigate the impact female directors has had on firms in the aftermath of the financial crises in 2008. I will also recommend further investigations in the impact gender diversity has for its employees. This dissertation offers an initial analysis of this relationship, but the complexity of the matter encourages in depth scrutiny. Finally, I will urge researchers to investigate the impact increased gender diversity has for financial risk. The consequences of more female directors can change the risk profile of the firm in an unforeseen way.

[21] Kapital is a biweekly Norwegian Business Magazine covering the latest from economic policies to news from the business- and financial sector.

7. References

Adams, R. B. and Ferreira, D. (2007). A Theory of Friendly Boards. *Journal of Finance 62*(1), 217-250.

Adams, R. B. and Ferreira, D. (2009). Women in the Boardroom and their Impact on Governance and Performance. *Journal of Financial Economics 94*(2), 291-309.

Adams, R. B. and Funk, P. (2011). *Beyond the glass ceiling: Does gender matter?* (UPF Working paper series; ECGI – Finance working paper no. 283/2010*).* Available at SSRN: http://ssrn.com/abstract=1475152.

Adams, R. B. and Kirchmaier, T. (2013). *From Female Labor Force Participation to Boardroom Gender Diversity*. (Discussion Paper 715, London School of Economics). London: London School of Economics.

Ahern, K. R. and Dittmar, A. K. (2012). The Changing of the Boards: The Impact on Firm Valuation of Mandated Female Board Representation. *The Quarterly Journal of Economics 127,* 137-197.

Allison, P. D. (1999). *Multiple regression: A primer*. California: Pine Forge Press, Inc.

Bhandari, L. C. (1988). Debt/Equity Ratio and Expected Common Stock Returns: Empirical Evidence. *Journal of Finance 43*(2), 507-528.

Breusch T. S. and Pagan, A. R. (1979). A Simple Test for Heteroscedasticity and Random Coefficient Variation. *Econometrica 47*(5), 1287-1294.

Brooks, C. (2008). *Introductory Econometrics for Finance* (2nd Edition). New York: Cambridge University Press.

Bråthen, T. (2009). *Styremedlem og aksjonær* (2. utgave). Bergen: Fagbokforlaget Vigmostad & Bjørke AS.

Bøhren, Ø. and Staubo. S. (2014). Does Mandatory Gender Balance Work? Changing Organizational Form to Avoid Board Upheaval. *Journal of Corporate Finance, 6 Forthcoming.* Available at SSRN: http://ssrn.com/abstract=2257769.

Bøhren, Ø. and Stuabo. S. (2014). *Female Directors and Board Independence: Evidence from Boards with Mandatory Gender Balance*. *(*Unpublished doctoral dissertation, BI Norwegian Business School*)*. Oslo: BI Norwegian Business School.

Bøhren, Ø. and Strøm, Ø. (2005). *The value-creating board: Theory and evidence*. (Research Report 8/2005). Oslo: BI Norwegian School of Management.

Bøhren, Ø. and Strøm, Ø. (2010). Governance and Politics Regulating Independence and Diversity in the Board Room. *Journal of Business Finance & Accounting 37*(9) & (10), 1281-1308.

Campbell, K. and Mínguez-Vera, A. (2008). Gender Diversity in the Boardroom and Firm Financial Performance. *Journal of Business Ethics 83,* 435-451.

Carter, D. A., Simkins, B. J. and Simpson, W. G. (2003). Corporate Governance, Board Diversity and Firm Value. *Financial Review 38*(1), 33-53.

Dale-Olsen, H., Schøne, P. and Verner, M. (2013). Diversity among Norwegian Boards of Directors: Does a Quota for Women Improve Firm Performance? *Feminist Economics 19*(4), 110-135.

Demsetz, H. and Lehn, K. (1985). The Structure of Corporate Ownership: Cause and Consequences. *Journal of Political Economy 93*(6), 1155-1177.

Fama, E. F. (1980). Agency Problems and the Theory of the Firm. *Journal of Political Economy 88*(2), 288-307.

Fama, E. F. and Jensen, M. C. (1983). Separation of Ownership and Control. *Journal of Law and Economics 26*(2), 301-325.

Farrell, K. A. and Hersch, P. L. (2005). Additions to corporate boards: The effect of gender. *Journal of Corporate Finance 11*, 85-106.

Galåen, A. (2010). *Forskjeller i regnskapskvalitet mellom NGAAP og IFRS*. (Unpublished master dissertation, Høgskolen i Buskerud*).* Kongsberg: Høgskolen i Buskerud.

Goergen, M. (2012). *International Corporate Governance*. England: Pearson Education Limited.

Gysler, M., Kruse, J. B. and Schubert, R. (2002). *Ambiguity and Gender Differences in Financial Decision Making: An Experimental Examination of Competence and Confidence Effects*. (Working paper series, CER.ETHZ). Zürich: Center for Economic Research, Swiss Federal Institute of Technology. Retrieved at CER.ETHZ: http://www.cer.ethz.ch/research/workingpapers.

Hagen, I. M. (undated). *Norway.* Brussels: SEE Europe. Retrieved 03.03.2014 at: http://www.seeurope-network.org/homepages/seeurope/countries/norway.html.

Hambrick, D. C., Cho, T. S. and Chen, M. J. (1996). The Influence of Top Management Team Heterogeneity on Firms' Competitive Moves. *Administrative Science Quarterly 41*(4), 659-684.

Hermalin, B. E. and Weisbach, M. S. (2006). *A Framework for Assessing Corporate Governance Reform.* (NBER Working paper no. 12050). Retrieved from NBER: http://www.nber.org/papers/w12050.

Ireland, P. (1999). Company law and the myth of shareholder ownership. *Modern Law Review 62*(1), 32-57.

Kennedy, P. (2008). *A Guide to Econometrics* (6th Edition). United Kingdom: Blackwell Publishing.

Klenke, K. (2003). Gender influences in decision-making processes in top management teams. *Management Decisions 41*(10), 1024-1034.

Lau, D. C and Murnighan, J. K. (1998). Demographic Diversity and Faultines: The Compositional Dynamics of Organizational Groups. *Academy of Management Review 23*(2), 325-340.

Lemmon, M. L. and Zender, J. F. (2010). Debt Capacity and Test of Capital Structure Theories. *Journal of Financial & Quantitative Analysis 45*(5), 1161-1187.

Levin, Ross (2013.01.13). Rethinking Employee Compensation. *Journal of Financial Planning*.

Mao. C. X. (2003). Interaction of Debt Agency Problems and Optimal Capital Structure: Theory and Evidence. *Journal of Financial & Quantitative Analysis 38*(2), 399-423.

Matsa, D. A. and Miller, A. R. (2013). A Female Style in Corporate Leadership? Evidence from Quotas. *American Economic Journal: Applied Economics 5*, 136-169.

Nygaard, K. (2011). *Forced board changes: Evidence from Norway.* (Discussion Paper no. 5/2011, NHH) Bergen: Norwegian School of Economics and Business Administration.

Plümper, T. and Neumayer, E. (2012). *Model Uncertainty and Robustness Tests: Towards a New Logic of Statistical Inference*. (Working paper, London School of Economics). London: London School of Economics. Retrieved from SSRN: http://ssrn.com/abstract=2129113.

Regjeringen Bondevik II. (2003). *Ot.prp. nr. 97 2002-2003.* Norway: Ministry of Children, Equality and Social Inclusion. Available at: http://www.regjeringen.no/en/dep/bld/dok/regpubl/otprp/20022003/otprp-nr-97-2002-2003-.html?id=127203

Rendon, S. R. (2013). Fixed and Random Effects in Classical and Bayesian Regression. *Oxford Bulletin of Economics & Statistics 75*(3), 460-476.

Sapienza, P., Zingalas, L, and Maestripieri, D. (2009). Gender differences in financial risk aversion and career choices are affected by testosterone. *Proceedings of the National Academy of Science in the USA 106*(36).

Schleifer, A. and Vishny, R. W. (1997). A survey of corporate governance. *Journal of Finance 52*(2), 737-783.

Schrader, C. B., Blackburn, V. B. and Iles, P. (1997). Women in Management and Firm Financial Performance: An Exploratory Study. *Journal of Managerial Issues 9*(3), 355-372.

Schubert, R., Brown, M, Gyslar, M. and Brachinger, H. W. (1999). Financial Decision-Making: Are Women Really More Risk-Averse? *The American Economic Review 89*(2), 831-835.

Smith, N., Smith, V. and Verner, M. (2006). Do women in top management affect firm performance? A pane study of 2,500 Danish firms. *International Journal of Productivity & Performance Management 55*(7), 569-593.

Srinidhi, B., Ferdinand, A.G. and Tsui, J. (2011). Female Directors and Earnings Quality. *Contemporary Accounting Research 28*(5), 1610-1644.

Strøm, R. Ø. (2014.03.03). *Persistence in discrimination?* (mimeo, Oslo and Akershus University College*)*. Oslo: Oslo and Akershus University College.

Strøm, R. Ø., D'Espallier, B. D. and Mersland, R. (2014). Female leadership, performance, and governance in microfinance institutions. *Journal of Banking & Finance 42*, 60-75.

Stuart, C. (2011). *Robust Regression.* (mimeo, Durham University*)*. UK: Durham University, Department of Mathematical science). Retrieved from DUR: http://www.maths.dur.ac.uk/Ug/projects/highlights/CM3/Stuart_Robust_Regression_report.pdf.

Tutchell, E. and Edmonds, J. (2013, January). Made in Norway: How Norwegians have used quotas to increase the number of women on company boards. *Booklet produced following the Conference on the Norwegian Quota Law organized in House of Commons, London, UK.*

Terjesen, S. and Singh, V. (2008). Female Presence on Corporate Boards: A Multi-Country Study of Environmental Context. *Journal of Business Ethics 88*, 55-63.

Vathunyoo, S., Gonzalez, A. and Hagendorff, J. (2014). *Women on Board: Does Boardroom Gender Diversity Really Affect Firm Risk?* (Working paper series, University of Edinburgh). Scotland: University of Edinburgh. Retrieved at SSRN: http://ssrn.com/abstract=2379025.

Verdens Gang. (2002.02.22). Møkk lei «Gutteklubben grei». *VG Nett.* Available at: http://www.vg.no/nyheter/innenriks/moekk-lei-gutteklubben-grei/a/3024189/

Wilson, N. and Altanler, A. (2009). *Director Characteristics, Gender Balance and Insolvancy Risk: An Empirical Study*. (Working paper series, University of Leeds). UK: University of Leeds. Retrieved at SSRN: http://ssrn.com/abstract=1932107

Wooldridge, J. M. (2014). *Introduction to Econometrics, Europe, Middle East and African Edition*. United Kingdom: Cengage Learning EMEA.

Yohai, V. J. (1987). High Breakdown-Point and High Efficiency Robust Estimates for Regression. *The Annals of Statistics 15*(20), 642-656.

8. Appendix

Appendix 1.

TABLE 17

This table shows the VIF score for the dependent variables used in my models.

	Base-case models		
	(1)	(2)	(3)
Diversity	4.818	4.839	5.137
Δ diversity	1.326	1.324	1.322
Board size	1.280	1.276	1.284
Age		1.179	1.168
Δ income			1.010
Risk	1.012		1.013
Size	2.512	1.589	1.460
Income	2.226		
ROA		1.153	
Dummy high/low	4.083	4.082	4.345
Dummy year	2.694	2.387	2.273

Notes: This table shows the VIF score for my variables when included in the same model. High VIF scores can cause a multicollinearity problem. The VIF is calculated in an unweighted linear model with 1 df. Dummy high/low has been removed from model (3) because of a VIF>5. Table 6 defines the variables, and the sample is all non-financial Norwegian PLCs listed on the Oslo Stock Exchange.

Appendix 2.

TABLE 18

Cross-sectional regression for ROA against gender diversity and control variables

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Diversity	-0.349 (0.275)	0.065 (0.330)	0.020 (0.171)	0.018 (0.163)	0.164 (0.103)	-0.022 (0.099)	-0.028 (0.105)	0.062 (0.226)	-0.105 (0.248)	0.303 (0.336)
Control										
Δ diversity	0.077 (0.043)*	-0.050 (0.061)	-0.012 (0.054)	-0.052 (0.023)**	-0.107 (0.074)	-0.001 (0.023)	0.023 (0.022)	0.089 (0.093)	0.002 (0.128)	-0.153 (0.182)
Board size	0.004 (0.011)	0.024 (0.026)	-0.014 (0.009)	-0.010 (0.013)	-0.017 (0.008)**	-0.011 (0.005)**	-0.006 (0.008)	-0.008 (0.014)	-0.027 (0.017)	-0.014 (0.006)**
Risk	0.001 (0.001)	-0.001 (0.000)**	0.010 (0.012)	0.012 (0.019)	-0.005 (0.005)	0.001 (0.000)***	0.007 (0.003)**	-0.001 (0.000)*	0.001 (0.017)	-0.001 (0.000)**
Size	0.191 (0.082)**	0.231 (0.051)***	0.086 (0.027)***	0.077 (0.035)**	0.030 (0.022)	0.032 (0.019)*	0.040 (0.025)	0.176 (0.031)***	0.157 (0.046)***	0.137 (0.033)***
Income	-0.083 (0.036)**	-0.087 (0.021)***	-0.031 (0.012)**	-0.015 (0.009)*	-0.001 (0.005)	0.001 (0..006)	-0.004 (0.007)	-0.061 (0.010)***	-0.041 (0.015)**	-0.034 (0.008)***
Dummy sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R squared	0.3361	0.4167	0.2291	0.2749	0.2599	0.2355	0.2782	0.5015	0.3757	0.3837
Obs.	129	130	116	117	129	138	141	157	143	135

Notes: This table shows the effect of gender diversity in a cross-sectional OLS analysis. Dependent variable is the firms return on assets (ROA). Statistical significance coefficients at 1%, 5% and 10% levels are marked with ***, **, and * respectively. Table 6 defines the variables, and the sample is all non-financial Norwegian PLCs listed on the Oslo Stock Exchange.