Norwegian School of Economics
Bergen, Autumn, 2020

NHH

Towards Gender Parity: Female Directors' Impact on Firm Policies

A Study on the Norwegian Boardroom Gender Quota

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Abstract

After a 20-year period of frequent introductions of board gender diversity quotas in European countries, this paper examines the effect on firm policies of the first mover, the Norwegian quota. Looking at several performance measures, financial and investment policies, and labor policies, we find that the results highly depend on the method used to handle the endogeneity issue introduced by the optional timing of compliance within a two-year period. However, our results suggest small or no impact on the performance measures return on assets and asset turnover. Cash holdings and capital expenditures relative to assets, and dividend ratio seem to have declined for the companies obliged to follow the quota after the enforcement, while the debt ratio appears to have increased. Studying labor policies give mixed results; however, total labor costs seem to have increased while CEO pay has decreased. In addition, the fraction of female directors on the board appears to lead to a decrease in performance-sensitivity of CEO turnover.

Aknowledgements

We want to thank our supervisor Francisco Santos for valuable guidance and continuous support throughout the process. We are very grateful for his insight, helpful feedback, and for challenging our ideas. In addition, we want to thank Karin Thorburn and Knut Nygaard for taking the time to answer our questions about their process and thoughts around their paper, and for highly appreciated advice. Lastly, we want to thank Aksel Mjøs for access and helpful insights regarding the data.

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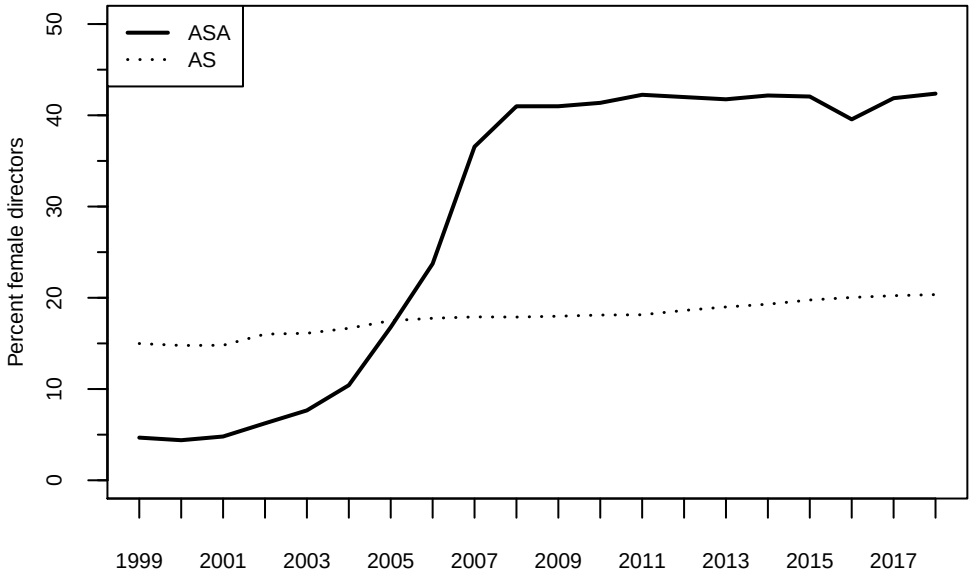
1 Introduction

"I think empowering more women on the continent, that right away is going to, I think, lead to some better policies." - Barack Obama (Prisco, 2018).

Women remain underrepresented on the boards of companies worldwide (Mensi-Klarbach & Seierstad, 2020). Concerned with the low fraction of women on corporate boards, several countries have established gender quotas. Norway mandated the first board gender quota in December 2005, requiring public limited companies (ASA) to have at least 40% representation of each gender on their board seats. Firms had to comply with the quota within two years, or face forced liquidation. The government claimed that the low share of women on corporate boards was due to cultural aspects and ideologies resulting in women not being considered for these positions (The Ministry of Children, Family and Equality, 2003), and therefore, found it necessary to intervene.

Figure 1: Percent female board directors, ASA and AS

The solid line shows the average percent of female shareholder-appointed directors of Norwegian ASA each year, while the dotted line shows the corresponding percentage for Norwegian AS. The sample consists of 1,177 ASA (499 ASA in 1999 and 210 ASA in 2018), and 340,848 AS (98,576 AS in 1999 and 51,578 AS in 2018).



As seen in Figure 1 above, the fraction of female directors increased dramatically from 2003, when the quota law was presented, until the deadline of compliance. While the fraction of female directors was about 8% in 2003, it was 41% by 2008. Several other countries have followed or are considering following Norway's lead to implement their own mandatory board

quotas.[1] In addition to the international change that followed the Norwegian quota, there has also been a voluntary increase in the fraction of female directors in Norwegian private limited firms (AS) from about 16% in 2003 to more than 20% in 2018.

Given the dramatic transformation in the composition of Norwegian boards of directors in ASA, what effects did regulators expect to achieve by imposing a gender quota on corporate boards?

The purpose of this thesis is to examine the impact of the Norwegian board gender diversity quota on firm policies. As Norway was the first to introduce a board gender quota in the movement towards board gender diversity, and since most previous studies on the impact on firm policies only include the years of the financial crisis as the post-quota period, it is especially interesting to look at the quota's effect in respect to what we can expect in other countries that have implemented, or are working to implement a quota. In addition, to our knowledge, the impact on firm policies is not widely studied. On policies such as dividend payout and Chief Executive Officer (CEO) turnover performance-sensitivity, we have not found any research on the effect of the Norwegian quota. Furthermore, as the quota is not driven by firm policies or performance, it provides a unique setting that facilitates for inferences to be made about potential effects of forced board gender diversity.

Although the motivation behind the quota provides a unique setting that facilitates for inference, the optional timing of compliance before the deadline not being exogenous leads to issues regarding endogeneity. Therefore, on each policy, we test different methods of addressing this endogeneity issue, in addition to different specifications for the sample and control variables for the different methods. We follow Ahern and Dittmar (2012) (henceforth AD) and use an instrumental variable analysis with the fraction of female directors in year 2002 interacted with year dummies from 2004 to 2009 as an instrument for the annual board composition. In contrast to AD, who only look at a selection of listed ASA, we include both listed and unlisted ASA, as the quota applies to both organizational forms. Furthermore, AD's sample period ends in 2009, only including the years of the financial crisis as the post-quota period. In our analysis, we extend the time period to the year 2013. Our second method of addressing reverse causality is a difference-in-difference analysis inspired by Eckbo et al. (2020) (henceforth ENT) and Matsa and Miller (2013) comparing what happens to firms subject to the quota, to firms not subject to the quota, before and after the implementation.

We have divided our policies into three categories: performance policies, financial and

[1] After Norway's introduction of a corporate board quota in 2003, ten European countries had introduced quotas by the beginning of 2018. In addition to Norway, this includes Spain, Italy, France, Iceland, Germany, Belgium, The Netherlands, Austria, and Portugal (Mensi-Klarbach & Seierstad, 2020)

investment policies, and labor policies. Our findings suggest that the results are highly sensitive to the choice of method of addressing the endogeneity issue. Furthermore, changing the sample period, using different control groups, and including different control variables also have a substantial effect in certain cases. Except when looking at return on assets (ROA), which show no significant impact, we have specifications resulting in both significant and insignificant estimates for all policies.

Our insignificant estimates when regressing on ROA contradict the findings of Matsa and Miller (2013) who find a significantly negative impact of the quota on ROA. However, ENT (2020), who follow a similar approach as Matsa and Miller, but increase the sample period to 2013, find that the decline is insignificant, which is in line with our results. Turning to our other performance measure, asset turnover, using a difference-in-difference approach, some specifications show a negative effect of increased board gender diversity, which might imply an increase in agency costs (Barth et al., 2017). However, most specifications point to an insignificant impact.

Turning to financial and investment policies, our results suggest that the quota had a significant positive impact on debt ratio, indicating that debt levels increased. These findings contradict the large literature of indirect evidence relating corporate outcomes to CEO gender or board gender diversity arguing that women are more risk averse and less overconfident (e.g., Huang & Kisgen, 2013). However, it is consistent with Adams and Funk (2012) who find that female directors are less risk-averse than male directors. This is also supported by our findings of decreased cash holdings after the quota using difference-in-difference analysis. Looking at dividend policy, we find a negative relation between more gender diverse boards and dividend payouts. This might suggest that more gender diverse boards result in better and new investment opportunities as female directors bring new perspectives and networks to the firm. However, female directors might also be new to the game, lacking experience (AD, 2012), leading them to accept more projects. When it comes to capital expenditures, we find negative associations between board gender diversity in two specifications, while all other specifications point to no significance.

When examining the relationship between board gender diversity and labor policies, we find quite different results across the different model specifications looking at employee levels and labor costs. Turning to CEO compensation, we find that gender diverse boards have a significant and negative impact on CEO pay using difference-in-difference analysis with a matched control group. This finding is consistent with evidence that female directors ask tougher questions and demand straight answers when it comes to controversial areas such as compensation (Konrad et al., 2008). Female presence might prompt the dialogue and

analysis of CEO pay contracts, decreasing the likelihood of excessive CEO compensation.

Finally, we investigate the potential impact that female directors have on the performance-sensitivity of CEO turnover. We find that female representation on boards is associated with marginally lower performance-sensitivity of CEO turnover, consistent with Kim et al. (2020), but contrary to Adams and Ferreira (2009). Adams and Ferreira interpret their result of increased likelihood that the CEO is fired when the firm performs poorly, as female directors being tougher monitors. Our finding of a marginally negative effect might imply that greater female presence on the board leads to more time spent on investigating the underlying reasons for poor performance.

The structure of our paper is as follows. Section 2 provides a background to the Norwegian gender quota and presents related literature. We discuss our data and the board characteristics of our sample in Section 3. In Section 4, we examine the relation between forced board gender diversity and different firm policies. Section 5 concludes the study.

2 Background and existing literature

2.1 The quota

The quota requires 40% representation of each gender on the board of "*Almennaksjeselskap*" (ASA) (comparable to the UK public limited liability companies), but not for the boards of the more numerous "*Aksjeselskap*" (AS) (comparable to the UK limited liability companies). The quota only applies to shareholder-elected directors, so this paper will solely focus on directors appointed by shareholders. ASA is a separate organizational entity designated for large companies with liquid stocks and many shareholders, while the AS organizational entity is for smaller companies with less liquid stocks and fewer shareholders (Woxholth, 2007). ASA have shares available to the general public (for instance through a stock exchange), while AS can only perform private placements. As a result, ASA have more comprehensive provisions for reporting and transparency compared to AS. An additional requirement for ASA is to have a capitalization of at least one million Norwegian kroner. ASA can be both listed and unlisted, and the quota applies to both groups.

Table 1 below shows that the quota mandates that in a firm with two or three shareholder-elected directors, each gender must be represented at least once; in a firm with four or five directors, at least two directors from each gender are required; in a firm with six to eight directors, at least three directors from each gender are required; and in a firm with nine directors, at least four directors from each gender are required. For a board of more than ten directors, at least 40% of directors must be from each gender. These limits indicate that the proportion of female directors required by the quota varies slightly with board size. Firms could meet the requirements by either replacing male directors or by changing the total board size.

Table 1: Quota requirements

Shareholder elected board directors	Required representation of each gender
2-3	1
4-5	2
6-8	3
9	4
> 9	40%

2.2 Background and timeline

Norway has been a pioneer when it comes to gender quotas. Already in the early 1990s, Norway implemented a minimum representation of women on boards; however, at that time, the legislation only applied to government-appointed boards, councils, and committees. After two green papers in 1999 and 2001 discussing how to increase the number of women on corporate boards, a quota requirement found unexpected support in 2002.

On the frontpage of a Norwegian newspaper ("Verdens Gang") on February 22, 2002, Ansgar Gabrielsen, the Minister of Trade and Industry, announced that he was "sick and tired of the old men's club" (Møkk lei "Gutteklubben grei", 2002). At the time, the proportion of female board members in ASA were approximately 5%. Gabrielsen's proposal that the proportion of female directors should be at least 40% in ASA took the market by surprise. Moreover, the statement contradicted the official policy of his political party, the Conservative Party "Høyre", and neither the prime minister nor the party leader knew about his proposal in advance (Hegtun, 2005). As a result, Gabrielsen publicly retracted his support the next day (ENT, 2020).

Despite the Conservative Party's clear stance against the quota, on March 8, 2002, the coalition government surprised the public by proposing a gender quota law. The law proposal was submitted to the parliament in June, and on December 19 the law was formally included in Norwegian corporate law. However, a clause in the law stated that if voluntary compliance was achieved before mid-2005, the law would not be mandated.

Although many firms started to increase their share of female directors, by the end of 2005 the voluntary compliance was well below the desired level. On December 9, 2005, the quota became mandatory, and the firms were given two years to comply. The sanction for non-compliers was forced liquidation – the ultimate penalty for violation of Norwegian corporate law. This came as a surprise, since just a few days before the quota became binding, the prime minister had said that the sanction for non-compliance would most likely be a fine (Nygaard, 2011). By April 2008, all firms subject to the quota had complied. A detailed timeline of important dates and events leading up to the quota is included in Table 9 in the Appendix.

While the quota was controversial when it was introduced, it is now widely accepted, and many other countries have introduced some sort of quota regulations for boards. For instance, Iceland, Italy and France (Mensi-Klarbach & Seierstad, 2020).

2.3 Literature review

The board of directors' most critical functions is to monitor and hire management, and to give advice (Adams et al., 2010). If the board monitors well and gives helpful advice, this ought to impact firm performance. Several studies document a positive relationship between the fraction of female board members and financial performance measures such as return on assets (ROA), return on invested capital, return on equity, profit to sales and Tobin‘s Q (e.g., Carter et al., 2003; Erhardt et al., 2003). Some studies find a negative relationship (Adams & Ferreira, 2009), while other studies find no relationship (Carter, et al., 2010; Rose, 2007; Shrader et al., 1997). However, the evidence presented above reflects the firm's own choice of board composition. Firm characteristics might drive both performance and board composition, which in turn makes it difficult to say anything about causality. However, looking at the Norwegian quota, which represents an exogenous push towards change, facilitates for inferences to be made about the impact of forced board gender diversity.

Looking at stock market reactions to the Norwegian quota, Nygaard (2011) finds that stock prices increased with the 2005 announcement of the quota becoming mandatory. AD (2012) report a significantly negative stock market reaction to the 2002 announcement by Gabrielsen, while recent work done by ENT (2020) find no significant stock price reaction to announcements of legislative decisions leading up to the quota law. AD (2012) also examine the effect of the quota on different corporate policies and accounting measures. Using data from annual reports for 94 listed ASA, they use the prequota variation in female board representation to instrument for exogenous changes to boards following the quota. They find that the new female directors were significantly younger and less experienced compared to existing male directors. Furthermore, affected firms experienced increases in leverage and acquisitions, and a decline in cash holdings. The findings of increased leverage and decline in cash holdings are consistent with our findings using difference-in-difference analyses. However, when employing instrumental variable regression, we find no such relationship.

Turning to capital expenditures, AD find no relation between capital expenditures and more gender-diverse boards. This is consistent with our findings using instrumental variable regressions. However, Levi et al. (2013), who also use an instrumental variable strategy, find that female board members correlate negatively with capital expenditures using data on S&P 1500 firms. Our paper seems to suggest, when applying difference-in-difference analyses, that the Norwegian gender quota indeed did impact capital expenditures negatively.

A piece of evidence often used to support AD's findings of a negative valuation effect of the quota is Matsa and Miller (2013) who find that the ROA of ASA decreased significantly

relative to AS. However, ENT (2020) show that this decline in ROA is most likely not related to the quota itself. Our findings are consistent with ENT as we find no evidence that the quota has influenced ROA. Matsa and Miller (2013) argue that the reduced firm performance is due to fewer employee layoffs, which led firms to have higher labor costs in the short-term. They attribute their result of women taking actions that are more favorable to employees to a "female leadership style". Using instrumental variable regression on both listed and unlisted ASA, our result is consistent with Matsa and Miller's (2013) findings of increased employment levels and labor costs. However, when using difference-in-difference analyses, we find that employment levels significantly decreased. Moreover, the estimates on labor costs fail to be statistically significant.

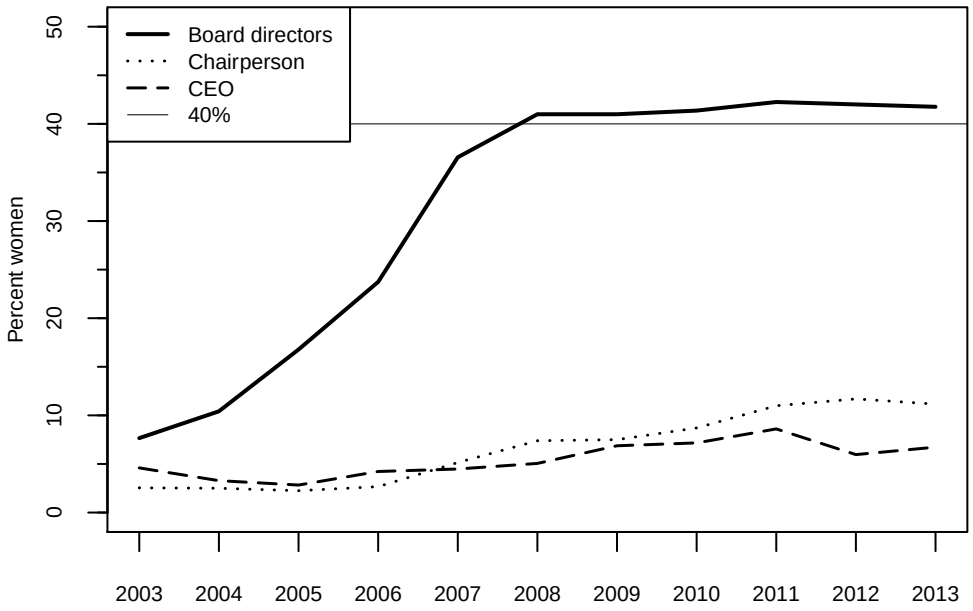
The board's ability to monitor is often measured by the probability that the CEO is fired when the firm performs poorly (CEO turnover performance-sensitivity). Research done by Adams and Ferreira (2009) using data on S&P 1500 firms from 1996 to 2003 suggests that gender-diverse boards allocate more time to monitoring. Female directors not only have better attendance records, but they are also more likely to join monitoring committees such as auditing, nomination, and corporate governance committees. Furthermore, male directors have fewer attendance problems the more women there are on the board. They find that CEO turnover is more sensitive to performance in firms with more gender-diverse boards. This is consistent with a recent study by Schwartz-Ziv (2017) on Isaeli government-owned firms. However, Kim et al. (2020), using data on publicly listed firms in Russia, find that female representation on boards is associated with lower CEO turnover sensitivity. Our paper seems to suggest that there indeed might be such a relation, at least in Norwegian ASA.

3 Data and board characteristics

The data used in this study is provided by SNF[2] and the Norwegian School of Economic's database of accounting and company information for Norwegian companies, developed by Berner, Mjøs, and Olving (2016). The data comes from the Brønnøysund Register Center[3] and comprise accounting data, corporate data and board data for firms registered in Norway. We use the population of ASA for the years 2003-2013.[4] There are 857 unique ASA—307 listed and 637 unlisted—for the sample period (87 ASA are both listed and unlisted during this period). In addition, we have retrieved stock and indices prices from Amadeus, a product of "Børsprosjektet NHH", where data provided by Oslo Børs Informasjon (OBI) is made available.

Figure 2: Percent female board directors, chairpersons and CEOs

The straight line illustrates the quota requirement of 40% female shareholder-appointed directors. The other lines show the average percent of female representation in Norwegian ASA each year for shareholder-appointed directors, chairpersons and CEOs. The sample consists of 857 ASA (514 ASA in 2003 and 240 ASA in 2013).



[2]SNF is short for "Samfunns- og næringslivsforskning", and is the centre for applied research at the Norwegian School of Economics (SNF, n.d.).

[3]The Brønnøysund Register Centre is a government body under the Ministry of Trade, Industry and Fisheries (The Ministry of Trade, Industry and Fisheries, n.d.). It consists of several different national registers, including "Regnskapsregisteret", where Norwegian companies send in financial statements each year (Brønnøysundregistrene, 2020).

[4]Subsidiaries not part of a group's consolidated statement are excluded.

As expected, the fraction of female board directors increased between 2003 and 2008, from 7.7% to 41.0% (illustrated in Figure 2 above). From 2008 to the end of our sample in 2013, the fraction has been relatively stable between 41.0% and 42.2%. An increase is also seen in the percent of female chairpersons and CEOs over the sample period, although not at the same magnitude; the proportion of female chairpersons increased from 2.5% in 2003 to 11.2% in 2013, while the percentage of female CEOs increased from 4.6% to 6.7% in the same years. The latter varied between 2.8% and 8.6% throughout the period.

Table 2 on the following page summarizes firm and board characteristics per year over the sample period. There is an average of 167 listed ASA and 221 unlisted ASA per year. The listed ASA are, on average, larger in terms of revenue, assets, and number of employees. The board characteristics for listed and unlisted ASA are more similar; however, unlisted ASA have an average of one fewer shareholder-appointed board director and one fewer board seat per board director. In general, mean revenue and assets increased for both listed and unlisted ASA over the sample period. The average number of employees decreased for the listed ASA but increased for the unlisted ASA. Another trend that can be seen here is that board directors have less experience as CEOs in ASA or in the 1% largest AS[5] the last three years for both listed and unlisted firms. [6]

As described earlier, firms could have complied with the quota law either by replacing male directors or by increasing board size. As seen in Table 2, the average number of shareholder-appointed board directors only varied between 5.0 and 5.4 in listed ASA and between 4.1 and 4.4 in unlisted ASA , which does not indicate a large increase in board size. If female directors would have pushed out more valuable male directors, firms could have avoided this by increasing the board size. However, the quota does not seem to have caused a change in average board size.

Further, we look more closely at board characteristics, broken down by gender. While Table 2 presents the means of firm averages, the graphs below show the means of the board directors in Norwegian ASA. First, looking at age, we can see from Figure 3 (presented after Table 2) that, on average, female directors are about four years younger than male directors. In addition, the average age for both genders slightly increased over the period; in 2003, the average age of female directors was 45 years, while the average age of male directors was 49 years; by 2013, the average age for female directors was 48 years, compared to 52 years for

[5]The 1% largest AS are used in this study because the AS population is dominated by small companies. For further explanation, see 5.1.2 ENT's method.

[6]CEO experience is defined per firm as the fraction of board directors with experience as CEO in an ASA or 1% largest AS by revenue over the past three years, like ENT (2020).

Table 2: Firm and board characteristics for listed and unlisted ASA, 2003-2013

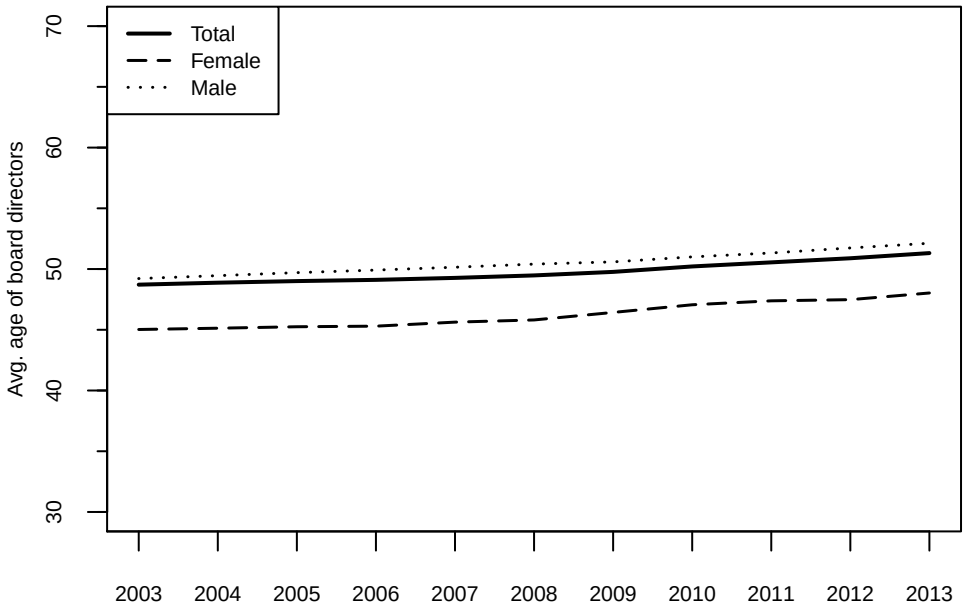
The table reports firm and board characteristics of Norwegian ASA per year from 2003 to 2013. Listed ASA are represented in Panel A, while unlisted ASA are represented in Panel B. *Avg. board size* refers to the average number of shareholder-elected board directors. Mean revenue and total assets are reported in million NOK. Revenue, total assets, number of employees and number of shareholder-appointed directors are winsorized at the 1% level. Board CEO experience is the fraction of the board's directors with CEO experience from ASA or the largest 1% AS by revenue over the past three years (Table 10 contains variable definitions). The last row in each sample shows the average annual value over the sample period. The sample consists of 857 unique ASA where 307 are listed and 637 are unlisted. 87 firms are both listed and unlisted during the period.

Year	Number of firms	Mean revenue	Mean total assets	Mean number of employees	Avg. board size (Shareholder-elected)	Board CEO experience (%)	Avg. number of board seats per board director	Avg. age board directors
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Listed ASA								
2003	148	3,823	15,116	241	5.0	20.7	6.2	51.1
2004	154	4,353	12,243	199	5.3	18.0	6.2	50.9
2005	175	4,174	12,315	178	5.4	19.2	6.4	50.4
2006	170	4,957	13,988	196	5.5	20.5	6.4	50.1
2007	198	4,403	13,882	149	5.3	19.6	6.3	49.6
2008	185	4,622	12,645	123	5.3	17.2	6.4	50.3
2009	167	4,970	12,870	119	5.2	16.8	6.3	50.7
2010	168	5,408	17,998	136	5.3	15.3	6.4	51.5
2011	166	6,097	19,062	133	5.3	15.5	6.3	52.3
2012	156	5,881	20,486	131	5.3	14.8	6.4	52.8
2013	148	6,253	22,303	122	5.2	14.1	6.2	52.8
Mean	167	4,995	15,719	157	5.3	17.4	6.3	51.1
Panel B: Unlisted ASA								
2003	366	467	2,840	61	4.1	25.2	4.8	47.9
2004	334	612	4,577	73	4.4	23.4	4.7	48.3
2005	285	628	5,728	72	4.4	22.9	4.7	48.3
2006	297	554	6,184	80	4.4	21.9	4.6	47.6
2007	267	685	7,118	86	4.3	16.9	4.4	47.8
2008	210	753	10,085	72	4.2	17.1	4.4	48.0
2009	171	839	11,910	85	4.2	17.8	4.4	49.1
2010	163	1,074	11,895	93	4.2	18.2	4.5	49.7
2011	134	1,540	14,814	111	4.3	13.5	4.6	50.9
2012	109	1,637	16,312	117	4.1	11.1	4.5	51.6
2013	92	2,169	19,872	137	4.2	11.4	4.6	52.0
Mean	221	996	10,121	90	4.3	18.1	4.6	49.2

male directors.

Figure 3: Average age of board directors

The different lines illustrate the average age of board directors in Norwegian ASA each year in total, for female directors, and for male directors. The sample consists of 27,786 directors (10,049 in 2003 and 10,626 in 2013), where 5,518 are female, and 22,268 are male.



Overall compliance to the quota was accomplished in 2008. As seen in Figure 4 on the following page, which reports the average number of ASA and 1% largest AS directorships held per board director, the average number of directorships for female directors remains stable throughout the period at around 1.4. This suggests that compliance with the quota was accomplished without overloading the typical female director. Moreover, opponents of the reform claimed that there were not enough qualified women to fill the required board seats; however, consistent with Bertrand et al. (2019), Figure 4 could suggest that the pool of qualified women was in fact sufficiently large.

An often important qualification for board members is CEO experience, as it is often viewed as central to board effectiveness (Lorsch & Maciver, 1989). Figure 5 on the following page shows the percentage of board members with CEO experience. The proportion of female board members with CEO experience is generally low—6.0% in 2003 and 7.0% in 2013—compared to 20.0% for male directors in both years.

Figure 4: Average number of board seats per board director

The different lines illustrate the average number of board seats held per board director in Norwegian ASA each year in total, for female directors, and for male directors. The sample consists of 27,786 directors (10,049 in 2003 and 10,626 in 2013), where 5,518 are female and 22,268 are male.

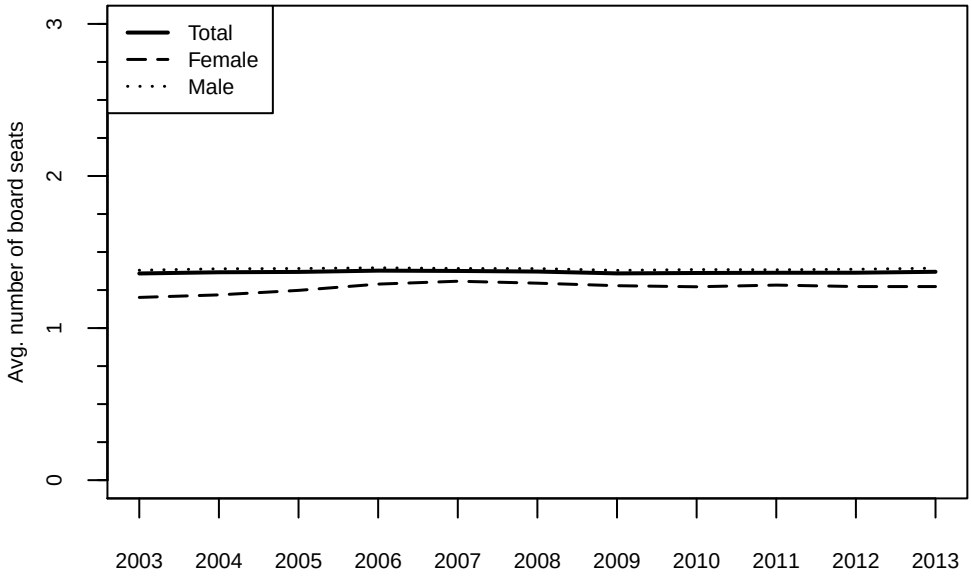
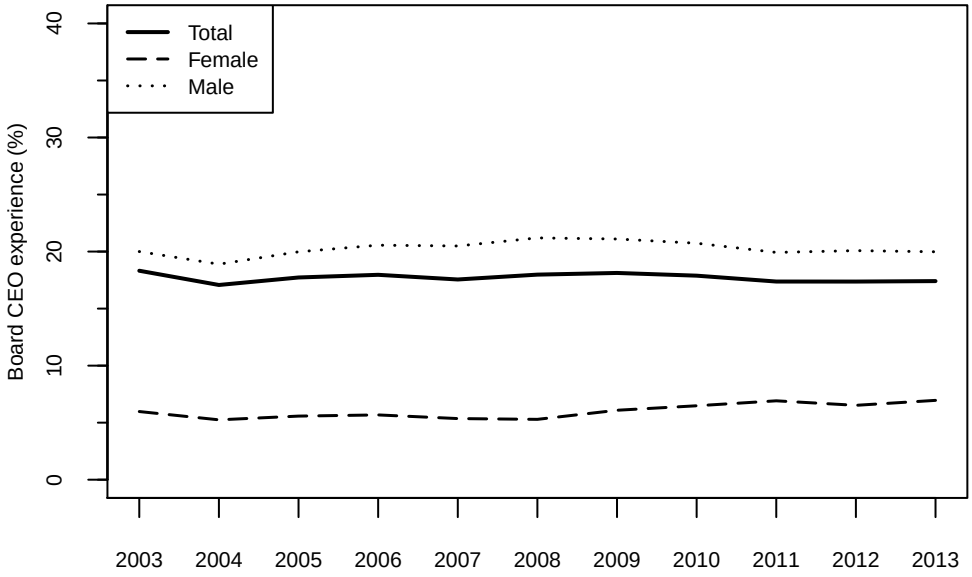


Figure 5: Percentage of board directors with CEO experience

The different lines illustrate the average percentage of board directors with CEO experience in Norwegian ASA each year in total, for female directors, and for male directors. CEO experience is defined as having experience as CEO in an ASA or one of the 1% largest AS by revenue, over the past three years. The sample consists of 27,786 directors (10,049 in 2003 and 10,626 in 2013), where 5,518 are female, and 22,268 are male.



4 Empirical Analysis

We begin our empirical analysis by explaining the methodology of the different models we use and the different model specifications. Thereafter, we have divided our chosen policies into three sections: performance policies, financial and investment policies, and labor policies. For each policy, we will justify our choice before we present and discuss our results. We follow the same methodology on all policies, except when investigating CEO turnover performance-sensitivity, where we explain the methodology in the respective subsection.

4.1 Methodology

As mentioned in the literature review, we have primarily found three studies on the effect of the Norwegian quota on firm policies. These studies were conducted by AD (2012), Matsa and Miller (2013), and ENT (2020). Both AD's and ENT's studies focus on the quota's effect on firm value, rather than on firm policies, but include a short section regarding this question. On the other hand, Matsa and Miller focus on corporate decisions.

AD look at multiple policies, including ROA, asset turnover, leverage, cash holdings, capital expenditures, number of employees, and CEO compensation, which we include in our analysis. Additionally, we also include dividend ratio, labor costs, and CEO turnover performance-sensitivity. However, AD do not debate their results to a large extent, and their research is limited to only listed companies in the time period 2003-2009.

Matsa and Miller investigate the quota's effect on the ROA of listed companies in the same time period as AD, using both a Norwegian and a Nordic control group, seeking to understand the change through the effects on revenues and costs. Therefore, they regress revenue, labor cost, and other costs relative to assets using the control group of Nordic companies, and log(employees) and log(labor costs) using both control groups and a combination of those.

ENT set out to improve Matsa and Miller's approach by also including unlisted ASA and extending the time period to 2013 to avoid a disproportionate impact of the financial crisis, given that Matsa and Miller's post-quota period (2007-2009) coincides with the crisis. ENT use a control group of Norwegian AS, which is also the sample we use, but while Matsa and Miller use different firm characteristics to match the different ASA, ENT choose the 1% largest AS by revenue. In addition, ENT include additional firm characteristics as control variables. Therefore, of the two approaches, we have decided to take ENT's approach further.

Since 2005, the firms listed on stock exchanges within the European Economic Area (EEA) have been required to report consolidated accounts in accordance with the International

Financial Reporting Standards (IFRS) (Gjerde et al, 2008). While no control variables or methods would be completely sufficient, we follow ENT's method to account for the new standards; we control for firm characteristics such as *Total assets, Leverage* and *Board size*. The change to IFRS could have impacted the listed companies differently, and for example including an IFRS dummy would assume similar effects for all companies. In addition, we do not have data on which companies that followed IFRS prior to 2005.

Following both AD and ENT, we control for firm and time fixed effects in all our regressions. Firm fixed effects are included to address the concern that omitted time-invariant firm characteristics might drive our results, and time fixed effects to control for factors that vary over time but not across firms.

In the following subsections, we explain AD's and ENT's methods and the different specifications that we have added. In addition, we introduce a method using the actual point of quota compliance for each firm.

4.1.1 AD's method

AD (2012) examine effects of the quota on the different firm policies in listed ASA[7] using a two-stage IV regression similar to the approach of Stevenson (2010), who examine the effect of female athletic participation on education and professional outcomes. The IV analysis for the six-year period of 2003-2009 is designed to account for the fact that even though the quota itself is exogenous, the timing of compliance is not. It could be that firms that complied during or before the voluntary period found it less costly, or that firms strategically timed their compliance with the law. To account for such endogenous quota compliance, AD use the fraction of women in 2002 interacted with year dummies, 2004-2009.

In addition to following AD's approach as closely as possible, we have added three more specifications. First, we include unlisted ASA, as they were also affected by the quota. Thus, we can get an idea of whether listed and unlisted ASA are impacted differently. Second, to prevent the results from being heavily impacted by the financial crisis in 2008-2009, we include the years until 2013. Third, we include controls for the firm characteristics that ENT introduced in their approach: *Firm age, Size, Leverage, Largest owner, Board size, Board CEO experience* and *Board busyness* (further explained in Table 10 in the Appendix).

[7]Our number of observations and sample differ from AD's sample, as they were not able to collect data for all companies and we do not have information about which companies they have data on. For example, they state that there were 241 OSE-listed companies in 2007, and that they were able to collect data on 163 firms in 2007. Our results do not differ significantly from theirs (when using all firms regardless of their use of IFRS) except on Debt ratio and Log(employees), where the result will be discussed in the corresponding sections.

As mentioned, in their first stage regression, AD regress the *Fraction female directors* on year dummies from 2004 to 2009 interacted with the fraction female directors for listed ASA firms in 2002. They also include time fixed effects (illustrated by year dummies) and firm fixed effects. Our results of the first stage regressions are presented in Table 3 on the following page. In the third and fourth column, where we have added the years 2010-2013, we have also made dummies for these years and have included the interaction term with the fraction of female directors in 2002. Unlisted ASA are included in Columns 2-4 and controls for firm characteristics are included in Column 4. Including firm characteristics and the years 2003 to 2013, the first stage regression can be written as follows:

$$(1) \quad Fraction\,female\,directors_{i,t} = \gamma_0 + Fraction\,female\,directors\,in\,2002_i * \sum_{t=2004}^{2013} \gamma_t \tau_t + \gamma_1 X_{i,t} + \theta_i + \tau_t + u_{i,t}$$

where $X_{i,t}$ is a vector of firm characteristics and θ_i and τ_t are firm and time fixed effects, respectively.

All coefficient estimates are significant in all four specifications, indicating that the fraction of female directors in 2002 interacted with year dummies is a good predictor of *Fraction female directors* and that the set of instruments are not weak. Our results are very similar to those of AD, both in terms of coefficients and significance. While AD do not find a significant estimate for the fraction of female directors in 2002 interacted with the dummy for year 2004, all other estimates are also significant in their case.

For the second stage regression, the dependent variable is the different firm policies regressed on the predicted values of *Fraction female directors* from the first stage regressions. The regression model can be written as follows:

$$(2) \quad Policy_{i,t} = \gamma_0 + \gamma_1 Fraction\,\widehat{female}\,directors_{i,t} + \gamma_2 X_{i,t} + \theta_i + \tau_t + \epsilon_{i,t}$$

where $\gamma_2 X_{i,t}$ is only included in the fourth specification that includes controls for firm characteristics. The results from the different specifications of the instrumental variable regressions are reported in the tables corresponding to the different sets of policies (Tables 5-7).

As the *Fraction female directors in 2002* is used to instrument for *Fraction female directors*, only companies with an available fraction of female directors in 2002 are included, leading to

Table 3: First stage regressions - AD's method

All columns report the result of the following first stage instrumental variable regression:

$$Fraction\,female\,directors_{i,t} = \gamma_0 + Fraction\,female\,directors\,in\,2002_i * \sum_{t=2004}^{a} \gamma_t \tau_t + \gamma_1 X_{i,t} + \theta_i + \tau_t + u_{i,t}$$

where a is the year the sample ends, and θ_i and τ_t are firm and time fixed effects, respectively. $X_{i,t}$ is a vector of firm characteristics, only included in Column 4. It contains the variables: *Firm age, Size, Leverage, Largest owner, Board size, Board CEO experience* and *Board busyness*. Columns 1 and 2 have the sample period of 2003-2009, while Columns 3 and 4 have the sample period of 2003-2013. The sample in Column 1 only includes listed ASA while the remaining columns include all ASA. In all columns, saving banks are excluded.

	Dependent variable: Fraction female directors			
	2003-2009		2003-2013	
	(1)	(2)	(3)	(4)
2004 dummy	0.040***	0.029***	0.033***	0.029***
	(0.010)	(0.005)	(0.006)	(0.006)
2005 dummy	0.119***	0.093***	0.098***	0.089***
	(0.015)	(0.008)	(0.009)	(0.010)
2006 dummy	0.205***	0.168***	0.173***	0.164***
	(0.016)	(0.011)	(0.012)	(0.013)
2007 dummy	0.335***	0.304***	0.301***	0.289***
	(0.014)	(0.012)	(0.012)	(0.015)
2008 dummy	0.367***	0.352***	0.352***	0.340***
	(0.012)	(0.009)	(0.010)	(0.014)
2009 dummy	0.360***	0.348***	0.348***	0.334***
	(0.012)	(0.009)	(0.010)	(0.015)
2010 dummy			0.355***	0.338***
			(0.013)	(0.017)
2011 dummy			0.358***	0.338***
			(0.013)	(0.019)
2012 dummy			0.361***	0.336***
			(0.012)	(0.019)
2013 dummy			0.358***	0.334***
			(0.012)	(0.019)
2004 dummy * fraction female directors in 2002	−0.119**	−0.089**	−0.099**	−0.101**
	(0.060)	(0.043)	(0.045)	(0.046)
2005 dummy * fraction female directors in 2002	−0.245***	−0.197***	−0.198***	−0.197***
	(0.076)	(0.056)	(0.059)	(0.060)
2006 dummy * fraction female directors in 2002	−0.554***	−0.380***	−0.385***	−0.381***
	(0.107)	(0.079)	(0.081)	(0.078)
2007 dummy * fraction female directors in 2002	−0.759***	−0.621***	−0.599***	−0.574***
	(0.074)	(0.064)	(0.067)	(0.066)
2008 dummy * fraction female directors in 2002	−0.896***	−0.695***	−0.680***	−0.650***
	(0.071)	(0.069)	(0.072)	(0.074)
2009 dummy * fraction female directors in 2002	−0.857***	−0.703***	−0.678***	−0.647***
	(0.084)	(0.065)	(0.069)	(0.066)
2010 dummy * fraction female directors in 2002			−0.708***	−0.669***
			(0.076)	(0.077)
2011 dummy * fraction female directors in 2002			−0.679***	−0.647***
			(0.080)	(0.084)
2012 dummy * fraction female directors in 2002			−0.814***	−0.768***
			(0.071)	(0.075)
2013 dummy * fraction female directors in 2002			−0.808***	−0.777***
			(0.060)	(0.062)
Firm and time FE	Yes	Yes	Yes	Yes
Firm characteristics	No	No	No	Yes
Sample	Listed ASA	ASA	ASA	ASA
Observations	832	1,894	2,102	2,102
R^2	0.676	0.607	0.621	0.637

Note: *p<0.1; **p<0.05; ***p<0.01

companies established after this year being excluded.[8]

Before using the Matsa and Miller-based method to regress ROA, ENT critique AD's IV test for effects on Tobin's Q, which follows the same method as their regression on the firm policies mentioned. Their critique is mainly based on the instrument; ENT argue that the *Fraction female directors in 2002* interacted with year dummies not only impact Tobin's Q through *Fraction female directors*, since board characteristics are endogenous and correlated with firm characteristics, which again affect Tobin's Q. This means that $Cov(Z_{i,t}, \epsilon_{i,t}) \neq 0$ and thus, the instrument is not valid. AD bring up the possible issue that *Fraction female directors in 2002* could correlate with changes in firm value. To examine this possibility, they compare the attributes of the firms in their sample with no female directors and firms with at least one female director. Looking at firm characteristics such as financial policies, investment behavior, and performance, they did not find any difference except in firm size (larger companies are more likely to have at least one female director). With these results, AD conclude that Tobin's Q, operating performance, and investment policies are not statistically different for firms with or without female directors.

While ENT do not suggest an alternative instrument nor aim to solve the endogeneity issue they believe is present, they also criticize the choice of "base year". They suggest interacting the year dummies with the fraction of female directors in 2001 instead of 2002, given the announcement in March 2002 of the government proposing the gender quota. This argument is based on their statement that 29% of companies listed on the Oslo Stock Exchange decreased their shortfall from the required gender representation in the subsequent annual shareholder meetings in the spring. However, AD emphasize that the majority of the firms in their listed sample had the same gender composition in both 2001 and 2002; in addition, the law was not presented or passed before 2003. According to Nygaard (2011), the percent of female directors in all ASA only increased from 4.0% to 5.1% from 2001 to 2002, which is the sample we use in three of the four specifications using AD's method. Bertrand et al. (2019) refer to 1998-2003 as a pre-reform period and use the share of female directors in 2003 to capture exogenous variation in the mandated changes in the proportion of female board members. We have chosen to follow AD's approach using *Fraction female directors in 2002*; however, we have also tested all specifications on all the policies for robustness, using *Fraction female directors in 2001*. The results do not differ significantly except for *Log(employees)* and *Log(labor cost)*; these differences will be mentioned in the respective section.[9]

[8] In addition, Norwegian saving banks are excluded from the sample as they, according to AD (2012), are listed but not ASA firms.

[9] Full regression results can be made available upon request.

By using only listed companies, AD, who use book values, had the opportunity to use the market value of assets in their calculation of ROA. We tested their approach using market value of equity when summing up total assets, to see if we would reach different conclusions. However, other than smaller coefficients due to a lower ratio, no significant changes were obtained in the regression results.[10]

4.1.2 ENT's method

Instead of an instrumental regression approach, ENT use whether the firm is an ASA interacted with *Comply*, which is a variable equal to 1 if the year is 2008 or later,[11] and add a control group of AS that were not affected by the quota. More precisely, ENT use a control group consisting of the 1% largest AS by revenue per year.[12] ENT argue this choice due to the fact that the annual population of approximately 100,000 AS are dominated by small companies; 46% of all AS have one employee at most, while 90% have ten at most. In comparison, the average annual number of employees are 657 for listed ASA and 209 for unlisted ASA. With an average of 45 employees, the 1% largest AS by revenue are considered the most comparable (ENT, 2020).

ENT discuss the assumption of Matsa and Miller's (2013) study that listed ASA and AS exhibit otherwise identical responses to aggregate shocks by stating that "This assumption is questionable since the choice of being a listed ASA or an AS is endogenous and may be correlated with latent time-variant factors not captured by the fixed effects." (ENT, 2020, p. 20). They do not attempt to completely resolve the issue, but they include unlisted ASA and extend the time period to 2013. Matsa and Miller obtain the same result on their ROA regression (using matched AS as a control group) when using a control group with listed companies from Sweden, Finland, and Denmark and when using a combined sample of these Nordic companies and Norwegian AS. However, these companies might have reacted differently to the financial crisis. As we only have access to data on Norwegian companies, we use the 1% largest AS by revenue (as ENT do) in Columns 5 and 6 in the regression panels for each policy (Tables 5-7). We also perform regressions using a control group of AS matched on multiple firm criterias. We use propensity score matching to choose three controls per ASA using the average of total assets, revenue, and number of board directors

[10] The regression table can be made available upon request.

[11] Setting *Comply* equal to 1 after 2007 reflects the deadline to comply with the quota at year end 2007. However, Matsa and Miller (2013) use post 2006 as their Comply variable. The last firms complied in April 2008.

[12] As ENT, we only include AS firm-year observations if total assets > 0, revenue > 0, long-term assets >= 0, current assets >= 0, long-term debt >= 0, short-term debt >= 0, total assets > cash holdings, and total assets > (current assets - current debt)

over the sample period. These results are illustrated in Column 7 and 8 in the same panels.

Another change from Matsa and Miller is the inclusion of more control variables. AD only control for firm and time fixed effects, while Matsa and Miller control for board size, average number of other board seats, industry and time fixed effects. For each specification, ENT run one regression that only controls for firm and time fixed effects and one regression that also controls for *Firm age, Size, Leverage, Largest owner, Board size, Board CEO experience* and *Board busyness*, as previously mentioned. While including additional control variables allows for the possibility to control for variables that may extraneously affect the relationship being investigated (Aguinis & Bernerth, 2015), it also presents the risk of including bad controls that also are affected by the quota (Angrist & Pischke, 2010). Therefore, like ENT, we have made one column including controls for firm characteristics and one not including them for each specification. The method can be written as follows:

$$(3) \quad Policy_{i,t} = \gamma_0 + \gamma_1 ASA_i * Comply_t + \gamma_2 X_{i,t} + \theta_i + \tau_t + \epsilon_{i,t}$$

where $X_{i,t}$ is a vector of firm characteristics, and θ_i and τ_t are firm and time fixed effects, respectively. $\gamma_2 X_{i,t}$ is excluded in the first specification of each sample.

4.1.3 Method with quota compliance

As mentioned, the reason to use instrumental variable regression or to have *Comply* after the respective year instead of a dummy equal to 1 when the firm has actually complied with the quota, is endogeneity problems. The quota itself is exogenous, but the timing of compliance is not. However, using the time of compliance also has its advantages.

According to Nygaard (2011), 7.2% of ASA firms had already complied by the beginning of the sample period, while that percentage was approximately 11% in 2004, 20% in 2005, 40% in 2006, and 80% in 2007. Early compliance is not captured in a model that uses the Comply dummy equal to 1 if the year is 2008 or later. Therefore, we have added a method regressing the firm policies on quota compliance (in general) and on quota compliance interacted with the ASA dummy. The method using quota compliance can be written as follows:

$$(4) \quad Policy_{i,t} = \gamma_0 + \gamma_1 Quota\,compliance_{i,t} + \gamma_2 ASA_i * Quota\,compliance_{i,t} + \gamma_3 X_{i,t} + \theta_i + \tau_t + \epsilon_{i,t}$$

This method is presented in the tables for each set of policies (Tables 5-7) in Columns 9 and 10, without and with controlling for firm characteristics, respectively. However, it is important to note that these results should be interpreted with caution due to the endogeneity

issues.[13] In the following, we examine the relation between board gender diversity and the performance policies ROA and asset turnover.

4.2 Performance policies

In addition to AD (2012), ENT (2020), and Matsa and Miller (2013), who look at the Norwegian gender quota's impact on performance, there are several international studies on the effect of female representation in the boardroom on performance. For instance, Couto et al. (2015) find that more female directors lead to higher performance, both in terms of Tobin's Q and return on assets (ROA), using data from 47 different countries. The positive relationship between the percent of female directors and firm value, measured by Tobin's Q is further confirmed by Campbell and Mínguez-Vera (2008), using a sample of Spanish firms.

Barth et al. (2017) investigate the relationship between female representation in the boardroom and agency cost, using the performance measure sales-to-asset ratio as a proxy for agency cost on a sample of Italian firms.[14] They find a positive significant impact, regressing a dummy, which equals one if the sales-to-asset ratio exceeds the median of the sample, and zero otherwise, on the percentage of women on the board using a probit model. However, Adams and Ferreira (2009) find that the positive relation between gender diversity on boards and firm performance often cited, is not robust to methods addressing the endogeneity of gender diversity. They state that "The true relation between gender diversity and firm performance appears to be more complex" (Adams & Ferreira, 2009, p. 308).

In most of the studies, firm value is used as a performance measure. Our focus being on firm policies rather than firm value and performance itself, we include two performance measures which can be an indicator of management's efficiency in use of assets. ROA is a measure of a firm's profitability relative to its assets, while asset turnover is a measure of a firm's sales or revenues relative to its assets. Like ENT, we use earnings before interest and taxes as a measure of probability and, like AD, we use revenues to calculate asset turnover. ROA and asset turnover can be seen as an indicator of how efficient a company is using its assets to generate earnings and revenue, respectively.

ROA is the only measure that AD, ENT, and Matsa and Miller analyze. While AD point to

[13] In both these columns (9 and 10), and the columns illustrating ENT's method (5-8), we follow ENT's approach for restricting the sample; we require no missing observations of the control variables, require a minimum of two observations of each firm, and exclude financial firms and ASA registered as AS at some point during the sample period.

[14] The sales-to-assets ratio (asset turnover) is used in multiple studies as a proxy for agency costs, with the reasoning being that a high ratio of sales-to-assets shows that assets generate a large amount of sales and thereby suggest low agency cost(Ang et al., 2000; Barth et al., 2017).

a negative effect of the quota on Tobin's Q and abnormal announcement returns, they find no significance when regressing ROA on the predicted value of the fraction of female directors. Matsa and Miller (2013), on the other hand, find that ROA of ASA decrease significantly relative to AS. As mentioned, ENT revisit Matsa and Miller's findings by extending the sample period to 2013 and including unlisted ASA. They find that with these changes, the quota does not appear to have a significant effect on ROA. Our attempt of replicating ENT's regressions are shown in Table 4 on the following page.

Columns 1 and 2 present the results of using the sample of ASA and large AS (1% largest AS by revenue) from 2003 to 2009 without and with controlling for firm characteristics. Using this approach, the quota seems to have had a negative impact on ROA with coefficients of -0.029 and -0.026, significant at the 5% level, consistent with Matsa and Miller's results, with coefficients of -0.027, also significant at the 5% level. When widening the sample period to 2013 in Columns 3 and 4, the quota does not seem to have had significant impact. Looking at the effect each year after the quota by interacting the ASA dummy with year dummies from 2008 to 2013 (Columns 5 and 6) suggests that the negative treatment effect that Matsa and Miller identify, is mainly found in 2008. ENT specify that this may be a result of a heterogeneous impact of the financial crisis on treated and control firms, rather than the quota requirement itself.

Table 5 (presented on the page following Table 4), Panel A presents the results using our chosen specifications. All ten specifications of the different methods indicate no effect of the quota on ROA, consistent with the findings of ENT and AD.[15]

In their paper about female directors and their impact on governance and performance using a US sample, Adams and Ferreira (2009) choose two performance measures, Tobin's Q and ROA. They regress the measures on fraction female directors, board size, the number of business segments, and year dummies, using several specifications. While we focus on their ROA regressions, their regressions on the natural logarithm of Tobin's Q give the same results in terms of significance and sign of coefficient. When using an ordinary least squares model with industry dummies, they find a positive significant impact of the fraction of

[15]It is worth mentioning that even though AD (2012) find no significance using instrumental variable regression, they do point to a decline in operating profits and state that their results on this measure are in line with Matsa and Miller's (2013) results. When presenting these results, they refer to a reduced form regression in their online appendix, where they regress ROA directly on the Fraction of female directors in 2002 interacted with year dummies from 2004 to 2009. They do, however, only find one significant coefficient when regressing on their full sample, which is the year dummy for 2005 interacted with the fraction of female directors in 2002. The coefficient is negative and significant at the 10% level. When regressing on their sample restricted to only firm-year observations with accounting disclosures that follow IFRS, they find three significant coefficients, however, they are all positive in this case.

Table 4: ROA - ENT's method

Columns 1-4 report the estimates of the coefficient γ_1 from the following equation:

$$ROA_{i,t} = \gamma_0 + \gamma_1 ASA_i * Comply_t + \gamma_2 X_{i,t} + \theta_i + \tau_t + \epsilon_{i,t}$$

where $Comply_t$ is a dummy equal to 1 if the year is 2008 or later, zero otherwise. In columns 5 and 6 the following model is used:

$$ROA_{i,t} = \gamma_0 + ASA_i * \sum_{t=2008}^{2013} \gamma_t \tau_t + \gamma_1 X_{i,t} + \theta_i + \tau_t + \epsilon_{i,t}$$

ASA_i is a dummy equal to 1 if firm i is an ASA, zero otherwise. $X_{i,t}$, which are included in Columns 2, 4 and 6, is a vector of the following firm characteristics: *Firm age, Size, Leverage, Largest owner, Board size, Board CEO experience* and *Board busyness*. θ_i and τ_t are firm and time fixed effects, respectively. Columns 1 and 2 have the sample period 2003-2009, while the remaining columns have the sample period 2003-2013. Firms with only one observation and firms that switch between ASA and AS over the sample period are excluded. In addition, financial firms and firm-year observations with missing dependent or control variables are excluded.

	Dependent variable: ROA					
	(1)	(2)	(3)	(4)	(5)	(6)
ASA*Comply	−0.029**	−0.026**	−0.019	−0.003		
	(0.014)	(0.013)	(0.013)	(0.012)		
ASA*y08					−0.047***	−0.033**
					(0.017)	(0.016)
ASA*y09					−0.033*	−0.030
					(0.019)	(0.018)
ASA*y10					−0.002	0.016
					(0.018)	(0.018)
ASA*y11					−0.026	−0.003
					(0.024)	(0.020)
ASA*y12					−0.002	0.018
					(0.022)	(0.019)
ASA*y13					0.023	0.040**
					(0.018)	(0.019)
Firm and time FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics	No	Yes	No	Yes	No	Yes
End sample period	2009	2009	2013	2013	2013	2013
Sample	ASA & large AS	ASA & large AS	ASA & large AS	ASA & large AS	ASA & large AS	ASA & large AS
Observations	6,156	6,156	10,387	10,387	10,387	10,387
R^2	0.002	0.120	0.001	0.126	0.004	0.130
Note:						*p<0.1; **p<0.05; ***p<0.01

Table 5: Performance policies

In both panels, Columns 1-4 report the estimates of the coefficient γ_1 from the second-stage instrumental variable (IV) regression:

$$Policy_{i,t} = \gamma_0 + \gamma_1 Fraction\,\widehat{female}\,directors_{i,t} + \gamma_2 X_{i,t} + \theta_i + \tau_t + \epsilon_{i,t}$$

where $Fraction\,\widehat{female}\,directors_{i,t}$ is the fitted value from the first-stage IV regressions reported in Table 3. Each column in the first-stage regression corresponds to the same numbered column in the panels of this table. In the columns using this regression equation, saving banks are excluded. The sample of Column 1 in the panels, only includes listed ASA, while Columns 2-4 include all ASA. In both panels, Columns 5-8 report the estimates of the coefficient γ_1 from the following equation:

$$Policy_{i,t} = \gamma_0 + \gamma_1 ASA_i * Comply_t + \gamma_2 X_{i,t} + \theta_i + \tau_t + \epsilon_{i,t}$$

where ASA_i is a dummy equal to 1 if firm i is an ASA, zero otherwise, and $Comply_t$ is a dummy equal to 1 if the year is 2008 or later, zero otherwise. In both panels, Columns 9-10 report the estimates of the coefficients γ_1 and γ_2 from the following equation:

$$Policy_{i,t} = \gamma_0 + \gamma_1 Quota\,compliance_{i,t} + \gamma_2 ASA_i * Quota\,compliance_{i,t} + \gamma_3 X_{i,t} + \theta_i + \tau_t + \epsilon_{i,t}$$

where ASA_i is a dummy equal to 1 if firm i is an ASA, zero otherwise, and $Quota\,compliance_{i,t}$ is a dummy equal to 1 if firm i has complied with the quota, zero otherwise. In all panels, Columns 5-10, firms with only one observation and firms that switch between ASA and AS over the sample period are excluded. In addition, financial firms and firm-year observations with missing dependent or control variables are excluded.

$Policy_{i,t}$ is referring to *ROA* in Panel A and *Asset turnover* in Panel B for company i in year t. $X_{i,t}$, which are included in Columns 4, 6, 8 and 10 in both panels, is a vector of the following firm characteristics: *Firm age, Size, Leverage, Largest owner, Board size, Board CEO experience* and *Board busyness*. θ_i and τ_t, which are included in all columns in both panels, are firm and time fixed effects, respectively. In both panels, Columns 1 and 2 have the sample period 2003-2009, while the remaining columns have the sample period 2003-2013.

Panel A: Dependent variable = ROA

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Fraction female directors	0.115	−0.116	−0.068	−0.179						
	(0.111)	(0.182)	(0.145)	(0.154)						
ASA*Comply					−0.019	−0.003	−0.003	0.010		
					(0.013)	(0.012)	(0.013)	(0.013)		
Quota compliance									−0.007	−0.007
									(0.013)	(0.013)
ASA*Quota compliance									0.003	−0.003
									(0.018)	(0.017)
Firm and time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics	No	No	No	Yes	No	Yes	No	Yes	No	Yes
End sample period	2009	2009	2013	2013	2013	2013	2013	2013	2013	2013
Sample	Listed ASA	ASA	ASA	ASA	ASA & large AS	ASA & large AS	ASA & matched AS	ASA & matched AS	ASA & matched AS	ASA & matched AS
Observations	832	1,894	2,102	2,102	10,387	10,387	7,846	7,846	7,846	7,846
R^2	0.031	0.012	0.025	0.090	0.001	0.126	0.00001	0.115	0.0001	0.115

Performance - continued

Panel B: Dependent variable = Asset turnover

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Fraction female directors	0.144	−0.140	−0.196	−0.322						
	(0.357)	(0.460)	(0.350)	(0.359)						
ASA*Comply					0.030	−0.042	−0.101***	−0.170***		
					(0.033)	(0.031)	(0.039)	(0.037)		
Quota compliance									−0.001	−0.005
									(0.053)	(0.048)
ASA*Quota compliance									−0.052	−0.114**
									(0.057)	(0.054)
Firm and time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics	No	No	No	Yes	No	Yes	No	Yes	No	Yes
End sample period	2009	2009	2013	2013	2013	2013	2013	2013	2013	2013
Sample	Listed ASA	ASA	ASA	ASA	ASA & large AS	ASA & large AS	ASA & matched AS	ASA & matched AS	ASA & matched AS	ASA & matched AS
Observations	832	1,894	2,102	2,102	10,387	10,387	7,846	7,846	7,846	7,846
R^2	0.055	0.017	0.016	0.210	0.0002	0.058	0.001	0.147	0.0003	0.145

Note: *p<0.1; **p<0.05; ***p<0.01

female directors on ROA. However, when adding firm fixed effects and/or including different instruments for the fraction of female directors, the results are instead significantly negative or fail to be significant, leading to their statement about the relation between gender diversity and firm performance being more complex.[16]

Panel B reports the results of our regressions on asset turnover. All specifications using AD's method (Columns 1-4) also suggest no significant impact. ENT's method using the ASA and large AS sample in Columns 5 and 6 also show no significance. However, using the sample of matched AS firms (Columns 7 and 8) and using the actual time of compliance including firm characteristics (Column 10), indicate a significant negative impact of the quota on asset turnover. The results show a decrease in asset turnover of between 0.10 and 0.17 when affected by the quota at a 1% and 5% significance level, suggesting less revenue per NOK of assets.

Neither AD, nor Matsa and Miller, find a significant result when regressing asset turnover, in line with the results from our specifications in Columns 1-6 and 9. However, AD find a negative effect, significant at the 10% level, when restricting their sample to firm-years where IFRS are followed. Both the insignificant results and the significantly negative results can therefore be seen as being in line with AD's results, however, referring to different specifications.

[16]When looking at Tobin's Q, Adams and Ferreira's (2009) findings suggest that gender diversity increases firm value in firms with weak shareholder rights, but has no beneficial effects for firms with otherwise good governance. They state that this result is consistent with the idea that over monitoring could decrease value.

As mentioned, asset turnover can be used as a measure for agency costs as generating a large amount of sales relative to available assets suggests low agency costs (Barth et al., 2017; Ang et al., 2000). A significantly negative impact on asset turnover (here defined by sales/assets), would then indicate an increase in agency costs. This contradicts the findings of Barth et al. (2017) using a sample of Italian firms and a dummy equal to 1 when the sales-to-asset ratio exceeds the median of the sample.

Ang et al. (2000) point out that inefficient utilization of assets to generate revenue can be caused by poor investment decisions or management's shirking, for example, by investing in negative net present value assets, or giving little effort to help generate revenue. Possible reasons for lower revenue relative to assets after the quota, could therefore be that female directors make poorer investment decisions or are less involved in generating more revenue. As seen in Section 3, Data and board characteristics, female directors have, on average, less CEO experience than male directors, and have a lower average age, consistent with AD (2012). These characteristics might result in less experience in making investment decisions and other revenue generating decisions, and lead to taking a less decisive role due to feeling less superior.

In summary, the quota does not seem to have had a large impact on the performance measures, ROA and asset turnover. We find no significant results when regressing ROA using any of the specifications. As for asset turnover, we find a negative significant effect using ENT's approach with a matched sample and the quota compliance method including controls for firm characteristics, however, the remaining specifications give no significant results. The negative relation might be explained by characteristics of female directors, such as less CEO experience, and younger age, which might affect investment decisions and management's effort to help generate revenue. Next, we turn to financial and investment policies.

4.3 Financial and investment policies

In this section, we examine whether the quota has affected leverage, cash holdings, capital expenditures, and dividends.

4.3.1 Leverage

There is substantial literature on the differences in preferences between genders. For instance, women are found to be more risk-averse (Croson & Gneezy, 2009) and less competitive than

the average man (Niederle & Vesterlund, 2011). Based on this, if gender diverse boards are more risk-averse, this might lead to less risky corporate decisions. When the financial crisis broke out with the fall of Lehman Brothers in 2008, some commenters drew attention to the behavioral aspect of bankers. Nelie Kroes, previous EU-commissioner, said that if there had been more women in the profession of high-finance, we would not have had this deep crisis (European Commision, 2009). The basis for this argument known as the "Lehman Sisters hypothesis" is based on the preceding evidence arguing that women are naturally more risk-averse.

Huang and Kisgen (2013) examine whether US firms with female executives make different financing or acquisition decisions compared to firms with male executives. To mitigate endogeneity issues, they use a difference-in difference framework comparing what happens before and after transitions from a male to a female executive. They also use an instrumental variable approach with the state's state-level gender equality index as an instrument. They find that firms with female executives grow more slowly and are less likely to make acquisitions. Importantly, these firms have lower leverage and debt issuance. Furthermore, using a sample of Spanish companies, Martin-Uego et al. (2017) also find that firms with a female CEO have lower debt and financial leverage. These results are interpreted as female executives being less overconfident or more risk-averse compared to their male counterparts.

The above arguments might suggest that having boards with more female directors might lead to less risky outcomes. To test this hypothesis, we look at whether more gender diverse boards are associated with the firm's debt ratio as debt can function as a proxy for risk taking (Faccio et al., 2016). Furthermore, debt can also be seen as having a monitoring role with respect to agency costs (Jensen, 1986). An analysis between the board's female representation and debt might therefore yield some interesting insights.

Panel A of Table 6 on the following page presents our results. Applying all four specifications of AD's method, the fraction of female directors does not appear to have a significant effect on the debt ratio (Columns 1-4)[17]. This is also the result when using the method with actual compliance (Columns 9 and 10). These results are consistent with the findings of Matsa and Miller (2013), who also do not find any association between the gender quota and firms' debt-to-assets ratios. They suggest that this might imply that risk-aversion is not a distinctive part of women's approach to corporate decision-making.

[17]It should be mentioned that AD, when not controlling for IFRS, find that the quota lead to increased debt. Though using the exact same approach as AD in Column 1, we have, as mentioned earlier, a larger total number of firm years reflecting our access to board composition data in the Brønnøysund Register Centre, which seems to change the result.

Table 6: Financial policies

In all panels, Columns 1-4 report the estimates of the coefficient γ_1 from the second-stage instrumental variable (IV) regression:

$$Policy_{i,t} = \gamma_0 + \gamma_1 Fraction\,\widehat{female}\,directors_{i,t} + \gamma_2 X_{i,t} + \theta_i + \tau_t + \epsilon_{i,t}$$

where $Fraction\,\widehat{female}\,directors_{i,t}$ is the fitted value from the first-stage IV regressions reported in Table 3. Each column in the first-stage regression corresponds to the same numbered column in the panels of this table. In the columns using this regression equation, saving banks are excluded. The sample of Column 1 in the panels, only includes listed ASA, while Columns 2-4 include all ASA. In all panels, Columns 5-8 report the estimates of the coefficient γ_1 from the following equation:

$$Policy_{i,t} = \gamma_0 + \gamma_1 ASA_i * Comply_t + \gamma_2 X_{i,t} + \theta_i + \tau_t + \epsilon_{i,t}$$

where ASA_i is a dummy equal to 1 if firm i is an ASA, zero otherwise, and $Comply_t$ is a dummy equal to 1 if the year is 2008 or later, zero otherwise. In all panels, Columns 9-10 report the estimates of the coefficients γ_1 and γ_2 from the following equation:

$$Policy_{i,t} = \gamma_0 + \gamma_1 Quota\,compliance_{i,t} + \gamma_2 ASA_i * Quota\,compliance_{i,t} + \gamma_3 X_{i,t} + \theta_i + \tau_t + \epsilon_{i,t}$$

where ASA_i is a dummy equal to 1 if firm i is an ASA, zero otherwise, and $Quota\,compliance_{i,t}$ is a dummy equal to 1 if firm i has complied with the quota, zero otherwise. In all panels, Columns 5-10, firms with only one observation and firms that switch between ASA and AS over the sample period are excluded. In addition, financial firms and firm-year observations with missing dependent or control variables are excluded.

$Policy_{i,t}$ is referring to *Debt ratio* in Panel A, *Cash/assets* in Panel B, *Capex/assets* in Panel C and *Dividend ratio* in panel D for company i in year t. $X_{i,t}$, which are included in Columns 4, 6, 8 and 10 in all panels, is a vector of the following firm characteristics: *Firm age, Size, Leverage, Largest owner, Board size, Board CEO experience* and *Board busyness*. θ_i and τ_t, which are included in all columns in all panels, are firm and time fixed effects, respectively. In all panels, Columns 1 and 2 have the sample period 2003-2009, while the remaining columns have the sample period 2003-2013.

Panel A: Dependent variable = Debt ratio

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Fraction female directors	0.021	0.106	−0.023	−0.109						
	(0.167)	(0.344)	(0.157)	(0.162)						
ASA*Comply					0.092***	0.079***	0.069***	0.061***		
					(0.015)	(0.014)	(0.018)	(0.017)		
Quota compliance									0.001	0.001
									(0.014)	(0.014)
ASA*Quota compliance									0.016	0.010
									(0.022)	(0.021)
Firm and time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics	No	No	No	Yes	No	Yes	No	Yes	No	Yes
End sample period	2009	2009	2013	2013	2013	2013	2013	2013	2013	2013
Sample	Listed ASA	ASA	ASA	ASA	ASA & large AS	ASA & large AS	ASA & matched AS	ASA & matched AS	ASA & matched AS	ASA & matched AS
Observations	832	1,894	2,102	2,102	10,387	10,387	7,846	7,846	7,846	7,846
R^2	0.032	0.005	0.016	0.062	0.019	0.049	0.005	0.032	0.0003	0.028

Financial policies - continued

Panel B: Dependent variable = Cash/assets

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Fraction female directors	−0.031	−0.130	−0.141	−0.151						
	(0.137)	(0.142)	(0.121)	(0.128)						
ASA*Comply					−0.036***	−0.026***	−0.027**	−0.021*		
					(0.010)	(0.010)	(0.012)	(0.012)		
Quota compliance									0.018**	0.018**
									(0.008)	(0.008)
ASA*Quota compliance									−0.039***	−0.036***
									(0.012)	(0.012)
Firm and time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics	No	No	No	Yes	No	Yes	No	Yes	No	Yes
End sample period	2009	2009	2013	2013	2013	2013	2013	2013	2013	2013
Sample	Listed ASA	ASA	ASA	ASA	ASA & large AS	ASA & large AS	ASA & matched AS	ASA & matched AS	ASA & matched AS	ASA & matched AS
Observations	832	1,894	2,102	2,102	10,387	10,387	7,846	7,846	7,846	7,846
R^2	0.011	0.00002	0.0003	0.042	0.007	0.033	0.002	0.019	0.002	0.019

Panel C: Dependent variable = Capex/assets

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Fraction female directors	0.160	0.191	0.008	−0.028						
	(0.164)	(0.136)	(0.093)	(0.102)						
ASA*Comply					−0.008	−0.026**	−0.019	−0.035***		
					(0.011)	(0.012)	(0.012)	(0.013)		
Quota compliance									0.007	−0.001
									(0.007)	(0.007)
ASA*Quota compliance									−0.007	−0.018
									(0.014)	(0.015)
Firm and time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics	No	No	No	Yes	No	Yes	No	Yes	No	Yes
End sample period	2009	2009	2013	2013	2013	2013	2013	2013	2013	2013
Sample	Listed ASA	ASA	ASA	ASA	ASA & large AS	ASA & large AS	ASA & matched AS	ASA & matched AS	ASA & matched AS	ASA & matched AS
Observations	827	1,881	2,088	2,088	9,678	9,678	7,174	7,174	7,174	7,174
R^2	0.015	0.007	0.019	0.122	0.0001	0.060	0.001	0.055	0.0001	0.054

Panel D: Dependent variable = Dividend ratio

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Fraction female directors	0.015	−0.552*	−0.293	−0.212						
	(0.208)	(0.295)	(0.237)	(0.250)						
ASA*Comply					−0.033*	−0.028*	0.001	0.009		
					(0.017)	(0.017)	(0.026)	(0.026)		
Quota compliance									0.010	0.011
									(0.031)	(0.031)
ASA*Quota compliance									0.021	0.041
									(0.039)	(0.039)
Firm and time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics	No	No	No	Yes	No	Yes	No	Yes	No	Yes
End sample period	2009	2009	2013	2013	2013	2013	2013	2013	2013	2013
Sample	Listed ASA	ASA	ASA	ASA	ASA & large AS	ASA & large AS	ASA & matched AS	ASA & matched AS	ASA & matched AS	ASA & matched AS
Observations	767	1,849	2,055	2,055	10,165	10,165	7,732	7,732	7,732	7,732
R^2	0.018	0.001	0.005	0.016	0.001	0.005	0.00000	0.007	0.0002	0.008

Note: *p<0.1; **p<0.05; ***p<0.01

Turning to ENT's approach, using both the largest AS as a control group and the matched control group, the impact of the quota is significantly positive, indicating that debt levels increased (Columns 5-8). For instance, looking at Column 6, debt increased by 7.9% of assets, relative to unaffected firms after the quota. This finding is consistent with the findings of AD when not controlling for IFRS. AD also find evidence that the quota led to more acquisitions, which they suggest is consistent with their findings of increased debt and reduction in cash. The findings of increased debt contradict the indirect evidence presented earlier who document that female executives have lower leverage and debt issuance compared to their male counterparts, which is interpreted as women being less overconfident and more risk averse. The latter is consistent with the typical idea that gender differences in the population carry over to the boardroom, implying that greater board gender diversity leads to less risk.

If director gender gaps in preferences are the same as the "typical" gender gaps, then it might be plausible that more gender diverse boards lead to less risky outcomes. However, our findings of increased debt question this inference. This is supported by Adams and Funk (2012) who surveyed Swedish directors on human values according to Schwartz (1992). The Schwartz PVQ is an established questionnaire that has been shown to predict economic behavior in an experimental setting. They also augment the survey with a question to measure risk aversion. Using a sample of 628 individuals where 27.9% represent answers from directors and 36.6% represent answers from CEOs of publicly traded firms in Sweden, they find that female directors report significantly different core values than male directors. Also, they find that the gender gap in the boardroom is not necessarily the same as the "typical" gender gap in the population at large. For instance, they find that female directors are more stakeholder-oriented, emphasize benevolence and universalism, and care less for power and achievement. Importantly, they find that female directors are less risk averse than male directors. The fact that female directors, according to Adams and Funk's (2012) findings, appears to be more risk-loving than male directors seems to be consistent with our result, and might cast doubt on the inference that more women in high positions lead to less risky outcomes.

The increased debt can also be seen in light of Jensen's (1986) arguments saying that there is a conflict of interest between shareholders and managers in firms with high free cash flow (FCF).[18] Managers of these firms might act opportunistically and be involved

[18]Jensen defines free cash flow as "cash flow in excess of that required to fund projects that have positive net present value when discounted at the relevant cost of capital" (Jensen, 1986, p. 323).

in value-destroying activities. He argues that debt can reduce the agency costs of FCF by not only reducing the FCF, but it also provides discipline to management through the debt market. The threat caused by failure to make debt payments also enhances managers' incentives to improve the efficiency of fund utilization.

Adams and Ferreira (2009) find that female directors have better attendance records at board meetings compared to male directors and that male directors have better attendance records the more women there are on the board. In addition, they find that CEO turnover is more sensitive to performance in firms with more gender diverse boards. They interpret these findings as female directors being stricter monitors. Furthermore, Gul et al. (2011) shows that the presence of female directors improves the public disclosure and informativeness of stock prices through better monitoring.

In sum, debt can be argued to function as a monitoring device as it reduces the FCF available and might improve the efficiency of fund utilization by avoiding failure to make debt payments. Given evidence that female directors are associated with stricter monitoring, they might use debt as a device to monitor managers, consistent with our findings of increased debt.

4.3.2 Cash holdings

Corporate cash holdings provide liquidity to firms for their operational necessities and is a key corporate decision. Firms might choose to hold cash as a means for shielding against funding and underinvestment risk, as well as saving transaction costs (Bates et al., 2009). Following transaction costs and precautionary motives, available cash can be employed to launch investments in times of financial distress (Bates et al., 2009). As mentioned in the section looking at debt, women are often viewed in the literature as being more risk-averse compared to men (Faccio et al., 2016; Croson & Gneezy, 2009). In this vein, they might opt to hold more cash to preserve financial stability, and avoid more expensive external financing and difficulties in financing investment projects, or in cases of unforeseen events.

The above argument is supported by studies finding that firms led by female CEOs have higher cash holdings (Adhikari, 2018; Sah, 2020). These studies mainly attribute their findings to higher female risk aversion compared to men. However, Adams and Funk (2012) provide evidence that female directors are tempted to make riskier decisions than their male counterparts, which might manifest in lower cash holdings. In the following, we examine whether board gender diversity affects corporate cash holdings.

The main results are reported in Panel B of Table 6. Using AD's approach, the fraction

of female directors appears to have no effect on cash holdings (measured as cash divided by total assets) in all four specifications (Columns 1-4). Turning to ENT's method, the impact of the quota is significantly negative, indicating that annual cash holdings decreased (Columns 5-8). For instance, looking at Column 6, cash holdings declined by 2.6% relative to assets among ASA after 2007 after controlling for firm characteristics and firm and time fixed effects, significant at the 1% level. These results are consistent with the findings of AD (2012) who find that the quota led to a decline in cash in the international accounting standards subsample.[19] AD explain this decrease by their finding that firms affected by the quota undertook significantly more acquisitions. The negative impact of the quota on cash holdings is also consistent with research done by Atif et al. (2019), using S&P 1500 index firms in the US. However, using the method with actual compliance shows that the impact of the quota is significantly positive on cash holdings (Columns 9-10).

Our result using ENT's method implies that more gender diverse boards are associated with a decline in cash as a fraction of assets. Consistent with our findings that the quota increased debt using ENT's method in the previous section, the findings of increased debt and reduced cash holdings potentially aligns with Adams and Funk's (2012) evidence that female directors appear to be less risk-averse than male directors. This evidence contradicts the large literature on gender differences in preferences that provide evidence that women are more risk averse (Croson & Gneezy, 2009).

Adams and Funk (2012) suggest that these differences come from selection. They argue that female directors are not random members of the population; that because it is unlikely for women to sit on a firm's board, the women who obtain such positions might be unusual. Due to selection, female directors might therefore be quite different from the general population of women. However, it should be mentioned that Adam and Funk look at firms in Sweden, and Sweden has not implemented a gender quota for boards. Since Norway has implemented a gender quota, this might imply that it is more likely for women in Norway to hold board seats compared to women in Sweden. Consistent with the argument that women directors might be more risk-loving compared to male directors, Berger et al. (2014) find that German banks with a higher proportion of female directors increase portfolio risk. Our evidence of decreased cash holdings (and increased debt, see Section 4.3.1) might indeed confirm the findings of Adams and Funk (2012) and Berger et al. (2014) of female directors being less risk averse than men.

Excessive cash might be opportunistically used by entrenched managers leading to private

[19]This finding is obtained when restricting the sample to firm-year observations with accounting disclosures that follow IFRS. When AD (2012) use their full sample, they find no significant result looking at cash/assets.

benefit extraction (Jensen, 1986; Masulis et al., 2009). This may cause inefficient use of resources, leading to increased agency costs in firms. According to Fama and Jensen (1983), a potential solution to the agency problem arising from excessive cash holdings is having a board that efficiently monitors and ratifies important decisions and chooses, dismisses, and rewards management. The presence of female directors who are recognized as being more efficient monitors (Adams & Ferreira, 2009; Schwartz-Ziv, 2017), might therefore imply a decrease in cash holdings to reduce inadequate managerial behavior.

In sum, using AD's method, there appears to be no evidence that gender-diverse boards affect cash holdings. However, when using ENT's approach, we find a negative relation between gender-diverse boards and cash holdings. This might imply that female directors, contrary to the large literature on gender preferences, are more risk-loving compared to their male counterparts. Furthermore, female directors being more efficient monitors might manifest in decreased cash to mitigate the agency problem of cash holdings. Our evidence of decreased cash holdings are in line with our findings of increased debt (see Section 4.3.1).

4.3.3 Capital expenditures

Levi et al. (2014) suggests that more gender diverse boards affect important corporate decisions such as M&As. They find that firms that have more female directors make fewer bids for M&As, and pay less for acquired companies. Women are suggested to be less overconfident, which leads them not to overestimate merger gains. Based on this conclusion, women seem to correlate with decreases in M&As, and one might suspect that they also have an impact on other activities involving risk, such as capital expenditure decisions.[20] The board of directors has an important role when it comes to reviewing and approving capital requests. A question arises whether the presence of female directors on corporate boards is associated with firms' tendency to undertake capital expenditures.

Our results are shown in Panel C of Table 6. AD's instrumental variable model does not give significance in any specifications (Columns 1-4). The lack of significance is also the case when using ENT's method with both the 1% largest AS and the matched sample as the control group, while not controlling for firm characteristics, and when regressing on the actual point of quota compliance. However, applying ENT's method to both control groups and controlling for firm characteristics imply a decrease in the capex-to-assets ratio of 2.6% and 3.5% after 2007.

Croson and Gneezy (2009) find that women are more risk averse than men. They explain the

[20]We would have looked at M&As, however, we do not have access to data about this.

gender difference in risk-taking using three potential explanations: differences in emotional reactions to risky situations, interpretations of risky situations, and risk attitudes relating to confidence. Following the last explanation, there seems to be a general tendency of women being less overconfident compared to men. Barber and Odean (2001) find that men trade more than women and thereby reduce their returns more so than women do. They suggest that this is due to men being more overconfident, which in turn leads them to trade more and perform worse than women. Men might be overconfident in their abilities and knowledge while women tend to view their predictions of how the future will unfold as less precise. Furthermore, women tend to see future outcomes in less favorable terms than men do (Malmendier and Tate, 2005).

Based on the above arguments, other things equal, women might perceive the same investments as less favorable due to lower overconfidence and might expect lower cash flows from investments compared to male directors. This might imply that the significantly negative relation between the presence of female directors and capital expenditures is driven by female directors being less overconfident in general.

Our findings might also be driven by the observations by Adam and Ferreira (2009) of women being more efficient monitors. More efficient monitoring might suggest that the board, to a larger degree, will not approve upon investments that might destroy value. However, decreased capital expenditures might also suggest that the firm has less investment opportunities. Firms that invest more might have better investment opportunities. On the other hand, firms that invest more may more likely be managed by individuals who tend to overinvest. Titman et al. (2004) find a negative association between abnormal capital investments and future returns. This finding supports the argument that investors might underestimate the importance of unfavorable managerial intentions. Based on this, the negative relation between the presence of female directors and capital expenditures might imply that firms with more gender diverse boards are less likely to overinvest.

Overconfident managers can result in overinvestment and excessive risk taking, which in turn may destroy value. Research has shown that women are more likely to express their independent view and are less conformist (Adams & Ferreira, 2009), as they do not belong to the "old boys" network. Furthermore, female directors can bring different perspectives and greater diversity of viewpoints, which might improve the quality of board discussions (Ferdinand et al., 2011). This may imply that boards with higher female presence are more likely to challenge the CEO and push the managers to consider a wider range of options. This could then lower CEO overconfidence and correct for possible biased beliefs.

Chen et al. (2019) study whether CEOs in the US are less likely to exhibit overconfidence when there are female directors on the board. They find a negative association between the presence of women on the board and the overconfidence measure for male CEOs. They measure overconfidence by looking at the CEO's option exercise behavior.[21] In firms with female directors, male CEOs were less likely to continue holding options when exercising would give profits. However, they did not find the same effect on the option-behavior of female CEOs. Gender diverse boards might therefore reduce CEO overconfidence, which might lead to less aggressive investment policies and decreasing capital expenditures consistent with our results using ENT's method and controlling for firm characteristics.

As stated above, female directors might bring in a greater diversity of viewpoints, which can increase the information available as well as challenge the CEO. However, considering a wider range of opinions might also result in conflict and can be more time-consuming. Having to consider more viewpoints can lead to delayed decision-making (Rose, 2007). This is consistent with findings of Levi et al. (2014) who find that deal completion time in their data is longer when the acquirer's board is more diverse. Thus, delayed decisions might lead to a decline in capital expenditures. However, taking more time to deliberate on investment decisions might also result in improved decision quality.

In summary, we find that the fraction of female directors on the board is associated with lower capital expenditures relative to assets using ENT's method controlling for firm characteristics. However, the other specifications do not result in any significance. The negative associations between board gender diversity and capital expenditures are consistent with several female behavioral characteristics that have been observed in other contexts. This includes that female directors might have less overconfidence compared to their male counterparts, which might lead them to view the same investments as less attractive, as they might expect lower cash flows from the investment. Furthermore, women are found to be more likely to express their views, which in turn might suggest that they will challenge the CEO, and could attenuate CEO overconfidence. However, a decline in capital expenditures might also suggest that firms lack new and better investment opportunities. Finally, weighing up more perspectives might delay decision-making, resulting in a decline in capital expenditures.

[21] To assess CEO overconfidence, Chen et al. (2019) calculate the moneyness of the CEO's option portfolios (how much the stock price exceeds the exercise price for each year). Holding on to options that are already in the money are seen as evidence of overconfidence about the company's future outcomes.

4.3.4 Dividends

A major financial decision corporate boards encounter is dividend policy (Chen et al., 2017), and the effectiveness of such decisions might depend on the particular board characteristics, such as gender. According to agency theory, managers might use corporate resources in ways that benefit themselves and not shareholders (Jensen, 1986). Paying higher dividends reduces the amount of cash available to shareholders and thus mitigates the amount of free cash available to managers, thereby reducing the agency problem. However, dividends also increase transaction costs as they make the firm more reliant on expensive, external financing. Hence, there is an optimal dividend payout, which minimizes the sum of the agency costs, and transaction costs (Rozeff, 1982).

A few studies have examined the relationship between board gender diversity and dividend policy. Studies focusing on emerging economies such as China, India, Jordan and Russia have produced mixed results[22] (Al-rahahleh, 2017; Saaed & Sameer, 2017), whereas studies focusing on developed economies such as the US suggest a positive relationship between gender diversity and dividend payments (Byon et al., 2016; Chen et al., 2017).

For instance, Chen et al. (2017), who use data on S&P 1500 companies from 1997 to 2011, find that firms with a larger fraction of female directors have greater dividend payouts. Their findings are consistent with Byoun et al. (2016). This positive relationship is explained by literature suggesting that female directors increase the board's monitoring intensity (e.g., Adams and Ferreira, 2009). Therefore, boards with more female directors might be more likely to use high dividend payouts as a monitoring device compared to their male counterparts.

Using the unique quasi-experimental setting the Norwegian quota law provides, we reexamine the role of board gender diversity on dividend policy. Panel D of Table 6 shows our results. Using AD's method on all ASA (Column 2), we obtain a negative significant estimate at the 1% level of -0.55, indicating that an increase of 10 percentage points in the fraction of female directors is associated with a 5.52 percentage point decrease in the firm's dividend payout. We also find a negative relationship of the quota and dividend ratio when applying ENT's method, both with and without controlling for firm characteristics (Columns 5-6). In the remaining specifications, more gender-diverse boards do not appear to affect the dividend ratio. What might explain this negative relationship found in Columns 2, 5 and 6? In the following, we will present some potential explanations: investment opportunities, lack of

[22]Saeed and Sameer (2017) investigate the impact of board gender diversity using a dataset of listed firms from India, China and Russia. They find that board gender diversity is negatively related to dividend payments in all the mentioned emerging economies. However, Al-Rahahleh (2017) finds a positive relationship between board gender diversity and dividend payments looking at listed firms in Jordan.

experience, and better governance.

An argument can be drawn from the strategic decision making studies that find support for the fact that gender diversity is a valuable source of expertise and knowledge when it comes to assessing firm strategic decisions. For instance, Chen et al. (2014) argue that increased female board representation affects the social-psychological processes driving the board decision making, and thereby increasing decision-making thoroughness and comprehensiveness. Diversity in views and values might increase the number of alternatives considered, as well as the quality of ideas. Assuming that women bring in different perspectives, networks and experiences, increased gender diversity might result in a more informed and strategic basis to investment decisions for the firm, in turn, creating better and new investment opportunities. According to the life cycle theory (Fama and French, 2001), new growth opportunities in general tend to reduce the dividend payouts as firms retain earnings to meet the future needs. This is especially the case if the firm wants to avoid raising capital through capital markets. Thus, new and better investment opportunities may have a negative impact on dividend payout.

Assuming that women bring in better and new investment opportunities, one might expect that capital expenditures would increase. However, in our case, we do not find such a relationship (see Section 4.3.3). When it comes to acquisition decisions, AD did find that firms affected by the quota undertook significantly more acquisitions. Furthermore, Ravaonorohanta (2020), using acquisition bids for Canadian companies, found that female directors appear to keep firms away from adverse effects of the executive team overconfidence, resulting in value-creating deals. Each additional female director on an acquiring firm board increased the bidder return by 2.29%. These findings support the view that female directors seem to bring different perspectives to the board, which in turn might improve board dynamics. When considering major strategic proposals suggested by management, especially in light of findings showing that senior executives can have high levels of overconfidence (Chen et al., 2019), gender diverse boards might be more exhaustive in their evaluations and more ready to block excessive risk proposals. Ravaonorohanta's (2020) findings suggesting that gender diverse boards seem to achieve better performance on mergers and acquisitions might imply that female directors show more prudence and less hubris in their decisions, limiting excessive risk taking.

Another possibility might be that women are new to the game. It can be thought that a potential lack of experience might lead them to accept more projects. An often discussed hypothesis in the setting of the Norwegian quota is that restricting shareholders' free choice of directors might result in lower board effectiveness. Firms might be forced to appoint

female directors with less CEO experience, which in turn might lead to a decrease in board effectiveness (AD, 2012). CEO experience is often viewed as an important qualification for appointing new board members (Lorsch & Maciver, 1989, p. 19). Does this imply that all or most of the board members should have CEO experience?

Fahlenbrach et al. (2010) find that US companies appointing the first outside CEO as a director on their board have a higher stock-price reaction compared to appointing an outside director not in a CEO position. However, when the second or third outside CEO is appointed to the board, there is no similar reaction. This evidence suggests that there is a benefit to recruiting a CEO as an outside director when firms have no CEO outside director on the board, but once a firm has a CEO outside director, the market is indifferent toward the appointment of a CEO outside director and other outside directors. Furthermore, they find no increase in operating performance or performance-sensitivity of CEO turnover. Also, firms with CEO outside directors do not make better acquisition decisions, as the stock market's reaction to merger announcements does not improve after the appointment of an outside CEO to the board. Having interlocked CEO directors on the board, however, leads to a decrease in operating performance.[23] Thus, it might be hard to argue that the board should be packed with CEOs.

Moreover, opponents of the quota law claimed there were not enough qualified women in Norway to fill the reserved board seats, and that the few qualified women would get overly busy. However, overall compliance with the quota was accomplished without overloading the typical female director, as the average number of directorships per female remained stable over the period at around 1.2.[24] Bertrand et al. (2019) also find that these concerns were not realized in practice, as the average observable qualifications of women appointed to the boards of ASA firms significantly improved after the reform.

Most studies that find a positive relationship between board gender diversity and dividend payouts explain this by women impacting board governance. For instance, gender diverse boards are more efficient and active monitors (Adams & Ferreira, 2009; Schwartz-Ziv 2017). However, one could also argue that sound corporate governance practices such as efficient monitoring would protect investors from expropriation, hence reducing the need for dividend payments. Thus, fims may set the level of dividend payout based on the soundness of their governance practices. Well-governed firms might then induce low dividend payouts, while weakly-governed firms might induce high dividend payouts.

[23] If the CEO of one company sits on a second company's board, and the second company's CEO sits on the first company's board, then the CEOs are interlocked.

[24] Illustrated in Figure 4 in the Data and board characteristics section.

Consistent with the above argument, John and Knyazeva (2006) find that firms with strong governance practices are associated with decreased levels of dividend payments. Well-governed firms are perceived to have lower agency conflicts, as better governance practices allow more accurate following of managerial actions, whereas firms with weak corporate governance pay higher dividends on average. They also find that in firms facing high agency costs, corporate governance plays a more critical role than dividends. Jiraporn and Ning (2006), using US firms, also confirm a negative relation between the strength of shareholder rights and dividend policy.[25]

In summary, using AD's specifications on the full sample and ENT's method with the 1% largest AS serving as the control group, we find a negative relation between more gender diverse boards and dividend payouts. This might suggest that women bring in new perspectives and networks leading to better and new investment opportunities. Another explanation might be that women are new to the game leading them to accept more projects. More gender diverse boards might also increase the efficiency of the board's monitoring activities, which in turn reduce the need for high dividend payments. However, using our remaining specifications, increased female presence on the board does not appear to have a significant impact on dividend payout. Next, we turn to labor policies.

4.4 Labor policies

In this section, we investigate the relationship between board gender diversity and labor policies. We first look at employee levels and labor cost, before turning to CEO compensation. Finally, we examine CEO turnover performance-sensitivity. All regression results regarding labor policies are presented in Table 7, except the results regressing CEO turnover performance-sensitivity, which are presented in Table 8 since a different methodology is used.

4.4.1 Employees and labor cost

Matsa and Miller (2013) find that introducing the Norwegian quota law reduced the short-term profitability of affected firms, owing to increased relative labor costs and employment levels. Firms with more gender diverse boards had fewer employee layoffs, leading to higher labor costs. Matsa and Miller's interpretation of their findings is that female directors have more other-regarding preferences, and they attribute their results to a "female leadership style". However, as mentioned, their post-quota period (2007-2009) coincides with the

[25] Jiraporn and Ning (2006) use the Governance Index developed by Gompers et al. (2003) to proxy for shareholder rights. They find a positive relation between dividends and the Governance Index, meaning that firms with weak shareholder rights (high Governance Index) have higher dividend payouts.

financial crisis. Compared to the control companies of either Norwegian AS or publicly-traded firms in Denmark and Sweden, firms affected by the quota seem to have failed to reduce their workforces. Another explanation might be that Norwegian AS and firms in Denmark and Sweden faced more pressure to reduce their workforce during the financial crisis (Swedish Corporate Governance Board, 2013). In the following, we investigate Matsa and Miller's findings on labor costs and employee levels.

The main results are reported in Panels A and B of Table 7. Using AD's approach with only listed firms, the fraction of female directors is not significantly related to employment (Panel A, Column 1). It should be mentioned that AD, in this case, find a positive significant coefficient of 2.0. With the use of the board composition at year-end 2001 to provide an exogenous cross-sectional distribution of the fraction of female directors, we get a similar result of a positive and significant estimate of 1.9.[26] By broadening the sample to include both listed and unlisted ASA as well as extending the sample period to 2013, we also obtain significant and positive estimates indicating that the fraction of female directors is positively related to the total employment levels (Panel A, Columns 2 and 3). However, when firm characteristics are included, the significance disappears (Panel A, Column 4). In terms of labor costs, using AD's approach yields a positive and significant relation between the fraction of female and labor costs in all four specifications (Panel B, Column 1-4). When the fraction of female directors at year-end 2001 is used, the significance in Columns 1, 3, and 4 disappear. In sum, our positive and significant estimates for employee levels and labor costs using AD's method are consistent with Matsa and Miller's (2013) findings.

The fewer employee layoffs leading to higher relative labor costs might potentially be explained by female directors having more other-regarding preferences. Tate and Yang (2015) study whether female managers cultivate more women-friendly cultures, using a worker-firm matched panel data set from the US Bureau of the Census's Longitudinal Employer-Household Dynamics (LEHD). They use plant closures in the period 1993-2001 as an exogenous shock to employment. They estimate the difference in wage changes for men and women who were displaced from the same closing plant and who moved to the same new firm, and they investigate whether the new wage difference is related to whether the new firms are led by female managers. They find that displaced women experienced roughly 5% greater wage losses compared to men, but the wage loss was reduced to roughly 50% if they were hired at a firm with more female management. Tate and Yang suggest that having women in leadership positions develops more women-friendly environments in their firms.

The above argument is consistent with the findings of Adams and Funk (2012), who surveyed

[26] As mentioned in Section 4.1.1, results using the board composition at year-end 2001 can be requested.

Table 7: Labor policies

In all panels, Columns 1-4 report the estimates of the coefficient γ_1 from the second-stage instrumental variable (IV) regression:

$$Policy_{i,t} = \gamma_0 + \gamma_1 Fraction\,\widehat{female}\,directors_{i,t} + \gamma_2 X_{i,t} + \theta_i + \tau_t + \epsilon_{i,t}$$

where $Fraction\,\widehat{female}\,directors_{i,t}$ is the fitted value from the first-stage IV regressions reported in Table 3. Each column in the first-stage regression corresponds to the same numbered column in the panels of this table. In the columns using this regression equation, saving banks are excluded. The sample of Column 1 in the panels, only includes listed ASA, while Columns 2-4 include all ASA. In all panels, Columns 5-8 report the estimates of the coefficient γ_1 from the following equation:

$$Policy_{i,t} = \gamma_0 + \gamma_1 ASA_i * Comply_t + \gamma_2 X_{i,t} + \theta_i + \tau_t + \epsilon_{i,t}$$

where ASA_i is a dummy equal to 1 if firm i is an ASA, zero otherwise, and $Comply_t$ is a dummy equal to 1 if the year is 2008 or later, zero otherwise. In all panels, Columns 9-10 report the estimates of the coefficients γ_1 and γ_2 from the following equation:

$$Policy_{i,t} = \gamma_0 + \gamma_1 Quota\,compliance_{i,t} + \gamma_2 ASA_i * Quota\,compliance_{i,t} + \gamma_3 X_{i,t} + \theta_i + \tau_t + \epsilon_{i,t}$$

where ASA_i is a dummy equal to 1 if firm i is an ASA, zero otherwise, and $Quota\,compliance_{i,t}$ is a dummy equal to 1 if firm i has complied with the quota, zero otherwise. In all panels, Columns 5-10, firms with only one observation and firms that switch between ASA and AS over the sample period are excluded. In addition, financial firms and firm-year observations with missing dependent or control variables are excluded.

$Policy_{i,t}$ refers to *Log(employees)* in Panel A, *Log(labor cost)* in Panel B, and *Log(CEO pay)* in Panel C for company i in year t. $X_{i,t}$, which are included in Columns 4, 6, 8 and 10 in all panels, is a vector of the following firm characteristics: *Firm age, Size, Leverage, Largest owner, Board size, Board CEO experience* and *Board busyness*. In addition, the CEO characteristics *CEO age, CEO gender* and *CEO chairman* are included in these columns in panel C. θ_i and τ_t, which are included in all columns in all panels, are firm and time fixed effects, respectively. In all panels, Columns 1 and 2 have the sample period 2003-2009, while the remaining columns have the sample period 2003-2013.

Panel A: Dependent variable = Log(employees)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Fraction female directors	1.254 (0.918)	1.699** (0.825)	1.518* (0.906)	1.134 (0.862)						
ASA*Comply					−0.185** (0.081)	−0.224*** (0.080)	−0.279*** (0.091)	−0.263*** (0.088)		
Quota compliance									0.045 (0.061)	0.058 (0.061)
ASA*Quota compliance									−0.248** (0.105)	−0.242** (0.102)
Firm and time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics	No	No	No	Yes	No	Yes	No	Yes	No	Yes
End sample period	2009	2009	2013	2013	2013	2013	2013	2013	2013	2013
Sample	Listed ASA	ASA	ASA	ASA	ASA & large AS	ASA & large AS	ASA & matched AS	ASA & matched AS	ASA & matched AS	ASA & matched AS
Observations	668	1,547	1,817	1,817	6,834	6,834	5,952	5,952	5,952	5,952
R^2	0.009	0.001	0.018	0.072	0.005	0.048	0.012	0.084	0.006	0.079

Labor policies - continued

Panel B: Dependent variable = Log(labor cost)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Fraction female directors	1.883** (0.869)	3.419*** (0.990)	2.562*** (0.947)	1.730*** (0.538)						
ASA*Comply					0.132* (0.077)	0.022 (0.044)	0.018 (0.106)	−0.028 (0.066)		
Quota compliance									0.048 (0.063)	0.041 (0.034)
ASA*Quota compliance									0.121 (0.113)	−0.025 (0.077)
Firm and time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics	No	No	No	Yes	No	Yes	No	Yes	No	Yes
End sample period	2009	2009	2013	2013	2013	2013	2013	2013	2013	2013
Sample	Listed ASA	ASA	ASA	ASA	ASA & large AS	ASA & large AS	ASA & matched AS	ASA & matched AS	ASA & matched AS	ASA & matched AS
Observations	688	1,677	1,939	1,939	9,936	9,936	6,750	6,750	6,750	6,750
R^2	0.129	0.048	0.074	0.633	0.003	0.548	0.00002	0.472	0.002	0.472

Panel C: Dependent variable = Log(CEO pay)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Fraction female directors	−0.057 (0.873)	0.679 (0.896)	0.722 (0.706)	0.669 (0.764)						
ASA*Comply					−0.075 (0.061)	−0.067 (0.059)	−0.180*** (0.062)	−0.155** (0.060)		
Quota compliance									−0.050 (0.034)	−0.048 (0.034)
ASA*Quota compliance									−0.026 (0.079)	−0.012 (0.077)
Firm and time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm and CEO characteristics	No	No	No	Yes	No	Yes	No	Yes	No	Yes
End sample period	2009	2009	2013	2013	2013	2013	2013	2013	2013	2013
Sample	Listed ASA	ASA	ASA	ASA	ASA & large AS	ASA & large AS	ASA & matched AS	ASA & matched AS	ASA & matched AS	ASA & matched AS
Observations	348	904	1,094	1,094	3,660	3,660	3,800	3,800	3,800	3,800
R^2	0.079	0.104	0.087	0.023	0.001	0.007	0.006	0.035	0.001	0.032

Note: *p<0.1; **p<0.05; ***p<0.01

directors in publicly-listed firms in Sweden in 2005 and find that female and male directors differ significantly in terms of values and risk attitudes. For instance, they find that women care less about power and achievement, and they emphasize universalism and benevolence.[27] Our findings of fewer employee layoffs and increased labor costs, together with Matsa and Miller's (2013) and Tate and Yang's (2015) findings, are consistent with Adams and Funk's (2012) finding that female directors emphasize universalism and are more stakeholder-oriented than male directors.

In terms of the other model specifications in Table 7, when we apply ENT's approach using both the largest AS as a control group and the matched control group, total employment is significantly negatively affected (Panel A, Column 5-8). This result contradicts the result of Matsa and Miller (2013) (and the results when using AD's approach), who found that firms affected by the quota increased employment levels in comparison to the control group. Keeping the right-sized staff can be seen as a balancing act; too many employees might lead to increased costs and underutilize the firm's resources, while too few employees might lead to frustration among employees and prevent the firm from properly serving its clients. As mentioned earlier, female directors are thought to be stricter monitors (Adams & Ferreira, 2009), and this stricter monitoring might imply that more gender diverse boards pay greater attention to the use of the firm's resources, which could potentially manifest as a decline in total employment.

Though layoffs may directly reduce costs (such as payroll costs), they may also increase costs at later stages by decreasing employee morale and or lead to greater hiring and training costs if demand rebounds (Parsons, 1972). Indeed, research shows that bad layoffs and layoffs for the wrong reasons rarely help senior leaders accomplish their goals (Gupta & Sucher, 2018). The relationship between workforce reduction and financial performance remains unclear. For instance, Lin and Rozeff (1993) find that announcements of layoffs are associated with negative returns, Muñoz-Bullón and Sánchez-Bueno (2011) find no effect on financial performance, while Love and Nohria (2005) find that downsizing increases performance and sales.

As mentioned, using ENT's approach with both the 1% largest AS and a matched control group give statistically significant negative estimates when looking at employment levels. The estimate for total labor costs is positively and statistically significant under ENT's approach with the 1% largest AS as control group (Panel B, Column 5). However, when

[27] According to Schwarts (1992), universalism and benevolence indicate the motivation to promote the welfare of others. Universalism values apply to all of humankind and to the natural environment, while benevolence apply to those close to us or those with whom one frequently interacts.

firm characteristics are included, the significance disappears. Under ENT's approach with a matched control group and the use of actual compliance, the quota does not appear to have a significant effect on labor costs.

In summary, we find quite different results across the different model specifications. Our positive estimates on employee levels and labor costs are consistent with the findings of Matsa and Miller (2013). However, using ENT's method, we find a significant decrease in employee levels, which might suggest that more gender-diverse boards pay more attention to the use of firms' resources. Having looked at total employee and labor cost levels, in the following section we will investigate whether increased board gender diversity is associated with a change in CEO compensation.

4.4.2 CEO compensation

There is no question that CEO compensation has become a contentious topic in the business world attracting attention from several stakeholders such as the media, regulators, investors, and company employees. Equilar, a compensation research firm who analysed at the CEO pay of 100 large companies in the US in 2016, found that boards with greater gender diversity pay their CEOs about 15% more compared to less gender diverse boards (Morgenson, 2016). Nell Minow, a chairwoman at ValueEdge Advisors and an expert in governance, were not surprised by the result and commented that it is difficult for women to get on boards and they therefore might be under more pressure to go along and get along; "The culture of the boardroom is to vote yes. You want to stay on the board, don't you?" (Morgenson, 2016).

Panel C of Table 7 shows our regression results for CEO pay. In addition to the same controls as in the previous tables, we control for the CEO characteristics *CEO age, CEO gender* and textitCEO chairman (see Table 10 for variable definitions). The instrumental variable analysis shows no significance (Columns 1-4). This is also true when applying ENT's approach using the 1 % largest AS by revenue as control group (Columns 5 and 6) and when using actual compliance and the matched sample as control group (Columns 9 and 10). These results are consistent with the findings of Adams and Ferreira (2009) who find no statistically significant effect of the fraction of female directors on either the fraction of incentive pay, or the level of total CEO pay. They suggest that this result is due to women being less likely to be appointed to the compensation committee compared to men, and therefore, have less influence over the CEO compensation design. Thus, women do not appear to be an important determinant of the total CEO compensation. The result is also consistent with the findings of AD looking at the Norwegian quota law. Likewise, they find no evidence that greater female representation alters the level of CEO pay in their sample of listed ASA.

Turning to ENT's approach using the matched sample, the negative and significant estimates imply that total CEO pay decreased for ASA firms after the quota (column 7 to 8). This is consistent with Bugeja et al. (2016), who also find a negative relationship between gender-diverse compensation committees and the level and composition of CEO pay. They suggest that these results imply that the CEO might receive excess compensation that is mitigated by female presence in the compensation committee. However, this only holds for the compensation committee.

Studies have suggested that the presence of female directors enhances board processes, and increases the accountability of CEO compensation and the efficiency of the board's monitoring and advising activities (Abbott et al., 2012; Adams and Ferreira, 2009; Konrad et al., 2008; Schwartz-Ziv, 2017). This might imply that gender-diverse boards, through both efficient advising, monitoring, and contracting, tend to minimize biases of overpaid CEOs. Female directors might emphasize pay-for-performance making it less likely that there will be excessive CEO compensation.

Konrad et al. (2008) study the effect on boardroom dynamics of increased female presence by interviewing 50 female directors at Fortune 1000 companies. They suggest that women ask tougher questions and demand straight answers when it comes to controversial areas such as compensation. They observe numerous instances where female directors are alone in questioning the CEO's compensation or voting no on compensation issues. Furthermore, they find that women tend to widen the board discussion to better represent stakeholders, including customers, employees, and the community at large. Schwartz-Ziv (2017), using Israeli government-owned firms,[28] find that boards with at least three female directors present in the board meetings were twice as likely to request further information from management and to take initiative. In gender diverse boards, both men and women were more active in the meetings. Based on that women might raise questions male directors are more unwilling to ask, as well as broadening the discussion and request information, the presence of female directors might prompt the dialogue and analysis of the CEO compensation contract. This might decrease the likelihood of excessive CEO compensation, which might imply that gender-diverse boards are associated with lower levels of CEO compensation.

An often-discussed debate is the pay gap between CEOs and average workers. A possibility might be that female directors are more stakeholder-oriented and altruistic compared to male directors. This inference is supported by the findings of Adams and Funk (2012). They find that female directors are more universalism- and stakeholder-oriented than male directors.

[28]These government-owned businesses have traditionally a larger fraction of female directors (on average 37%).

Equality, social justice, and a world at peace form a subset within the universalism value item (Schwartz & Boehnke, 2004). The fact that women might care more for correcting injustice and have more other-regarding preferences may suggest that they prefer the CEO not to earn substantially more than the average worker. Based on this, the presence of female directors could cause a decline in CEO pay.

In summary, applying AD and ENT's method, in addition to the method using actual compliance, the presence of female directors does not appear to have a significant effect on CEO pay. However, using ENT's approach with a matched control group shows that gender diverse boards have a significant and negative impact on CEO pay. This result is consistent with arguments that women play more active monitoring and advisory roles on corporate boards, as well being more universalism- and stakeholder-oriented compared to male directors. Next, we turn to the sensitivity of CEO turnover to stock return performance.

4.4.3 CEO turnover performance-sensitivity

The board of directors has the critical functions of hiring and monitoring as well as advising top management (Adams et al., 2010). The relative importance of these two roles is disputed, but after several corporate scandals in the last decade, the role of monitoring has been emphasized more. In empirical research, an often-used measure for the efficiency of the board's monitoring activities is the likelihood that the CEO is fired when the firm performs poorly (the performance-sensitivity of CEO turnover). Adam and Ferreira (2009) find that in poorly performing firms with relatively more female directors, the likelihood that the CEO is fired increases. Their interpretation is that female executives appear to be tougher monitors. In this section, we investigate the impact forced board gender diversity might have on the performance-sensitivity of CEO turnover.

Our approach is similar to that of Adams and Ferreira (2009). The dependent variable, *CEO turnover*, is a dummy variable defined as equal to one if the CEO leaves his or her position in the following year, implying a lag of one year between poor performance (as well as other firm variables) and the CEO leaving. The independent variables are *Fraction female directors, Stock performance*, measured as the firm's stock return for the year net of the Oslo Stock Exchange Benchmark Index (OSEBX), and the two variables interacted. We control for the same firm characteristics as earlier (*Firm age, Size, Leverage, Largest owner, Board size, Board CEO experience* and *Board busyness*) and the same CEO characteristics as in the analysis of CEO pay (*CEO age, CEO gender* and *CEO chairman*) which might have an impact on CEO turnover. Furthermore, we control for firm and time fixed effects. This results in the following regression equation:

$$(5) \quad CEO\,turnover_{i,t} = \gamma_0 + \gamma_1 Fraction\,female\,directors_{i,t} + \gamma_2 Stock\,performance_{i,t} + \gamma_3 Fraction\,female\,directors_{i,t} * Stock\,performance_{i,t} + \gamma_4 X_{i,t} + \theta_i + \tau_t + \epsilon_{i,t}$$

where $X_{i,t}$ is a vector including the above mentioned firm and CEO characteristics.

In the search for a robust conclusion, we run the regression on three models: a linear probability model (LPM), a logit model, and a probit model. For the logit and probit models, we report marginal effects. While a binary regressor usually calls for a nonlinear model like probit and logit, Ai and Norton (2003) point at the complexity of evaluating the coefficients of interaction terms when the model is nonlinear. Like Adams and Ferreira (2009), we therefore use a LPM. However, we also include a logit and a probit model, which adds robustness and bind the predicted probabilities between 0 and 1. Our main results are shown in Table 8. For the interaction term, we can see a relatively similar estimate of the coefficient across all models, only varying between 0.070 and 0.088. In terms of the significance of the coefficients, at first glance, it looks rather different. However, the p-values only vary between 0.09 and 0.13 in the different specifications, indicating a significance at between the 9% and 13% level.

For each model, we have included one column without controlling for firm and CEO characteristics and one column including these controls. In the logit and probit specifications, neither poor stock performance or the fraction of female directors appear to have a significant effect on CEO turnover. Looking at the LPM, we find that poor stock return performance increases the likelihood of CEO turnover (Columns 1-2). However, the p-values to Stock performance coefficients are also relatively similar (between 0.08 and 0.12).

As mentioned, when we interact *Stock performance* with *Fraction female directors*, we find positive coefficients in all specifications. In this case, a positive coefficient indicates a decrease in CEO turnover performance-sensitivity, the reasoning being that if the firm performs poorer than the OSEBX, the Stock performance variable is negative. As *Fraction female directors* will always be positive (between 0 and 1), a positive coefficient to the interaction term would result in a negative impact on CEO turnover. Looking simply at the significance levels 1%, 5% and 10%, we find that in firms with relatively more female directors, the performance-sensitivity of CEO turnover is lower using the LPM without controlling for firm and CEO characteristics (Column 1) and when using the logit model (Columns 3-4) at a 10% significance level. This result is consistent with the findings of Kim et al. (2020), who used a

Table 8: CEO turnover performance-sensitivity

All columns report the estimates of the coefficients γ_1, γ_2 and γ_3 from the following regression equation:

$$CEO\,turnover_{i,t} = \gamma_0 + \gamma_1 Fraction\,female\,directors_{i,t} + \gamma_2 Stock\,performance_{i,t}$$
$$+\gamma_3 Fraction\,female\,directors_{i,t} * Stock\,performance_{i,t} + \gamma_4 X_{i,t} + \theta_i + \tau_t + \epsilon_{i,t}$$

where *Stock performance* is firm i's stock return net of the Oslo Stock Exchange Benchmark Index (OSEBX) return and θ_i and τ_t are firm and time fixed effectes, respectively. $X_{i,t}$ is a vector of the following firm and CEO characteristics: *Firm age, Size, Leverage, Largest owner, Board size, Board CEO experience, Board busyness, CEO age, CEO gender* and *CEO chairman*, and are included in Column 2, 4 and 6. The sample period is 2003-2013 in all columns, and the sample consist of listed ASA. Financial firms and firm-year observations with missing dependent or control variables are excluded.

	Dependent variable: CEO turnover					
	(1)	(2)	(3)	(4)	(5)	(6)
Fraction female directors	0.170	0.194	0.163	0.180	0.156	0.177
	(0.140)	(0.138)	(0.130)	(0.133)	(0.129)	(0.131)
Stock performance	−0.021*	−0.021*	−0.029	−0.030	−0.025	−0.023
	(0.012)	(0.013)	(0.019)	(0.019)	(0.017)	(0.017)
Fraction female directors *	0.071*	0.070	0.088*	0.088*	0.075	0.070
stock performance	(0.042)	(0.044)	(0.052)	(0.052)	(0.047)	(0.047)
Model	LPM	LPM	Logit ME	Logit ME	Probit ME	Probit ME
Firm and CEO characteristics	No	Yes	No	Yes	No	Yes
Firm and time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,338	1,338	1,338	1,338	1,338	1,338
R^2	0.004	0.027	0.004	0.027	0.004	0.027
Note:						*p<0.1; **p<0.05; ***p<0.01

sample of public listed firms on the Moscow stock exchange from 2006 to 2015 measuring firm performance by ROA. Using the LPM model controlling for firm and CEO characteristics in Column 2 and the probit model in Columns 5-6, the interaction term enters with an expected positive sign but fails to be statistically significant.

The marginally negative effect on CEO turnover performance-sensitivity found using the logit model and the first specification of the LPM, might be explained by the initial concern from opponents of the reform claiming that qualified women were in short supply (Criscione, 2002). Assuming this was a problem, it might imply that the few qualified women would get overly busy in terms of having too many board seats. In this case, they might not be able to do their job properly, and the CEO might get away with poor performance. However, as stated earlier, the fact that the average number of board seats for females remained quite stable throughout the entire period (2003-2013) might suggest that this concern was not realized in practice.

Following Adam and Ferreira's (2009) interpretation, a decrease in the performance-sensitivity of CEO turnover would imply that females are less efficient monitors. AD (2012) attribute their findings of the quota leading to a significant negative impact on firm value to the new female board member's younger age and lack of CEO experience. Having less high-level work experience might suggest that the new females appointed to the boards are new to their role, which might make them less able to monitor properly. In this vein, our finding of a marginal decline in the likelihood of CEO turnover when the firm performs poorly, might be interpreted as disadvantageous to the firm in terms of less efficient monitoring. However, could less firing of the CEO also be seen as beneficial for firms?

As discussed earlier, research suggests that women have more other-caring preferences. For instance, Matsa and Miller's (2013) and Tate and Yang's (2015) evidence that female directors and female managers might care more for the well-being of employees is consistent with Adams and Funk's (2012) findings that female directors are more universalism- and stakeholder-oriented compared to their male counterparts. These findings might suggest that female directors will show more sympathy and grant the CEO more time to fix potential poor performance or problems. In turn, it might be that the CEO does better. As previously mentioned, research has shown that women trade less compared to men and make better returns (Barber & Odean, 2001). This is consistent with the findings of a study by Warwick Business School (2018) who interpret the results as women being more long-term-oriented and acknowledge that it takes time for things to change. When assessing the quality of the firm's CEO, standard economic theory suggests that the board should ignore components of firm performance that are beyond the CEO's control. However, Jenter and Kanaan (2015)

using a US sample of 3,042 CEO turnovers over the years 1993-2009, find that CEOs are significantly more likely to be fired after bad industry and bad market performance. Women might be willing to spend more time investigating whether potential poor performance is due to the actual actions of the CEO, exogenous industry, market shocks beyond their control, or simply bad luck.

Furthermore, focusing on the underlying reasons for poor performance might also imply that more gender diverse boards take into account measures other than hard data, such as stock return, when evaluating the quality of the CEO. Cornelli et al. (2013) suggest that "soft" information plays a much larger role than hard data, and that this helps to avoid firing a CEO for bad luck or in response to adverse external shocks. In addition, caring more about employees by being supportive and more patient might also foster trust between the board and CEO. However, there might be a fine balance; if the CEO senses that he or she will get a second chance and be retained regardless of performance outcomes, his or her incentive to work hard might be weakened, at least short term. Thus, being too patient might result in the CEO destroying more value.

5 Conclusion

After Norway was the first country to introduce a corporate board quota in 2003, ten European countries had introduced a quota by the beginning of 2018 (Mensi-Klarbach & Seierstad, 2020). As a pioneer in this movement towards mandated board diversity, the impact of the Norwegian quota can be of high interest for countries that have or are planning to implement a board gender quota; especially since multiple studies suggest female directors exhibit different characteristics (Adams & Ferriera, 2009; Adams & Funk, 2012). In addition, we now have the possibility to include several years after the financial crisis. As the quota is not enforced based on firm policies or performance, it is an exogenous shock to diversity. However, the timing of compliance being endogenous, the analysis of the impact becomes complex.

By including additional policies and comparing different regression methods for each policy, our results highlight the importance of addressing the endogeneity issue properly. Looking at the quota's effect on different performance measures, financial and investment policies, and labor policies, we find both significant and insignificant coefficient estimates on all policies, except on ROA, which give no significant results. In addition to the sensitivity to the choice of method to address the endogeneity issue, the results also vary with adjustments of the sample period and the choice of control group.

It is important to notice what we do not find. Looking at our performance measures (ROA and asset turnover), we obtain almost exclusively insignificant results, which signifies that our findings do not disprove the business case of gender diversity, at least when looking at the chosen accounting measures. Looking at financial and investment policies and labor policies, there might be different opinions if a positive or negative relationship is more favorable.

We find that increased female board presence increases debt levels, which contradicts the idea that the "typical" gender gaps (e.g. risk aversion) in the population are similar to boardroom gender gaps. This is supported by the finding of a decline in cash holdings. Looking at dividend and capital expenditures, we have specifications showing a negative impact. The investigation into labor policies give mixed results, especially employee levels where the different methods suggest both significant positive and significant negative effects. However, the results point to an increase in labor costs, but a decrease in CEO compensation. Our finding of a marginally negative effect on performance-sensitivity of CEO turnover might imply that gender-diverse boards develop a more long-term view focusing on the underlying reasons for poor performance, and exercise greater supportiveness.

While our results emphasize the importance of choice of method to deal with the endogeneity

problem, they do support the hypothesis that female directors exhibit different characteristics and contribute differently, compared to their male counterparts. It might not be gender itself doing the difference, but that the composition of people is more diverse, resulting in an increased variety of perspectives, backgrounds, and experiences being represented on the board. As stated in the introduction, Barack Obama (former US president) quotes that more women in positions of power can result in better policy outcomes. Indeed, our research suggests that increased board gender diversity has an impact on firm policies in general, and that stimulating more equal gender representation through gender quotas influences firm outcomes.

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7 Appendix

Table 9: Timeline of important dates and events leading up to the board gender quota

October 1999: The first public hearing regarding changes of the equity act from 1978 which specified a minimum of 40% of each gender for committees, boards and councils etc. appointed by a public body. Suggestion of 25% female share in boards of listed firms with boards consisting of four or more members.

July 2, 2001: Second public hearing from the Stoltenberg-government. The proposal now includes a 40% target and suggests that the quota is incorporated into corporate law instead of the gender equality law.

February 22, 2002: Public announcement from the Minister of Trade and Industry, Ansgar Gabrielsen, in the Norwegian Newspaper "Verdens Gang" saying that the fraction of female directors should be minimum 40% in ASA. The statement contradicted the official policy of his political party.

March 8, 2002: The government proposes a board gender quota. They state that they want to cooperate with the private sector toward a voluntary increase in female directors, canceling the quota if firms voluntarily complied by mid-2005.

June 13, 2003: The government presents the law proposal for a 40% board gender quota which covers government-owned companies and all ASA. If firms meet the required limit by July 1, 2005, the law will not be mandated.

November 27, 2003: "Odelstinget" (Parliament's lower house) passes the law.

December 9, 2003: "Lagtinget" (Parliament's upper house) passes the law.

December 19, 2003: The quota law formally becomes part of Norwegian Corporate Law, still under the consideration that voluntary compliance by the 1st of July 2005 would cancel the law. The law has no sanctions.

July 1, 2005: The deadline for voluntary compliance. In the time after this deadline, there was a public debate in Norway regarding the law as well as substantial media attention on gender diversity.

December 9, 2005: The government sets the quota law into effect. The law now includes liquidation for non-compliance - the ultimate penalty for breach with Corporate Law.

January 1, 2006: Existing ASA were given two years to comply with the quota. ASA registered after this date needed to comply immediately.

January 1, 2008: All ASA had to comply with the quota at this date. There were still 77 firms not in compliance. These firms were informed to comply by a new deadline of February 2008. Twelve firms had still not complied and these firms received a final warning to comply.

April 2008: All ASA are in compliance with the quota.

Note: Table based on Nygaard (2011)

Table 10: Variable definitions

Variable name	Defintion
Panel A: Policies	
Asset turnover	Revenue / total assets.
Average pay	Labor cost / number of employees.
Cash/assets	Cash holdings / total assets.
Capex/assets	Capital expenditures / total assets.
CEO turnover	Dummy equal to 1 if there is a new CEO the year after.
Debt ratio	Total debt / total assets.
Dividend ratio	Dividend and group contributions paid from subsidiaries to parent companies as a share of total profit or loss. Reported as not applicable if negative.
Log(CEO pay)	Natural logarithm of the CEO's pay.
Log(employees)	Natural logarithm of number of employees.
Log(labor cost)	Natural logarithm of labor cost.
ROA	Return on assets (EBIT / total assets).
Panel B: Regressors	
ASA	Dummy equal to 1 if the company is a public limited company ("Allmenaksjeselskap").
Comply	Dummy equal to 1 when the year is >= 2008.
Fraction female directors	Fraction of female directors of shareholder elected directors.
Quota compliance	Dummy equal to 1 if the company has complied with the quota.
Stock performance	Stock return net of the Oslo Stock Exchange Benchmark Index (OSEBX) return.
Panel C: Control variables	
Board busyness	Fraction of the board's directors that sit on a minimum of three board seats in ASA or the 1% largest AS by revenue.
Board CEO experience	Fraction of the board's directors with experience as CEO over the past three years in an ASA or one of the 1% largest AS by revenue.
Board size	Number of shareholder-elected directors on the board.
CEO age	Age of CEO.
CEO chairman	Dummy equal to 1 if the CEO is also the chairman of the board.
CEO gender	Dummy equal to 1 if the CEO is female.
Firm age	Natural logarithm of the number of years since the company was incorporated.
Largest owner	Percentage ownership by the company's largest shareholder.
Leverage	Debt ratio (total debt / total assets).
Size	Natural logarithm of revenue.
Leverage	Debt ratio (total debt / total assets).