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Navn: Victoria Skøtt Dahl og Amanda Mack Korsfur

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Andre medlemmer i gruppen:	

Amanda Mack Korsfur
Victoria Skøtt Dahl

Gender Diversity on Boards and Firm Financial Performance: A study of Norwegian firms

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Abstract

We examine the effect of gender diversity on boards on firm financial performance. Our data are Norwegian AS and ASA firms from 2002 to 2020. As previous literature on this topic is ambiguous, we start by presenting economic reasons for why findings might vary. By employing pooled cross-sectional and fixed effect regressions, we find that gender diversity is positively related to ROA and profit margin. This is consistent for both the largest and smallest firms in our sample. Further, we find a negative relationship for the firm exposed to the introduction of the gender balance law. Followed by these results, we conclude that the relationship is not as robust and apparent as other papers indicate.

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1. Introduction

Over the past decades, we have seen an increasing trend in the number of women in the labor force relative to men. In 1972, 78% of men in Norway were employed while the proportion was only 45% for women. In 2021, the ratio was respectively 75% and 69% (Statistisk Sentralbyrå, 2021a). This trend has contributed to a more even distribution between men and women in firms and promoted more diversity. Aligned with this trend, the proportion of women on boards increased from 6.4 % in 2002 to 42.5 % in 2021 for Norwegian ASA firms (Econ Senter for økonomisk analyse, 2003, p. 2; Statistisk Sentralbyrå, 2021b).

The shift in the proportion of women on boards in Norway is mainly due to the gender balance law (GBL). The GBL was implemented between 2004 and 2008 to stimulate gender diversification on boards (Mission of Norway to the European Union, 2017). It was first introduced as voluntary, but from 2008 it was required by law. The law stipulated that boards consisting of ten or more people must have 40% of each gender. Smaller boards were given a minimum number by size. The GBL applies to only listed and unlisted Norwegian public limited firms (ASA) (Ikdahl, 2020). Norway was the first country in the world to adopt such quota rules at board level in firms and thus emerged as an international pioneer in gender equality measures (Kandal, 2020). Similar work and initiatives have been done in other countries. The European Union introduced the same target to be complied for all large firms by 2026 (European Parliament, 2022).

Beyond the fact that board diversity promotes gender equality, it is also argued to have positive economic outcomes. Several studies (Campbell & Mínguez-Vera, 2008; Carter et al., 2003; Vafaei et al., 2015) point out that gender diversity on boards positively affects the financial performance of firms. A recent study from the Norwegian division of PricewaterhouseCoopers (PwC) showed that large publicly traded firms with a high share of women on boards performed better financially (PricewaterhouseCoopers, 2019). It is argued that a more diverse board will have a better understanding of the complexities of the business environment. Thus, greater gender diversity could

improve the quality of decision-making. In turn this could lead to higher financial performance (Campbell & Mínguez-Vera, 2008).

Some other studies (Adams & Ferreira, 2009; Bøhren & Strøm, 2010; Joecks et al., 2013; Matsa & Miller, 2013; Rose, 2007) argue that the relationship between women on boards and financial performance is negative or non-existing. In our thesis, we start by discussing findings from previous academic research to point out some reasons for the ambiguous results. Secondly, it is also unclear whether there is a causal relationship or only a correlation. The discussion of ambiguous findings in the literature and causal interpretation is discussed in section 2.

Further structure of the thesis is a description of our methodological approach and data in sections 3 and 4. Through our thesis, we study the relationship between gender diversity on boards and financial performance. Hence, our research question is: "*Does gender diversity on boards affect firm financial performance?"*. We investigate this for a sample consisting of Norwegian ASA and AS firms over 18 years. We measure gender diversity by the percentage share of women on the board and a dummy that implies whether there are any women on the board. Financial performance is measured by return on asset (ROA), profit margin, and annual revenue growth (ARG).

In our main analysis, in section 5, we examine our research question by conducting pooled cross-sectional and a fixed effect regressions. Here we find that women on boards positively affect our profitability measures ROA and profit margin, while negatively affect ARG. Adams and Ferreira (2009) observe that the representation of women on boards is closely linked to firm size. By rerunning our regression for the 25% smallest and largest firms, we find a conclusive positive association for both profitability measures. The effect is weaker on ROA for small firms, but stronger for profit margin. Our inconsistent results make further conclusion on firm size difficult.

Lastly, we look at the impact of GBL on the financial results of Norwegian firms. We conduct a fixed effect regression for two samples, a short- and long-term sample around

the implementation in 2008. The effect seems to be negative for ASA firms, but the overall effect for both firm types is positive and fairly small. In section 6, we conclude.

2. Literature review and discussion

2.1 Literature review

Within corporate governance research, studies on board gender diversity and firm financial performance is a popular topic and previous empirical literature is abundant. The effect of gender diversity on boards is also studied by consulting firms such as McKinsey and PwC. In general, these consulting studies find a positive correlation between gender diversity on boards and financial performance.

McKinsey & Company finds that inclusion and diversity are a source of competitive advantage and a key enabler of growth (Hunt et al., 2018). The study by PwC (2019), also finds that large Nordic firms with a high share of females on the boards have higher growth, higher return on equity, higher profit margins, and less volatile equity prices. Compared to research papers, consulting studies do not focus on ascertaining whether they find causality or just correlation to such an extent. Thus, their findings do not imply that more women on boards cause stronger financial performance.

Empirical research papers, which try to ascertain causality, do also find an association between gender diversity and firm financial performance. However, the findings are not unambiguous. Some empirical studies, like the consulting firms, find a positive association (Campbell & Mínguez-Vera, 2008; Carter et al., 2003; Vafaei et al., 2015). Other studies point to an opposite or not existing relation (Adams & Ferreira, 2009; Bøhren & Strøm, 2010; Joecks et al., 2013; Matsa & Miller, 2013; Rose, 2007). An overview of the main findings and key information can be found in **Table 2.1**.

As the results from empirical studies vary, one cannot conclude how the real association of women representation on boards and firm financial performance is. There may also be other factors than women on boards driving the change in financials as proposed by Rose (2007).

Table 2.1: Literature overview of empirical papers on financial performance and gender diversity on boards

Authors	Association	Region	Period	Enterprise type	Number of firms	Model	Performance measure	Diversity measure	Title
Adams and Ferreira (2009)	Negative	US.	1996-2003	Listed	1,939	Firm fixed effects with year dummies	1) Tobin's Q 2) ROA	1) % Women on board 2) Dummy for women on board	*Women in the boardroom and their impact on governance and performance*
Bøhren and Staubo (2014)	Not specified	Norway	2001-2009	Listed and unlisted	Varies over years. Total number is not specified.	Logit model	Average real return on asset	% Women on board	*Does mandatory gender balance work? Changing organizational form to avoid board upheaval.*
Bøhren and Strøm (2010)	Negative	Norway	1989-2002	Listed	203	Fixed effects and random effects estimations	1) ROA 2) ROS 3) Tobin's Q	% Women on board	*Governance and Politics: Regulating independence and diversity in the board room*
Campbell and Mínguez-Vera (2008)	Positive	Spain	1995-2000	Listed	68	Two-state least squares regression	Tobin's Q	1) Dummy for women on board 2) % Women on board 3) Blau's index 4) Shannon index	*Gender Diversity in the Boardroom and Firm Financial Performance*
Carter et al. (2003)	Positive	US	1997	Listed	638	Two-state least squares regression	Tobin's Q	1) Dummy for women/minorities 2) % Women/ minorities on board	*Corporate Governance, Board Diversity, and Firm Value*
Joecks et al. (2013)	Both. Negative until 30% women. Positive after.	Germany	2000-2005	Listed	151	Multivariate OLS regression model	ROE	1) Dummy for different numbers of women on board 2) Blau's index	*Gender Diversity in the Boardroom and Firm Performance: What Exactly Constitutes a "Critical Mass?"*
Matsa and Miller (2013)	Negative	Norway	2006 and 2009	Listed and unlisted	104	Difference-in-difference model	ROA	% Women on board	*A Female Style in Corporate Leadership? Evidence from Quotas*
Rose (2007)	No link	Denmark	1998-2001	Listed	443	Cross-sectional regression	Tobin's Q	1) % Women on board 2) Dummy for women on board	*Does female board representation influence firm performance? The Danish evidence*
Vafaei et al. (2015)	Positive	Australia	2005-2011	Listed	500	OLS	1) ROA 2) ROE 3) Tobin's Q 4) CFO/TA	1) % Women on board 2) Dummy for women on board	*Board Diversity and Financial Performance in the Top 500 Australian Firms: Board Diversity and Financial Performance*

2.2 Correlation is not causality

Although many studies indicate that gender diversity and firm performance are related to each other, it is not clear whether the relationship is causal or if it is just a correlation. Correlation measures how much two variables move in relation to each other in a positive or negative direction. This relationship is used to describe connection and addiction (Foldnes et al., 2018). However, correlation does not imply causality. Causality is only present if there is a clear cause-effect relationship between two variables (Wooldridge, 2020). In other words, a change in one variable must directly influence the other variable. To infer with causality when there is only correlation can lead to erroneous conclusions as the correlation could be random or caused by other variables. This can, in turn, cause the real relationship to be misinterpreted.

In the study "*Women on boards: The superheroes of tomorrow*" by Adams (2016), she presents several reasons why the literature on gender diversity and financial performance should not be interpreted as causal. She discusses how the regression of firm performance on board gender diversity is likely to suffer from all three endogeneity problems: omitted variables, measurement errors, and reverse causality. Omitted variables is the omission of relevant explanatory variables in a regression model. Measurement errors occur when one uses an imprecise measure of an economic variable in a regression model (Wooldridge, 2020). Lastly, reverse causality is a situation where a change in one of the explanatory variables leads to a change in the value of interest (Brooks, 2019). Endogeneity arises when the variable of interest in the regression is correlated with the error term (Abdallah et al., 2015). Adams (2016) argues that these challenges are essential to solve before one can conclude that women on boards lead to increased firm performance.

Adams and Ferreira (2009) observe that female representation on boards and firm size are closely linked. Consequently, by not properly accounting for firm size in the regression, the presence of omitted variable bias can occur. This might also induce reverse causality, as large firms perform differently than small firms. Insufficient or omission of data on female board representations, such as backgrounds, skills, and

characteristics of women, can also create similar omitted variable bias. Such omission makes it difficult to determine the magnitude of the causal effect of gender diversity.

Adams (2016) further argues that a discussion of how to measure diversity on boards is missing in the debate. Typically, one measures diversity as the percentage of women on boards in each firm. This has implications as the diversity measure will increase if one woman goes from being on the board in one firm to two or more. This implies an increase that should not occur as the total number of female directors remains the same. Therefore, Adams argues that if an expansion of the total number of female directors is desirable, one needs to measure the composition correctly.

The selection of female board representation may also affect research results (Adams, 2016). Female directors are not random members but often arrive at their position through selection. Thus, these women may be quite different from representative women in the population. As a result, studies on gender diversity on boards will only describe how a particular type of woman affects the firm and cannot be generalized to women in general. Thus, several studies argue that one should be careful about predicting female directors' preferences using evidence from a non-managerial sample. Further, Adams argues that selection causes female directors to differ across countries, industries, and types of firms. As an example, Adams and Funk (2012) find that female board members in Sweden are more likely to be married and have more children than their counterparts in the United States. This suggests that barriers to boardrooms may be more present in the United States and shows that women across boards are different.

2.2.1 Economic reasons for positive correlation

Both popular press and research papers have concluded a positive connection between gender diversity on boards and firm financial performance. However, determining which factors that contribute to the positive correlation can be more challenging. Generally, men and women tend to have different backgrounds, characteristics, and skills. Among others, Adams and Ferreira (2009) find that women on boards contribute with greater participation in decision-making through attendance and tougher

monitoring of CEO. One can, therefore, argue that women contribute to more diverse board compositions.

It is argued that diversity increases creativity and innovation as the members have different skill sets. Therefore, boards with diversity can have a better base for solving complex problems and developing diverse solutions (Campbell & Mínguez-Vera, 2008). Conversely, in homogeneous boards, group thinking can easily arise and limit innovation. Group thinking is when a group of people with high cohesiveness focuses on preserving the group harmony when making decisions (Hart, 1991). A less diverse and innovative board can further be expensive for a firm in terms of future returns. Although some studies show that women lead to higher performance, it may be that diversity in general is the underlying cause. One may therefore argue that firms could perform equally well regardless of gender balance as long as other types of diversity factors are present.

Another factor which can explain the positive correlation is the size of firms. It can be seen as a significant risk for some firms to change their structure or composition. Carter et al. (2003) find that a higher share of women and minorities on boards increases with firm size. This might be because successful big firms have the possibility and capacity to be politically correct and might be more attractive to women. On the other hand, smaller firms are less profitable and do not have the same resources or time to focus on gender diversity at the same level. As a result, the correlation can be more present for large and successful firms than for small ones. Firm size is thus crucial for the result of gender diversity in performance.

Selection based on profitability and firm size can also induce selection biases. By only choosing to examine profitable and large firms, these firms might have some characteristics in common which can influence the result. Consequently, observing a sample like this can give positive bias as firm size is found to be related to women on boards and financial performance. These results will, therefore, not be convertible or generalizable for all types of firms.

2.2.2 Economic reasons for negative correlation

Aligned with the arguments for positive association, there are also similar arguments for the negative correlation between gender diversity on boards and firm financial performance. Although the study of Adams and Ferreira (2009) shows that women and men tend to behave differently, they do not find these differences to conduct value in all cases. They argue that more dissimilar directors disagree more, inducing more conflicts on the board. Further, they argue that the impact of diversity on performance is determined by the strength of the governance, which is defined by the ability to resist takeovers. They find that firms with weak governance perform better. On the other hand, they find that firms with strong governance could be negatively affected by enforcing diversity. This can be explained by the fact that a higher share of women on boards contributes to tougher and more extensive monitoring, which in turn could be counterproductive due to overmonitoring.

Like Adam and Ferreira, Joecks et al. (2013) also point to the fact that women and men are different. They find that boards with a minority of women act as a skewed group with perspectives that may not be adequately expressed or spotted by the men. Further, they believe that such boards will negatively affect the group performance as they are less likely to allow for productive discussions. However, they find that the effect is positive after a critical mass of 30 % women on the boards is reached. We, therefore, argue that previous research might obtain negative results due to the use of samples with less than 30 % of women on the boards.

Furthermore, the negative association between gender diversity and financial performance can be due to selection bias in the analyzed data. In a study by Bøhren and Staubo (2014), half of the firms exposed to the Norwegian GBL changed organizational form to avoid the rule. Further, they find that the ASA firms were more likely to change form if they were profitable, young, non-listed, and had few female directors. These common characteristics might skew the results, meaning distorting the actual relationship. It might, therefore, look like firms with women on boards are worse off because many profitable firms are excluded from the sample due to the GBL.

Matsa and Miller (2013) also argue that the negative link can be explained by higher expenses during the restructuring. Among others, increased labor costs and higher relative employment can reduce profitability. Additionally, they emphasize that one cannot say for certain that their findings can be used on examples where women joined the boards without the GBL as an explanation. One may imagine that the negative effect of the GBL will subside with time and maybe give a positive effect in some years after the implementing date. However, as Adams (2016) discusses, the effect might also diminish over time. She argues that the female director pool will likely increase over time, causing the differences between men and women to diminish in the long run. This is justified by the fact that female board members tend to be younger than male board members, but in the future, they will also be a part of the "old boys club" as they age. Whether the effect of the GBL is negative or positive in the long run, is something we will investigate further in *5.4*.

3. Methodology

As much of the literature on the increased proportion of women on boards and its effect on financial performance is ambiguous, we want to analyze this relationship ourselves. We investigate the issue by examining whether we can replicate the findings of the PwC (2019) study. Our hypothesis is the following: "The proportion of female board representatives has a positive or no effect on financial performance*"*. We estimate a pooled cross-sectional regression to study this hypothesis. Our rationale for choosing this model can be found in *3.1*. The dependent variable in our model is financial performance, which will be measured by different terms described in *3.2*. The pooled cross-sectional regression is the following:

$$Financial\ performance_{it} = \beta_1 * Diversity_{it} + \sum_{i=2}^{k} \beta_k x_{kit} + u_{it}$$

Definitions of the variables

$Financial\ pefformance_{it}$: Several financial measurements for firm i in year t

$Diversity_{it}$: Dummy variable for women on boards and % share of women on boards

x_{kit}: Vector of control variables

u_{it}: Clustered robust standard errors at firm ID

3.1 Pooled cross-sectional regression

Based on our research question, we investigate if firms with high gender diversity have higher financial performance than firms with low diversity. We will further refer to this as level effects. By using a pooled cross-sectional regression, we can capture these level effects between financial performance and gender diversity. Pooled cross-sectionals are also found to give test statistics with more power and more precise estimators by pooling random samples from the same population from different time periods (Wooldridge, 2020). The drawback of this model is that it does not control for individual level differences or enables us to compare the firms with themselves over time. Additionally, this model does not control for many other factors. Consequently, a problem of endogeneity may arise.

3.2 Measures of financial performance and gender diversity

Financial performance is measured by different terms to secure more robust results and to make our results comparable with what PwC obtained. As measurements, we use return on assets (ROA), profit margin, and annual revenue growth (ARG). These are calculated in the following way:

$$ROA_{it} = \frac{Net\ income}{(Total\ Assets_t + Total\ Assets_{t-1})/2}$$

$$Profit\ Margin_{it} = \frac{Net\ income}{Revenue}$$

$$ARG_{it} = \frac{Revenue_t - Revenue_{t-1}}{Revenue_{t-1}}$$

Instead of using ROA, we could have used return on equity as PwC. Both these measures are accounting-based, meaning they are based on assessing how the firm has performed in the past. Nevertheless, we argue that ROA is a better measure as we want to investigate if the firm creates value overall. The inclusion of profit margin and ARG is made to make our results more comparable to PwC's. We also considered to use Tobin's Q, a market-based measure that indicates a firm's current position and potential in the future (Haslam et al., 2009). However, Tobin's Q would not be optimal for our research as it limits the focus to only publicly listed firms that are less represented in our sample.

To control for gender diversity, we measure women's representation on the board by two measurements. Firstly, we measure it by the the share of women represented on the board in percentage (*% Women on board*). Secondly, we use a dummy variable for women (*Dummy Women on board*). The dummy variable is assigned the value of 1 for each year the firm board comprises both genders and 0 if only men are present.

3.3 Control variables

We include several firm-specific control variables in the main regression to isolate the causal effect of female board representatives on firm performance and enhance the internal validity. The control variables are the age of the firm (*Firm age*), the size of the board (*Board size*), the firm's total assets (*Total assets*), and the percentage of tangibles (*% Tangible*). The firm's age accounts for the status of the firm's life cycle and is likely to correlate with profitability. The board size is measured by the number of board members. The percentage of tangibles is defined by the tangible assets over total assets and is included to disclose how the firm allocates capital.

By not including sufficient control variables, the multiple regression analysis can be biased. As Adams (2016) discussed, omitting firm size can create biased results. To avoid this problem, we use the natural logarithm (ln) of total assets as a proxy for firm size. Ln of total assets is one of the most popular proxies in corporate finance (Dang et al., 2018). We could have included even more control variables to isolate the effect and

to get more robust results, but this was difficult due to our data limitations. We predict that all the control variables positively affect firm value except for the board size. Small or large boards can presumably have a negative effect on performance by decreasing the board's effectiveness.

3.5 Clustered standard errors

Clustering is known as the general approach to obtaining fully robust standard errors and t-statistics. It is a common approach used in modern empirical work with panel data (Wooldridge, 2020). Firm performance is expected to be correlated over time, but not across firms. We, therefore, cluster at firm ID to account for any serial correlation between the firms over time. We find that the standard errors are not homoscedastic, as the null hypothesis of homoscedasticity for both the Lagrange Multiplier Test for Autocorrelation and a Modified Wald test are rejected. This further highlight that we must use a robust option to correct for heteroskedasticity.

3.6 Expected outcomes

Many studies have already stated a positive correlation, and it is expected that we might get the same findings. However, there are several reasons why the result can be overly optimistic or false positive. By performing several different types of regressions, we can approach a causal understanding to some extent. However, it can still be challenging to identify all factors impacting our results, limiting our ability for causal understanding. One possible emerging problem is that we are not controlling for unobservable variables by performing a pooled cross-sectional regression. It will also be challenging to make a concrete conclusion because half of the firms change form to avoid the GBL (Bøhren & Staubo, 2014), leaving us with a skewed selection of firms.

4. Data

We have retrieved data from the Centre for Corporate Governance Research (CCGR). The extracted data are accounting numbers, industry, governance, and miscellaneous data. Our sample consists of both the firms exposed to the GBL (ASA) and private limited firms (AS). Norwegian firms operating in the period from 2002 to 2020. We exclude all other types of enterprises. Additionally, we exclude firms from the following industries: agriculture, forestry, and fishing; finance and insurance; educational services; healthcare and social assistance; cultural activities, entertainment, and leisure activities. Further, we exclude firms that do not have NOK as currency.

In cases of missing account data information, we exclude firms with zero or missing revenue for more than three years and firms which only appear once in the sample. Firms with a mean of revenue less than 250,000 NOK and a mean of board size less than 2.5 are also excluded. Further, we windsorize our accounting variables on both sides at a 5% level to remove large outliers. As a pooled regression is sensitive to outliers, these exclusion can prevent our estimates from being biased or skewed. It also enables us to look at active firms and not overrepresent the small ones.

Lastly, we derive an unbalanced panel dataset with 701,246 observations from Norwegian firms. In total, our sample contains 73,484 firms, of which 73,195 are AS firms and 289 are ASA firms. However, this number varies as firms both enter and leave the dataset during the period. This is a much larger sample than the research we have reviewed, but we argue that this will give us more valid results. By this, we can also investigate the association for small compared to large firms.

Table 4.1 shows an overview of relevant summary statistics. In our sample, the variable board size has a mean of 3.6, which is relatively small compared to other studies. For example, Bøhren and Strøm (2010) have a board size mean of 6.5, Vafaei et al. (2015) have 7.9, and Adams and Ferreira (2009) have 9.38. However, these studies look at only listed firms which generally have larger boards than non-listed firms.

Additionally, the share of women has a mean of 17 %. As the majority of the firms in our sample are AS, this finding is not so surprising.

Table 4.1: Descriptive statistics of firm characteristics

Variable	Obs	Mean	Std. dev.	Min	Max
Performance measures					
ROA	657,753	4.57 %	17.25 %	-37.41 %	37.08 %
Profit margin	673,910	2.09 %	17.48 %	-47.03 %	39.28 %
ARG	631,023	13.22 %	46.98 %	-59.50 %	157.46 %
Gender diversity measures					
Dummy women on board	701,246	43.69 %	49.60 %	0.00 %	100.00 %
% Women on board	687,844	16.99 %	23.10 %	0.00 %	100.00 %
Control variables					
Board size	687,844	3.60	1.24	1.00	16.00
Total assets	701,246	22,100,000	41,000,000	277,000	165,000,000
Firm age	672,909	13.21	13.35	0.00	170.00
% Tangible	700,218	28.38 %	29.01 %	0 %	91.14 %

Notes: The table displays descriptive statistics for all firms in the regression sample, for the whole period 2002-2020. Total assets are reported in NOK. % Women on board is the percentage of women on the board of directors relative to the total number of board members. Dummy Women on board is equal to 1 if there is one or more women on the board, and equal to 0 if not. Board size shows the number of board members. Firm age is the number of years since the incorporation. % Tangible show the proportion of total fixed assets relative to total assets. ARG stands for average revenue growth, and ROA for return on asset.

Further, we investigate the descriptive statistics for entirely homogenous and heterogeneous firms. The overview can be found in *Appendix A,* Table 1A. In our sample, the firms with a minimum of one woman on the board have a larger mean of board size and firm age. This is in line with Vafaei et al. (2015) predictions that mainly the older, larger, and better-performing firms have female representatives on their boards.

5. Results and discussion

5.1 Main results

We start by running a pooled cross-sectional regression to capture the level effects of gender diversity on boards on performance. The results are presented in **Table 5.1**.

Table 5.1: Pooled regression with control variables

	(1) ROA	(2) ROA	(3) Profit margin	(4) Profit margin	(5) ARG	(6) ARG
% Women on board	0.0198***		0.0404***		-0.0506***	
	(0.00165)		(0.00169)		(0.00272)	
Dummy women on board		0.00894***		0.0184***		-0.0258***
		(0.000770)		(0.000816)		(0.00130)
Ln of total assets	0.0194***	0.0193***	0.0173***	0.0171***	0.0148***	0.0150***
	(0.000235)	(0.000233)	(0.000278)	(0.000276)	(0.000466)	(0.000462)
Firm age	0.0000665*	0.0000650*	0.000633***	0.000630***	-0.00591***	-0.00589***
	(0.0000290)	(0.0000290)	(0.0000383)	(0.0000384)	(0.000103)	(0.000103)
% Tangible	-0.130***	-0.130***	-0.0476***	-0.0478***	-0.0493***	-0.0488***
	(0.00124)	(0.00124)	(0.00195)	(0.00196)	(0.00250)	(0.00250)
Board size	-0.00785***	-0.00830***	-0.00690***	-0.00784***	0.00754***	0.00898***
	(0.000287)	(0.000295)	(0.000334)	(0.000342)	(0.000569)	(0.000582)
_cons	-0.197***	-0.194***	-0.226***	-0.220***	-0.0241***	-0.0299***
	(0.00343)	(0.00338)	(0.00403)	(0.00396)	(0.00665)	(0.00653)
N	632249	632249	640446	640446	607524	607524
R^2	0.066	0.066	0.038	0.038	0.029	0.029

Notes: The table shows the results from our pooled cross-sectional regression of share of women on board, dummy women on board and the financial variables on ROA (1-2), Profit margin (3-4), and ARG (5-6). Sample period is 2002-2020. The coefficients % Women on board and % Tangible are reported as marginal effects and shows the probability increase in the dependent variable when the independent variable increases by one percent. For Dummy women on board the marginal effect shows the probability increase when the variable change from 0 to 1. Ln of total assets is also reported as the marginal effect and shows that an increase with 1% in the independent variable changes the dependent variable with the coefficient divided by 100. For the remaining variables, firm age and board size, the marginal effects show the probability increase in the dependent variable when they increase by one unit.

Standard errors are in parentheses, and * , ** , *** indicates significance levels of 10, 5 and 1% level, respectively. Robust standard errors are clustered at firm ID.

This table shows us different associations between gender diversity and financial performance depending on the measurement of financial performance. The association is positive at a 1% significance level for both our profitability measures, profit margin and ROA. This applies to both diversity measures. For example, a one percent increase in the share of women on the board results in a 1.98% increase in ROA. The GBL can be categorized as an exogenous event, so the relationship we investigate can therefore be described as a natural experiment. By this model we can incorporate exogenous

variation in the dummy variable for women on boards and cure some types of endogeneity. However, this does not apply to all types of endogeneity impying that we cannot determine a positive causal relationship in our findings.

As we want to compare our results with PwC (2019), we have also included ARG. Unlike their results, we do not find a positive connection between women on the board and ARG. The only thing we find in common is the positive association with profit margin. One reason for the different results might be that we investigate different samples. Compared to PwC, our sample is much larger and consists of many more small firms which grow differently. We also only look at only Norwegian firms, not the whole Nordic region. Thus, our results indicate that there is no positive correlation between ARG and women on the board for Norwegian firms. Moreover, we have not found any theory that suggests that gender diversity is associated with ARG. For this reason, we will not analyze ARG further in this thesis.

For the control variables, we can see that firm age and our proxy for firm size, ln of total assets, positively correlate with ROA and profit margin. This is not unexpected as larger and older firms are often more profitable. Board size and percentage tangibles are, on the other hand, negatively correlated. This is partly as we expected prior to the analysis but challenging to explain further.

5.2 Association of large and small firms

Several studies indicate that firm size is linked to gender diversity and firm performance. We, therefore, rerun our regression for the 25% largest and smallest firms. We define the size based on the mean value of our proxy for firm size for each firm over the sample period. This enables us to study the association to firm size for our sample and the validity of our previous results. The regression results can be found in *Appendix B,* Table B1 and B2.

The tables show that the significant positive relationship between gender diversity on boards and financial performance is valid regardless of firm size. However, how strong the association is differs based on the firm size. The effect of one percent increase in the share of women on board increases ROA with 1.35 % for the largest and 1.53% for the smallest. This indicates that the effect is somewhat stronger for smaller firms in terms of ROA. This may be because larger firms often have more women on boards, so the effect of additional women will be lower. On the other hand, as shown in *Appendix B*, Table B3, the mean proportion of women on boards is highest for the smallest firms. Controversially, we also see that the effect of women on boards is strongest for the largest firms in terms of profit margin. Followed by these ambiguous results, we do not have enough robust results to describe the association of firm size for our sample.

5.3 Fixed effect and endogeneity

We conduct a fixed effect (FE) regression to analyze our research question further. This is the same as the pooled regression, except that a firm fixed effect has been added to the regression. FE enables us to compare the same firm with itself, enabling us to observe how a change in diversity affects a firm's performance. We could also have included a time-fixed effect, but by joint testing, we saw that this was unnecessary. All the dummies for all years were equal to 0. Neither do we include an industry-fixed effect as we assume that a firm does not change industry within the period we observe. The results from our fixed effect regression are presented in **Table 5.3**.

Compared to the pooled regression model, FE solves several endogeneity problems. A firm fixed effect can be used to control for unobserved heterogeneity, which correlates with the error terms causing bias. By unobserved heterogeneity, we mean unobservable firm characteristics. This can for example, be fixed differences in corporate culture and workplace practices across firms, which FE will eliminate. By controlling for this, FE brings us closer to studying the causal relationship.

Table 5.3: Fixed effect regression

	(1) ROA	(2) ROA	(3) Profit margin	(4) Profit margin
% Women on board	0.00672**		0.00909***	
	(0.00222)		(0.00224)	
Dummy women on board		0.00305***		0.00409***
		(0.000908)		(0.000922)
Ln of total assets	0.0460***	0.0459***	0.0394***	0.0394***
	(0.000571)	(0.000571)	(0.000641)	(0.000641)
Firm age	-0.00394***	-0.00394***	-0.00205***	-0.00205***
	(0.0000676)	(0.0000675)	(0.0000722)	(0.0000721)
% Tangible	-0.186***	-0.186***	-0.136***	-0.136***
	(0.00209)	(0.00209)	(0.00239)	(0.00239)
Board size	-0.00672***	-0.00690***	-0.00564***	-0.00588***
	(0.000335)	(0.000343)	(0.000338)	(0.000345)
_cons	-0.542***	-0.542***	-0.510***	-0.509***
	(0.00845)	(0.00844)	(0.00946)	(0.00946)
N	632249	632249	640446	640446
R^2	0.069	0.069	0.040	0.040

Notes: The table shows the results from our fixed effect regression of share of women on board, dummy women on board and the financial variables on ROA (1-2) and Profit margin (3-4). Sample period is 2002-2020. The coefficients % Women on board and % Tangible are reported as marginal effects and shows the probability increase in the dependent variable when the independent variable increases by one percent. For Dummy women on board the marginal effect shows the probability increase when the variable change from 0 to 1. Ln of total assets are also reported as the marginal effect and shows that an increase with 1% in the independent variable changes the dependent variable with the coefficient divided by 100. For the remaining variables, firm age and board size, the marginal effects shows the probability increase in the dependent variable when they increase by one unit.

Standard errors are in parentheses, and * , ** , *** indicates significance levels of 10, 5 and 1% level, respectively. Robust standard errors are clustered at firm ID.

Our results indicate that the association between financial performance and gender diversity is still positive and significant. However, the association is weaker compared to the pooled regression. A one percent increase in the share of women on the board will result in a 0.90% increase in profit margin with a FE model and 4.04% with the pooled model. This might be because the FE model removes the level effect and much of the variation in the data (Angrist & Pischke, 2009). Table 1C in *Appendix C* shows that AS firms on average have a constant diversity percentage over the period. These AS firms that do not change their diversity composition will automatically be deleted from the sample. The FE model will, therefore, have a much smaller sample than the pooled model.

Although we are approaching a natural experiment to an even greater extent than with the pooled model, some endogeneity will still be present. For example, the firms that voluntarily increase the share of women on boards will still be included in the sample. This can further induce bias as it only includes the firms that are doing well or have the capacity to respond to social norms and the firms affected by the quota.

5.4 The impact of the gender quota rule

Bøhren and Strøm (2010) argue that politicians should encourage less gender diversity from an owner's perspective. Further, their paper states that the current GBL cannot be justified with valuation arguments. This is also supported by the research of Matsa and Miller (2013), which find that the short-term profitability declined after the adoption of the GBL. To examine the effect of the GBL, we split our sample and look at the relationship during two different periods. Firstly, we look at the time period of 2005-2010 to isolate the causal effect of the introduction of GBL in 2008. Secondly, we expect there to be a lagged effect and extend the time period to 2003 – 2013. By investigating the relationship over a longer time span, we can examine whether the effect of women on boards diminishes or is amplified over time.

We continue to use the fixed effect regression from *5.3* as this model is closer to describing a causal connection than the pooled model. For the regression, we include a dummy variable for the exposed ASA firms (*Firm_ASA*). This dummy is equal to 1 for each year the firm is an ASA firm and zero otherwise. We also include two interaction terms to capture the exogenous effect of the GBL (*Dummy ASA x Dummy Women on board)* and *(Dummy ASA x % Women on board*). To avoid the problem with ASA firms that changed enterprise form, we define the dummy for ASA in the interaction terms as 1 if the firm is an ASA in 2008. The regressions can be found in **Table 5.4** and in *Appendix D*, Table D1.

Table 5.4: Fixed effects regression for the period of 2005-2011

	(1) ROA	(2) ROA	(3) Profit margin	(4) Profit margin
% Women on board	0.00726		0.0110**	
	(0.00432)		(0.00419)	
Dummy ASA x % Women on board	-0.132**		-0.216**	
	(0.0497)		(0.0719)	
Dummy women on board		0.00166		0.00446**
		(0.00166)		(0.00163)
Dummy ASA x Dummy Women on board		-0.0536*		-0.109***
		(0.0248)		(0.0310)
Ln of Total assets	0.0575***	0.0575***	0.0484***	0.0484***
	(0.00118)	(0.00118)	(0.00123)	(0.00123)
Firm age	-0.0101***	-0.0101***	-0.00574***	-0.00575***
	(0.000221)	(0.000221)	(0.000199)	(0.000199)
% Tangible	-0.210***	-0.210***	-0.157***	-0.157***
	(0.00391)	(0.00391)	(0.00425)	(0.00425)
Board Size	-0.00708***	-0.00712***	-0.00555***	-0.00577***
	(0.000659)	(0.000672)	(0.000635)	(0.000644)
Firm ASA	0.0289	0.0282	0.0301	0.0293
	(0.0172)	(0.0172)	(0.0251)	(0.0251)
_cons	-0.634***	-0.633***	-0.600***	-0.599***
	(0.0174)	(0.0174)	(0.0182)	(0.0182)
N	229033	229033	235271	235271
R^2	0.082	0.082	0.048	0.048

Notes: The table shows the results from our fixed effect regression of share of women on board, dummy women on board and the financial variables on ROA (1-2) and Profit margin (3-4). Sample period is 2005-2011. The coefficients % Women on board and % Tangible are reported as marginal effects and shows the probability increase in the dependent variable when the independent variable increases by one percent. The coefficient Dummy ASA x % Women on board is reported as marginal effects and shows the probability increase in the dependent variable for firms when the firm is an ASA in 2008 and share of women increases by one percent. For Dummy women on board the marginal effect shows the probability increase when the variable change from 0 to 1. For Dummy ASA x Dummy W on board, the marginal effect shows the probability increase when the firm is an ASA in 2008 and the dummy women on board goes from 0 to 1. Ln of total assets are also reported as the marginal effect and shows that an increase with 1% in the independent variable changes the dependent variable with the coefficient divided by 100. For the remaining variables, firm age and board size, the marginal effects shows the probability increase in the dependent variable when they increase by one unit.

Standard errors are in parentheses, and * , ** , *** indicates significance levels of 10, 5 and 1% level, respectively. Robust standard errors are clustered at firm ID.

This table indicates a significant negative connection between the firms affected by the GBL (ASA) and firm performance in the short time span. For example, by getting a heterogenous board, profit margin decreases by almost 11%. The negative association is equivalent for both performance measures and interaction terms. However, the overall effect captured by the gender diversity measures shows that the effect for both AS and ASA firms is positive. Although this is only significant for profit margin, this indicates that women generally have a positive effect. These findings of different effects on AS and ASA firms can be explained by the fact that ASAs are usually more professional. It is, therefore, natural to assume that they have a more optimal board. The regulation will therefore force them to move away from their optimum. The firms that cannot change enterprise form will, therefore, be negatively affected.

For the long timespan, none of the interaction terms are significant. This indicates that we cannot conclude that there is an association with certainty in the long run. The advantage of investigating with a longer time frame is that one can capture the long-term effect of getting women into the board. Based on our assumption of a lagged effect, we do not believe that firms get a profit jump immediately. The problem, however, is that there may be many other things at play. It will, therefore, be difficult to determine what drives the results. Economic fluctuations, such as oil crisis and various bubbles, can have a greater impact on the Norwegian economy than a change in the board composition. Due to these endogeneity problems, capturing the effect of increasing the share of women on the board is difficult.

6. Conclusion

This research examines the relationship between women on boards and financial performance for Norwegian ASA and AS firms in 2002 to 2020. Findings in previous literature on this topic are ambiguous and cannot give the relationship a causal interpretation. This discussion with causality appears as the regression of firm performance on board gender diversity is likely to suffer from the three endogeneity problems: omitted variables, reverse causality, and measurement errors. By not taking this into account, one can make erroneous conclusions.

Our pooled cross-sectional regression model find a positive relationship between the representation of women on boards and firm performance. This is consistent and significant for both our performance measures ROA and profit margin. This indicates that firms with an increase in female board representatives will experience a percentage increase in financial performance. The same results apply to firms that go from a homogenous board composition to a heterogeneous one. Compared to the study of PwC, we do not find conclusive positive results as we find a negative association with ARG. Furthermore, we find that the positive association with ROA and profit margin is consistent independent of firm size. The significant positive association is still present for both the largest and smallest firms in our sample. However, we do not find consistent results to conclude that the association is stronger for larger firms as it depends on the financial performance measure.

Furthermore, the positive and significant relationship is robust to the inclusion of fixed effect to our regression. Compared to the pooled regression, the results are weaker. One plausible explanation might be that the fixed effect regression removes the level effect and much of the variation in the data. Lastly, we explore the effect of the Norwegian GBL by making a 5- and 10-year sample around the time period the law was introduced. We find evidence that the GBL has an effect on the financial performance of firms. The exposed firms experience a negative effect on firm performance in the short term. Though, in the 10-year sample, none of the results of interest are significant. As our results across our regressions are ambiguous, it might indicate that the

relationship is not as solid as many others like to conclude and maybe even non-existing. In conclusion, the true relationship between women on boards and firm financial performance appears to be more complex than presented by consulting firms.

We have tried to consider the three sources to endogeneity problems, but our research might have some limitations. Firstly, we do not account for the board member's characteristics, culture, experience, and education which presumably can affect the results. The valuable experience and education of the female board member will naturally have some effect on our regressions. The same applies to considering each firm's competitive situation. We might, therefore, face the problem with omitted variable bias. Secondly, we have not tested for reverse causality. Lastly, by selecting a large sample of firms from different industries, the effect on the different industries can partially be zeroed out. To discover the causal relationship between women on boards and firm financial performance, we encourage future research to explore these weaknesses.

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8. Appendices

Appendix A: Summary statistics

Table A1: Comparison of descriptive firm statistics with and without women on the boards

Variable	Obs	Mean	Std. dev.	Min	Max
Dummy Women = 1					
ROA	287,302	4.42 %	16.98 %	-37.41 %	37.08 %
Profit margin	295,473	2.64 %	17.42 %	-47.03 %	39.28 %
ARG	276,892	11.31 %	44.49 %	-59.50 %	157.46 %
% Women on board	293,007	39.87 %	18.45 %	7.14 %	1
Board size	293,007	3.89	1.34	1.00	16.00
Total assets	306,409	21,800,000	42,600,000	277,000	165,000,000
Firm age	293,091	14.15	14.30	0.00	168.00
% Tangible	305,886	29.07 %	29.28 %	0.00 %	91.14 %
Dummy Women = 0					
ROA	370,451	4.69 %	17.45 %	-37.41 %	37.08 %
Profit margin	378,437	1.66 %	17.51 %	-47.03 %	39.28 %
ARG	354,131	14.72 %	48.78 %	-59.50 %	157.46 %
% Women on board	394,837	0%	0%	0%	0%
Board size	394,837	3.39	1.12	1.00	13.00
Total assets	394,837	22,400,000	39,800,000	277,000	165,000,000
Firm age	379,818	12.48	12.51	0.00	170.00
% Tangible	394,332	27.85 %	28.79 %	0.00 %	91.14 %

Notes: The table displays descriptive statistics for all firms in the regression sample, for the whole period 2002-2020. Total assets are reported in NOK. % Women on board is the percentage of women on the board of directors relative to the total number of board members. Dummy women on board is equal to 1 in case boards have one or more women, and equal to 0 in case of no women on board. Board size shows the number of board members. Firm age is the number of years since its incorporation. % Tangible show the proportion of total fixed assets relative to total assets. ARG stands for average revenue growth, and ROA for return on asset.

Appendix B: Firm size association

Table B1: Pooled regression for det smallest firms

	(1) ROA	(2) ROA	(3) Profit margin	(4) Profit margin
% Women on board	0.0153***		0.0199***	
	(0.00344)		(0.00283)	
Dummy women on board		0.0102***		0.0132***
		(0.00198)		(0.00173)
Ln of total assets	0.0496***	0.0496***	0.0362***	0.0363***
	(0.000962)	(0.000962)	(0.000958)	(0.000959)
Firm age	0.00120***	0.00118***	0.00151***	0.00149***
	(0.000131)	(0.000132)	(0.000126)	(0.000126)
% Tangible	-0.150***	-0.150***	-0.121***	-0.122***
	(0.00391)	(0.00391)	(0.00395)	(0.00395)
Board size	-0.00894***	-0.00966***	-0.00654***	-0.00747***
	(0.000931)	(0.000948)	(0.000856)	(0.000871)
_cons	-0.614***	-0.614***	-0.472***	-0.472***
	(0.0127)	(0.0127)	(0.0128)	(0.0128)
N	94437	94437	98449	98449
R^2	0.075	0.075	0.060	0.060

Notes: The table shows the results from our pooled cross-sectional regression of share of women on board, dummy women on board and the financial variables on ROA (1-2) and Profit margin (3-4). Sample period is 2002-2020 and for the 25% of the smallest firms in the sample defined by the mean of ln of total assets. The coefficients % Women on board and % Tangible are reported as marginal effects and shows the probability increase in the dependent variable when the independent variable increases by one percent. For Dummy women on board the marginal effect shows the probability increase when the variable change from 0 to 1. Ln of total assets are also reported as the marginal effect and shows that an increase with 1% in the independent variable changes the dependent variable with the coefficient divided by 100. For the remaining variables, firm age and board size, the marginal effects shows the probability increase in the dependent variable when they increase by one unit.

Standard errors are in parentheses, and *, **, *** indicates significance levels of 10, 5 and 1% level, respectively. Robust standard errors are clustered at firm ID.

Table B2: Pooled regression for det largest firms

	(1) ROA	(2) ROA	(3) Profit margin	(4) Profit margin
% Women on board	0.0135***		0.0570***	
	(0.00286)		(0.00435)	
Dummy W on board		0.00574***		0.0206***
		(0.00116)		(0.00163)
Ln of Total assets	0.00406***	0.00403***	0.0100***	0.00987***
	(0.000448)	(0.000448)	(0.000751)	(0.000752)
Firm age	0.000144***	0.000143***	0.000596***	0.000600***
	(0.0000358)	(0.0000358)	(0.0000550)	(0.0000550)
% Tangible	-0.0983***	-0.0982***	0.00978**	0.0106**
	(0.00177)	(0.00177)	(0.00339)	(0.00339)
Board Size	-0.00249***	-0.00277***	-0.00507***	-0.00589***
	(0.000386)	(0.000398)	(0.000544)	(0.000560)
_cons	0.0293***	0.0305***	-0.133***	-0.128***
	(0.00762)	(0.00761)	(0.0124)	(0.0125)
N	200742	200742	199234	199234
R^2	0.055	0.055	0.015	0.014

Notes: The table shows the results from our pooled cross-sectional regression of share of women on board, dummy women on board and the financial variables on ROA (1-2) and Profit margin (3-4). Sample period is 2002-2020 and for the 25% of the largest firms in the sample defined by the mean of ln of total assets. The coefficients % Women on board and % Tangible are reported as marginal effects and shows the probability increase in the dependent variable when the independent variable increases by one percent. For Dummy women on board the marginal effect shows the probability increase when the variable change from 0 to 1. Ln of total assets are also reported as the marginal effect and shows that an increase with 1% in the independent variable changes the dependent variable with the coefficient divided by 100. For the remaining variables, firm age and board size, the marginal effects shows the probability increase in the dependent variable when they increase by one unit.

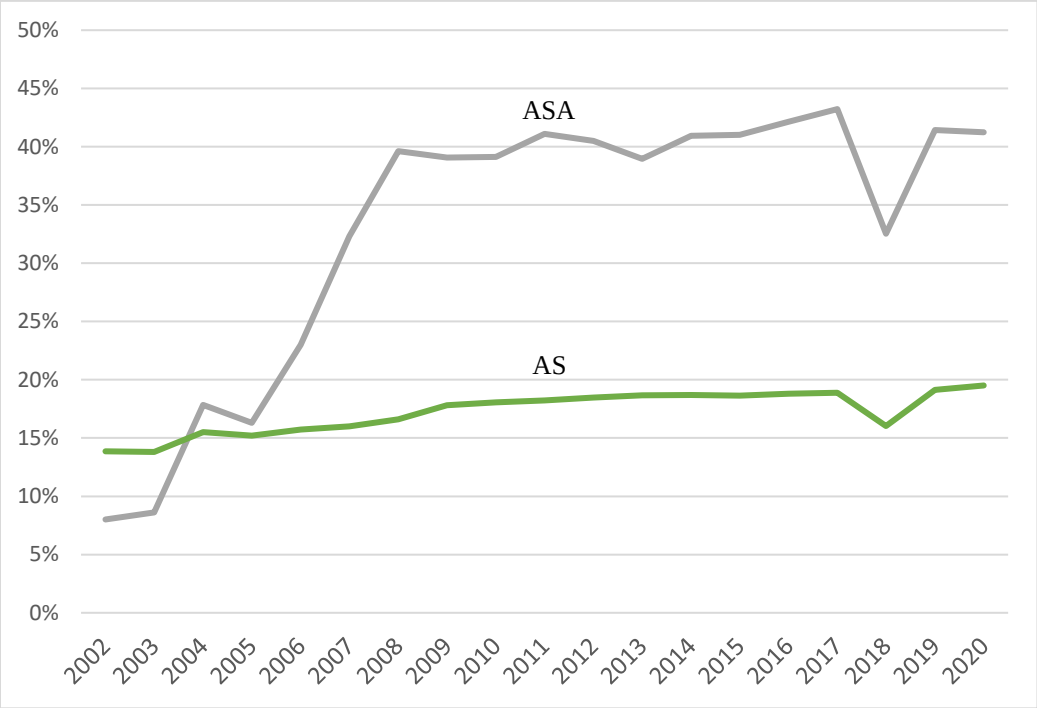
Standard errors are in parentheses, and * , ** , *** indicates significance levels of 10, 5 and 1% level, respectively. Robust standard errors are clustered at firm ID.

Table B3: Descriptive statistics by firm size

	Firm size by mean of ln of total assets	
	25% smallest	25% largest
ROA	-1.08 %	5.80 %
ARG	15.58 %	11.78 %
Profit margin	-2.48 %	4.52 %
Dummy women on board	0.56	0.39
% Women on board	24.84 %	13.04 %
Board size	3.32	4.03
Total assets	768,936.2	61,900,000
Firm age	7.47	17.79
% Tangible	18.68 %	37.91 %

Appendix C**:** Percentage share of women on boards

Table 1C: The percentage share of women on boards for AS and ASA firms in 2002 to 2020.



Appendix D: Subsamples models

Table D1: Fixed effects regression for the period of 2003-2013

	(1) ROA	(2) ROA	(3) Profit margin	(4) Profit margin
% Women on board	0.00639*		0.0101**	
	(0.00322)		(0.00312)	
Dummy ASA x % Women on board	-0.0422		0.0280	
	(0.0429)		(0.0690)	
Dummy women on board		0.00287*		0.00449***
		(0.00125)		(0.00122)
Dummy ASA x Dummy W on board		-0.0120		0.00784
		(0.0199)		(0.0307)
Ln of total assets	0.0516***	0.0516***	0.0430***	0.0430***
	(0.000827)	(0.000827)	(0.000903)	(0.000903)
Firm age	-0.00654***	-0.00654***	-0.00353***	-0.00353***
	(0.000124)	(0.000124)	(0.000120)	(0.000121)
% Tangible	-0.206***	-0.206***	-0.152***	-0.152***
	(0.00289)	(0.00289)	(0.00319)	(0.00319)
Board Size	-0.00634***	-0.00650***	-0.00509***	-0.00533***
	(0.000491)	(0.000501)	(0.000481)	(0.000489)
Firm ASA	0.00266	0.00238	0.00880	0.00898
	(0.0129)	(0.0128)	(0.0191)	(0.0190)
_cons	-0.592***	-0.591***	-0.546***	-0.545***
	(0.0121)	(0.0121)	(0.0133)	(0.0133)
N	357801	357801	365924	365924
R^2	0.077	0.077	0.045	0.045

Notes: The table shows the results from our fixed effect regression of share of women on board, dummy women on board and the financial variables on ROA (1-2) and Profit margin (3-4). Sample period is 2005-2011. The coefficients % Women on board and % Tangible are reported as marginal effects and shows the probability increase in the dependent variable when the independent variable increases by one percent. The coefficient Dummy_ASA x % Women on board is reported as marginal effects and shows the probability increase in the dependent variable for firms when the firm is an ASA in 2008 and share of women increases by one percent. For Dummy women on board the marginal effect shows the probability increase when the variable change from 0 to 1. For Dummy ASA x Dummy W on board, the marginal effect shows the probability increase when the firm is an ASA in 2008 and the dummy women on board goes from 0 to 1. Ln of total assets are also reported as the marginal effect and shows that an increase with 1% in the independent variable changes the dependent variable with the coefficient divided by 100. For the remaining variables, firm age and board size, the marginal effects shows the probability increase in the dependent variable when they increase by one unit.

Standard errors are in parentheses, and *, **, *** indicates significance levels of 10, 5 and 1% level, respectively. Robust standard errors are clustered at firm ID.