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Gender Diversity and Firm Performance

Evidence from Norway 2010-2014

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Abstract

The aim of this master's thesis is to investigate the impact of gender diversity in firms on firm performance using data from Norwegian firms and municipalities. Gender diversity is measured using three regional gender equality indicators measuring the ratio between men and women's share in the labour force, the level of gender balanced business structures and the gender distribution among leaders. The first two indicators are used as proxies for gender diversity at the employee level, whereas the latter is used as a proxy for gender diversity at the management level. Firm financial performance is measured by the accounting measures return on assets and return on equity. The variables for firm performance are calculated using detailed firm level data from a population of Norwegian firms.

The empirical analysis applies ordinary least square regressions, fixed effects regressions and quantile regressions. The results suggest that the effect of gender diversity on firm performance varies across the distribution of the performance variables. Gender diversity has a larger positive effect on firm performance in high-performing firms, and gender diversity at the management level is only positive for the highest-performing firms.

Acknowledgements

This thesis is written as the final piece of work, concluding my master's degree in Strategy and Management and CEMS Master in International Management at The Norwegian School of Economics. It constitutes 30 ECTS points of my major.

During my master's studies, I have taken courses bringing up the topic of diversity in firms and the impact a heterogeneous workforce may have on firm performance. This inspired me to further immerse in the topic of diversity and the effects it may have on organisational outcomes. My supervisor, Professor Astrid Kunze, inspired me to focus on gender diversity.

The existing literature on the effects of gender diversity on firm performance is extensive, but the findings are inconsistent. The empirical evidence from Norwegian firms is mostly related to the introduction of the mandatory 40 percent gender quota, which was imposed on all public limited companies in 2008. I wanted to contribute to the debate with evidence from Norwegian firms, but at a lower organisational level.

Working on this thesis has been a challenging and rewarding process. It has been a great opportunity to learn how to conduct an empirical analysis based on econometric techniques using different methodological approaches. I spent a great amount of time analysing the data and investigating different empirical strategies. In contrast to many past studies using a conditional mean approach assuming the effect of diversity is constant across the firm performance distribution, I decided to use a quantile regression approach which assumes the effect of diversity varies across the distribution.

I would like to thank my supervisor, Professor Astrid Kunze, for excellent guidance and inspirational discussions throughout the process. I would also like to thank family and close friends for their great support. Finally, I would like to thank SNF for providing me with access to detailed firm data which has made it possible to contribute with empirical evidence from Norwegian firms.

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Contents

List of tables

List of regression tables

List of figures

1. Introduction

1.1 Background

Diversity is a term commonly used to express differences among people. A widely used definition is "any attribute that another person may use to detect individual differences" (K. Y. Williams & O'Reilly III, 1998, p. 81). The attributes are often visible, such as gender, age and race. In this thesis, I understand diversity as having a gender mixed workforce with employees possessing different skill-sets and experiences due to their difference in gender. Men and women tend to make different human capital investments, which might be the reason behind the different skills-sets and experiences (Blau, 2014, pp. 181-182). For example, past research find that female directors are tougher monitors and have better attendance records than male directors (Adams & Ferreira, 2009).

Increased globalisation, competition in global markets and demographic changes have contributed to more heterogeneous organisations both in terms of gender, age and cultural diversity (Q. M. Robertson, 2013, pp. 239-253). The female labour participation rate has increased during the last century, which has led to a more gender diverse labour force (OECD, 2004; OECD.stat, 2017). The increased gender diversity results from among other things, policies and measures such as paid parental leave, child care subsidies and gender-specific anti-discrimination laws (OECD, 2004). Although the female labour participation rate has increased, women are still underrepresented in management positions and in boardrooms (Catalyst, 2004).

But why should business leaders care about the gender composition in their firm? The link between gender diversity and its benefits in business is a much-debated topic today, often referred to as the business case for gender diversity (Catalyst, 2004). The business case for gender diversity states that firms who recruit, develop and advance women will achieve better financial results compared to firms with low gender diversity. Furthermore, a diverse workforce is associated with a better leverage of talents, increased innovation, creativity, better reputation and market adaptation (Catalyst, 2014a). There are also challenges related to increased diversity, such as negative attitudes including prejudice and discriminatory behaviour (Joshi & Roh, 2009; Parrotta, Pozzoli, & Pytlikova, 2014). Women can be stereotyped and excluded from networks hindering them from advancement in the corporate environment (Devillard, de Zelicourt, Kossoff, & Sancier-Sultan, 2016).

From an ethical perspective, an increased emphasis on gender diversity and diversity management can therefore be important because it could contribute to reduced discrimination and equal access to opportunities for both genders (Catalyst, 2014b).

The business case argues that gender diversity is no longer only a matter of equality, but can also affect firm performance. Previous research has found both positive, negative and non-significant effects of gender diversity in firms (McMahon, 2010). The mixed results have been a motivation for researchers to study the impact of diversity and investigate the different internal and external contexts that can affect the diversity-performance relationship (McMahon, 2010).

1.2 Goal

This thesis aims to investigate whether gender diversity in firms and firm management has an impact on the financial performance of the firm using population data on all Norwegian firms from the period 2010-2014. The empirical analysis exploits detailed firm level data containing balance sheet information and hence very detailed firm performance measures. The data is not so rich on employee composition measures and I have therefore merged the firm data with very detailed regional level information on indicators of gender equality (data from 425 Norwegian municipalities). I assume that the regional indicators are highly correlated with firm level diversity measures and can therefore be used for a first analysis of this new topic.

I aim to answer the following research question:

What is the effect of gender diversity in firms and firm management on firm financial performance?

The regional indicators are used to measure gender diversity in firms. I use in total three different diversity indicators. Two measuring diversity at the employee level (Diversity Employees, Diversity Businesses) and one at the management level (Diversity Managers). Firm performance is operationalised by the accounting measures return on assets (ROA) and return on equity (ROE). I take out differences between firms by adding control variables, which makes it possible to compare only the levels of diversity.

1.3 Relevance

This thesis contributes to the growing literature on diversity in firms by adding evidence from Norway. Since the study uses population data on all Norwegian firms, not only a sample of firms, it can contribute with unique insights about the gender diversity situation in Norwegian firms. Previous empirical studies have not used regional variables to investigate firm level diversity, thus the study can contribute to the methodical approach of examining diversity when one does not have access to detailed firm level data. Furthermore, the thesis makes a methodological contribution by using a quantile regression approach that investigates the diversity-performance relationship at different points of the performance distribution.

1.4 Structure

The remainder of the thesis is structured as follows: Chapter two presents relevant literature on the link between gender diversity in firms and firm performance. Chapter three presents the data set and the sample used in the analysis. Chapter four outlines the empirical methodology including the regression models. Chapter five contains the empirical analysis which presents the results from the regressions on the diversity-performance relationship. Finally, in chapter six the findings are discussed, together with limitations and suggestions for future research. Chapter seven concludes.

2. Literature Review

In this chapter, empirical results from previous literature are summarised and discussed followed by an overview of the hypotheses I intend to test.

2.1 Gender diversity and firm financial performance

Many studies have investigated the relationship between gender diversity in firms and firm performance (see for example Joecks, Pull, & Vetter, 2013; McMahon, 2010; Q. Robertson, Holmes, & Perry, 2016). Previous research present inconsistent results, and reasons for this can be that the sample, time horizon, performance measures, diversity measures and estimation methods vary across the different studies (Joecks et al., 2013).

Based on surveys of diversity studies (see Joecks et al., 2013; McMahon, 2010; Q. Robertson et al., 2016) I find that previous researchers often use a cross-sectional design, looking at the correlation between diversity and firm performance at different organisational levels, often in the same positions. Different control and dummy variables are added to the model, such as firm size, firm age and industry to account for differences between the firms. This is done, to be able to compare the diversity variable in two otherwise similar firms. Some studies also control for organisational characteristics and processes that are not measurable or difficult to measure, such as organisational learning, organisational culture and management quality. By using a fixed effects approach, such unobserved firm heterogeneity is taken out of the model. Controlling for firm fixed effects can help gaining a deeper understating of the effects of diversity (O. C. Richard, Ford, & Ismail, 2006).

Different measures are used when operationalising gender diversity. Diversity indices are much used in past research and an index that is often referred to is the Blau's Index of Heterogeneity which can range from 0 (no diversity) to 1 (full diversity), depending on the number of groups included (Harrison & Klein, 2007; Q. Robertson et al., 2016). If two groups are included (men and women), the maximum value of the index is 0.5 (men and women are equally represented). Other studies use the proportion of women as a proxy for gender diversity (Adams & Ferreira, 2009; Labelle, Francoeur, & Lakhal, 2015) or dummy variables representing number of women on the board or in the team (Apesteguia, Azmat, & Iriberri, 2010).

It is argued that using indices is a more appropriate way to measure gender diversity than the proportion of women, because it takes into account other groups one is comparing women to, and the distribution of individuals in those groups (Unite, Sullivan, & Shi, 2016). Others argue that using proportions is better because it focuses on the relative number of men and women in a group (Kanter, 1977).

Firm performance is also a broad term including different types for measures. Some studies are using accounting based performance measures, such as return on assets (ROA), return on equity (ROE), return on sales (ROS) and return on investment (ROI). Accounting based measures are based on short-time performance and how the firm has performed in the past (Gentry & Shen, 2010). Tobin's Q is the most used market-based measure of long-run firm performance often used to complement the accounting-based performing measures in studies examining diversity and performance (Q. Robertson et al., 2016). Tobin's Q is only appropriate to use when investigation listed corporations. Results from past studies are not always consistent for the performance measures used because they measure different aspects of firm performance.

2.2 The empirical link between gender diversity and firm performance at different organisational levels

Previous studies examine the diversity-performance relationship at different organisational levels: in the boardrooms, top management teams, management, at the employee level and at the team level. This thesis is mainly investigating diversity at the employee level and at the management level. I complement the literature review by using literature on diversity in teams and boardrooms to achieve a broader understanding of the topic.

2.2.1 Team level diversity

At the team level, both the reviewed studies by Hoogendoorn et al. (2013) and Apesteguia (2012) are field experiments.

Hoogendoorn et al. (2013) estimate how the share of women in a business team can impact its financial performance (team sales and profits) using mean and median regressions. The median approach is used to examine if the results are sensitive to outliers. The field experiment was made with Dutch undergraduate students from five study fields within business studies.

As a part of their curriculum they had to start a real business and run it over a period of one year. The students were randomly assigned to 45 different 12-person teams, conditional on their gender. The results from the OLS regressions revealed that the teams having a share of women between 50 and 60 percent outperformed both male and female dominated teams. The gender-performance relationship follows an inverse u-shape, which means that when women are a minority or a majority the performance is worse compared to when the genders are equally represented. This is an important insight to business leaders; if there are enough equally qualified men and women, the firm will benefit from having a 50-50 gender composition in their teams.

Apesteguia (2010) uses data from three editions (2007-2009) of a large online business game with almost 38 000 participants from 90 different countries. The participants were divided into teams of three and had to take real business decisions. The incentives to win were strong. The winning teams were awarded with a cash prize, a trip and the possibility to be offered a job at the firm organising the competition. The results from the ordinary least squares and fixed effects regressions show that teams formed by only women are outperformed by both gender-mixed teams and teams of only men. The gender-mixed teams had the highest performance levels[1].

In sum, the investigated literature at the team level finds a positive relationship between gender diversity and team performance using an ordinary least squares approach. The optimal team composition is when the share of each of the genders is about 50 percent. The research at the team-level does not compare diversity in equal occupations, since the team members may have different educational backgrounds.

2.2.2 Employee level diversity

In research exploring employee diversity some studies have collected data based on surveys (see for example O. C. Richard et al., 2006), archival data (see for example Frink et al., 2003; Herring, 2009), register data (see for example Parrotta et al., 2014) and self-reported information from employees (see for example Gonzalez & Denisi, 2009). When using survey data measurement errors may be a problem, causing downward biased coefficients (J. M.

[1] Hansen et al. (2006) investigates the impact of gender diversity in student groups and find that male dominant groups perform worse in group projects than mixed-gender and female-dominated groups, also after controlling for other groups characteristics.

Wooldridge, 2016, pp. 320-322). The studies using archival and register data have access to larger numbers of samples, often measured over time (Q. Robertson et al., 2016), thus the chance of statistically significant results is bigger.

Herring (2009) uses a U.S. sample of profit maximising businesses from the National Organisations Survey from 1996-1997 and finds a direct, positive effect of diversity on performance using a cross-sectional approach controlling for legal form, industry, firm size and firm age. Frink et al. (2009) find a similar correlation also using a sample of 291 firms obtained from the National Organisations Survey. The study also finds a nonlinear diversity-performance relationship by adding squared terms of the diversity measure, the fraction of women in the firm, to the model. The results suggest that the performance of the firm increases up to a point where the female representation is 50 percent and decreases with a further growth in the fraction of women. This finding is consistent with the results from the team level literature.

According to Richard et al. (2006), firm contextual factors such as organisational processes, structure, culture and environment must be considered when modelling the diversity-performance relationship. In a study surveying 79 U.S. bank officers the relationship is investigated in the context of organisational structure (span of control) and the life-cycle stages of a firm[2]. A narrow span of control means that a firm has a high number of managers, whereas a firm with a broad span of control has more distance between its managers and employees. Richard et al. (2006) find a positive effect of diversity on firm performance when the firm has a structure with a narrow span of control, but argues that which structure is the most effective depends on the stability of the environment the organisation operates in. Furthermore, they find that firms in the earlier stages of development benefit more from having a diverse workforce compared to firms in later stages of development. This implies that the effect of diversity will decrease when the firm gets older. The study uses a cross-sectional approach investigating the firms at only one point in time.

In a cross-sectional study of a sample of 26 units of a regional restaurant chain in the U.S., Gonzales and Denisi (2009) find a positive curvilinear relationship between the gender diversity and the return on profits and productivity if the diversity climate in the firm is

[2] The organisational structure is measured in span of control. The span of control is defined as the fraction of managers and officials of the total number of employees. The organisational life cycle is divided into four stages: start-up, growth, mature and decline.

supportive. If the organisational environment does not support diversity, the link to performance is negative. In such an environment, the managers can be hindered from focusing on the financial performance of the firm. Gonzales and Denisi (2009) support Richard et al. (2006) and argue that contextual factors can mitigate the impact of diversity on performance.

The impact of the industry the firm belongs to is also investigated. Ali et al. (2011) use Australian archival data and find that the strength of the diversity-performance relationship may be affected by the industry type the firm is operating in when interacting the gender diversity measure with industry type. Services are consumed with production, which leads to a high interaction between the customer and the firm employees. Manufacturing activities require less involvement from the customer with the employees involved in the production process. The results from the conditional mean regression reveal that service industries are better at capitalizing on the positive effects of gender diversity, due to their greater interaction among employees and with customers.

In a more recent study, Ali et al. (2015) investigate the diversity-performance relationship in the context of the presence of work-family programs by using a hierarchical multiple regression approach adding interaction terms and independent variables in steps to the model. The study is using surveys and publicly available data on 198 Australian publicly listed companies. Ali et al. (2015) find that diversity has a stronger effect on performance in firms with many work-family programs such as flexible hours and maternity leave policies. At the management level, diversity had a negative effect on performance in firms with few work-family programs[3]. Ali et al. (2015) argue that few work-family programs can signal to managers that the employer does not value diversity.

Parrotta et al. (2012) use linked employer-employee data to analyse the effect of workplace diversity on the productivity of firms in Denmark. They address a potential endogeneity problem in the diversity index used, and attempts a causal relationship by using the diversity at the commuting area level as an instrument for workforce level diversity. The results from the first stage two-stage least squares regression reveal that the diversity at the commuting area level can be considered as a relevant instrument for firm level diversity.

[3] Bloom et al. (2010) also study the effect of work-family programs, but find that when controlling for good management practices, the positive correlation between firm productivity and work-family programs disappears. Their findings indicate that firms with high fractions of women and good management practices are more likely to adopt work-family programs.

In sum, the investigated literature at the employee level fins both direct and non-linear diversity-performance relationships. Furthermore, most of the positive and significant relationships are not direct relationships, but appear through interactions with different contextual factors such as organisational structure, life-cycle stages, diversity climate, industry type and work-family programs.

2.2.3 Management level diversity

Previous studies examining gender diversity at the managerial level are often limited to the top management group (Dwyer, Richard, & Chadwick, 2003). Dwyer et al. (2003) extend this research and use a broader definition of the management group, including senior executives, middle managers, department managers and supervisors. The managers are involved in different parts of the strategy of the firm (B. Wooldridge & Floyd, 1990). When considering both the top managers responsible for the overall strategy of the firm and the decision-making processes, and the lower-level managers doing the strategic implementation (B. Wooldridge & Floyd, 1990), the realisation of the diversity benefits are seen from a broader perspective (Dwyer et al., 2003).

Also at the management level, the role of context is investigated. Dwyer et al. (2003) study responses from 177 U.S. bank leaders and HR executives using a cross-level regression analysis adding variables and interaction terms in steps. The findings reveal a positive effect of having a clan organisational culture, focusing on teamwork, integration and team cohesiveness, whereas the effect is negative in firms pursuing an adhocracy culture with an external, results-focused orientation. Additionally, they find that firms with a strong growth orientation also benefit from having a diverse workforce contributing with different perspectives, experience and creativity which can help the firm to target new markets.

In a later study, Richard, Barnett, Dwyer and Chadwick (2004) investigate how an entrepreneurial orientation and having a positive attitude towards risk influences the diversity-performance relationship using a same sample of 153 U.S. banks. In firms having an innovative orientation the relationship was u-shaped, meaning that both high and low levels of gender diversity were associated with higher productivity measured by net income per employee. When the attitude towards risk was added to the model, the relationship between management group heterogeneity and productivity was inverted u-shaped for firms with a positive attitude towards risk, meaning that groups with moderate diversity performed better than groups with high or low levels of diversity. The authors argue that homogenous groups might not have the ability to grow in a competitive environment in a strategic context with high risk, whereas a management group with an equal distribution of men and women will be able to gain performance advantages by capitalising on the positive effects diversity brings.

In sum, the investigated literature at the management level finds non-linear diversity-performance relationships driven by contextual factors such as organisational culture, entrepreneurial orientation and attitude towards risk. A weakness with the investigated literature on the management level is that many the studies are based on small samples of U.S. banks.

2.2.4 Boardroom diversity

Two often cited studies by Adams and Ferreira (2009) and Ahern and Dittmar (2012) which investigate the impact of gender diversity on boardroom performance, find a negative effect of increased female representation on corporate boards[4]. A study by Conyon and He (2017) is also interesting because it applies a quantile regression approach, which is currently a less used empirical approach within the diversity-performance research.

In an analysis of firm characteristics and boardroom directors of 2000 U.S. firms in the period 1996-2003, Adams and Ferreira (2009) find that gender-diverse boards are tougher monitors and that the higher fraction of women on boards[5], the better attendance records. In firms that have weak governance, the effects of increased diversity positively affect performance, whereas in already well-governed firms imposing gender quotas could have a negative impact on firm performance and lead to over-monitoring. On average, they find that gender diversity does not add value to the firm. Adams and Ferreira (2009) address a possible endogeneity issue when using the fraction of female board directors as a proxy for boardroom diversity. Once firm effects are added, the link between diversity and performance turns negative. This could imply that the effect of diversity on performance was driven by omitted firm specific factors absorbed by the error term, causing an endogeneity problem. Reverse causality is also mentioned as a concern because firm performance may affect the selection of female directors.

[4] In an Australian study by Vafaei et al. (2015) board diversity is found to be positively associated with financial performance. The fraction of total board seats in other firms with female directors is used as an instrument in the 2SLS estimation. Labelle et al. (2015) find that the diversity-performance relationship is positive in firms voluntary adopting laws to promote gender diversity, whereas in countries using a regulatory approach the relationship is negative.

[5] Hoogendoorn et al. (2013) also find that monitoring is more intense in gender-mixed teams.

The fraction of male directors with board connections to female directors is used as an instrument in a two-stage least squares (2SLS) estimation to address this concern[6].

Ahern and Dittmar (2012) use data on board and director characteristics pre- and post the Norwegian gender quota imposing 40 percent of the board directors of publicly listed Norwegian firms to be female.[7] The paper concludes that the introduction of the gender quota had a negative effect on Tobin's Q[8]. Once director characteristics, such as their level of experience is controlled for, the gender composition has no effect on firm value.

Conyon and He (2017) investigate the relationship between firm performance and boardroom gender diversity in 3000 U.S. firms from 2007-2014, assuming the gender diversity effect is not equal for the whole distribution of the performance measures Tobin's Q and ROA. The results reveal that the effect of diversity is larger for the highest performing firms. The researchers argue that high-skilled women will be matched with high-performing firms. High performing firms are likely to be better managed than low-performing firms. Consequently, high-performing firms will most likely be better at utilising the talent of the female board members, resulting in a stronger effect on the firms' performance[9].

The investigated literature at the boardroom level finds both positive and negative effects of increased gender diversity, depending on the methodological approach. The studies using fixed effects and 2SLS estimation find negative effects of increased boardroom diversity, but on average, the effect of an increased fraction of women on corporate boards appears to have no effect. Studies using the quantile regression approach find both positive and negative effects depending on the part of the performance distribution investigated.

[6] Carter et al. (2010) also address the problem of endogeneity and reverse causality and use a 3SLS estimation, which accounts for both potential endogeneity and cross-equation correlation. They investigate a sample of the firms in the S&P 500 index for the period 1998-2002.

[7] The law was passed in 2003 and in 2008, all public limited Norwegian firms had to comply. In 2010, the average percent of women on Norwegian boards was 39 %.

[8] Related is also Matsa and Miller (2011) who provide evidence on accounting performance consistent with Ahern and Dittmar (2012).

[9] The quantile regression approach is also used by Solakoglu (2013) and Dang & Nguyen (2014). Solakoglu (2013) uses Turkish data and finds results consistent with Conyon and He (2017). Dang & Nguyen (2014) uses French data and find contradicting results between ROA and Tobin's Q. When ROA is the dependent variable, boardroom gender diversity is positively affecting firm performance only for the lower quantiles (10th to 40th). When Tobin's Q is the dependent variable, the results are consistent with Conyon and He (2017).

2.3 Summary of previous literature

By reviewing previous literature, I have gained insights into the diversity-performance relationship at different organisational levels. Past research has indeed found evidence supporting the link between diversity and different organisational outcomes, where financial performance is the most investigated context. I find that previous empirical studies examining the effect of gender diversity on firm performance present inconsistent results. Positive, negative, non-linear and non-significant effects are found. The results are not always consistent across organisational levels, diversity measures, performance measures, contextual factors and estimation methods. Different empirical strategies are used, but the main approach in many studies is to look at the correlation between diversity and firm performance in the same positions, conditional on a set of variables. The empirical methods are often more advanced at the boardroom level, where both fixed effects and 2SLS estimations are used. The findings from past studies highlight the complexity of the diversity-performance relationship.

This thesis uses population data on all Norwegian firms, not only a sample of firms. The data includes small and large firms, and firms with different performance levels. Based on the previous findings on the employee and management level, I make the following predictions:

Hypothesis 1a: Gender diversity in firms is positively related to firm performance.

Hypothesis 1b: Gender diversity in the firm management is positively related to firm performance.

Based on the previous findings investigating the diversity-performance relationship at different points of the performance distribution it is proposed that:

Hypothesis 2a: Gender diversity has a larger positive effect on firm performance in high-performing firms.

Hypothesis 2b: Gender diversity in the firm management has a larger positive effect on firm performance in high-performing firms.

3. Data and sample

This chapter firstly introduces the data set and then describes the selected data sample which the empirical analysis is based upon. The variables used in the empirical methodology are also defined. An overview of all the variables used can be found in appendix A.

3.1 Data description

The final data set used in this empirical study is created by merging data from two different sources. The first data source is the Institute for research in Economics and Business Administration (henceforth SNF) which has provided me with detailed accounting data on Norwegian firms. The second data source is Statistics Norway (henceforth SSB) which publishes data on gender equality in Norwegian municipalities[10].

3.1.1 SNF data/Firm data

The data set received from SNF is an unbalanced panel with 4.010.511 observations of Norwegian firms from the period 1992 to 2014 (Berner, Mjøs, & Olving, 2015). The data set is based on firm population data which SNF has received from the Brønnøysund Register Centre[11]. The data set includes a substantial number of variables, both business and accounting variables, which provide detailed company information. The data from SNF does not contain a sample of firms, but consists of all Norwegian firms (Berner et al., 2015). Having access to data on the whole population of firms in Norway makes the SNF data set valuable and unique, and much used among researchers and students at the Norwegian School of Economics.

3.1.2 SSB data/Gender equality data

The SSB data consists of 12 indicators on gender equality in Norwegian municipalities which are considered the most relevant in describing differences in regional gender equality (Hirsch Aaby & Lillegård, 2009). Each of the municipalities get a scaled score for each of the indicators, making the different indicators and municipalities comparable. The indicators have

[10] The SSB data is publicly available at ssb.no. The indicators are generated based on available register statistics (Hamre & Egge-Hoveid, 2016).
[11] The data is registered in the accounting database Bisnode D&B Norway AS, and SNF has together with Menon Business Economics AS bough the data. The only changes made are standardisation of variable names, file structures and troubleshooting. Some of the firm variables are added from other sources. The industry groups are obtained from SSB.

a score which varies between 0 and 1. A score of 1 indicates maximum gender equality and 0 indicates maximum gender inequality. The basis of each of the indicators is that the genders are equally represented when the score equals 1 (the share of men and women is equal). A score of less than 1 on an indicator imply that there is a larger share of either women or men. The indicators do not favour one of the genders (Egge-Hoveid, 2013). Despite that, when investigating the shares further, the share of women is often lower and a source of a lower indicator score.

The indicator scores are not dependent on the level of welfare in the municipality, solely on how the available resources are distributed and the participation of the genders (Egge-Hoveid, 2013). If the possibility to participate in the labour force is favouring one of the genders, the indicator score will be affected negatively. The 12 indicators are divided into two groups and cover gender equality along six dimensions (Egge-Hoveid, 2013). The first group cover institutional and structural frameworks for equality, whereas the second group covers the local adaptations of men and women (Hamre & Egge-Hoveid, 2016).

Based on the 12 indicators an overall gender equality index is calculated for each of the municipalities (Hirsch Aaby & Lillegård, 2009). The index also ranges between 0 and 1 which makes it possible to compare the overall gender equality in the municipalities, but also compare regions. Since different indicator scores can result in the same score on the overall index, two municipalities with the same level of gender equality could still differ.

SSB has published the equality index for the Norwegian municipalities since 1999. The index was reviewed in 2009 and the calculation method became more comprehensive, and indicators have been added or removed from the index (Hirsch Aaby & Lillegård, 2009). I use the data from 2010-2014, to avoid using data from both pre-and post the revision. I do not use the index as a variable, but I use some of the indicators the index is based on which I find the most relevant to make inference on gender diversity if firms.

The EU has also created an index to measure gender equality in the member countries across four dimensions (Plantenga, Remery, Figueiredo, & Smith, 2009). Norway has gained international attention for being one of few countries which has good enough data at a regional level to create a regional index. A critique of the indices is that not all aspects affecting gender equality can possibly be included in one index. The EU and SSB has decided on which variables to include in the indices.

3.1.3 The merged data sets

The SNF data does not contain variables which could be used to make inference about the workforce diversity in the individual firm[12]. To gather this information, I have merged the information on firms from the SNF data base with regional data on gender equality in Norwegian municipalities from SSB. The data sets are merged using the municipal code as primary key. Because the firms in the SNF data set are given a municipal code, it is possible to extract information on how all the firms located in a municipality perform.

The merged data set consist of in total 1.321.296 observations covering the period 2010-2014. The data set in an unbalanced panel, which means that not all the firms appear in the data for the whole period investigated. The data set consists of selected variables describing different firm characteristics such as industry, number of employees, the legal form of the firm and different accounting variables such as sales revenues, total assets, total income and total equity. Furthermore, the data set includes the 12 gender equality indicators. New variables have also been generated based on the information in the population data from SNF, such as return on assets, return on equity and a variable for firm age. All the firm variables, indicators and new variables are listed in appendix A.

3.2 The sample selection

The selection rules that I have applied, have led to a final sample consisting of 152.776 observations. The selected rules applied and the sample is presented in table 1. The final sample in row (11) is used in the empirical analysis.

I have excluded the firms that are categorised as inactive in the data. Firms that are inactive have missing observations on several of the accounting variables. Furthermore, only firms with the legal form AS and ASA are kept in the sample. The variable *selskf* in the data set gives detailed information on the legal form of the firm. There are in total 42 legal forms included in the data. Since I am measuring firm performance, the firms who have an accounting obligation are of main interest. The accounting obligation applies to all limited companies (AS) and public limited companies (ASA) (Altinn, 2017). General partnerships

[12] The data set does contain a variable representing the proportion of women on the board of directors. I will not investigate the gender diversity at the boardroom level.

such as ANS and DA can also have an accounting obligation based on their sales revenues and number of employees. Since the reporting on the employee variable is poor, I only keep AS and ASA in the sample.

Moreover, I have excluded all the firms with sales revenues below 10.000.000 NOK. This is to exclude sole proprietorships and small firms with low revenues. The sample represents only the largest firms in the original data set. It seems like the data collection for the large firms is better compared to the smaller firms when looking at the missing values. I have also done some sample selections based on missing values such as removing firms with missing municipal number, industry group, performance measures and firms which are not properly matched with indicator scores. A small number of the observations on the indicator *score1* have been measured above 1, which indicates a mistake in the data collected from SSB since the indicators should have values between 0 and 1. I have therefore removed the indicator scores for indicator 1 measured above 1.

Table 1: Sample selections

	Number of observations	**Number of removed observations**
(0) All observations of Norwegian firms from 2010-2014.	1.321.296	
(1) Removing inactive firms	1.267.316	53980
(2) Keeping firms with the legal form ASA, and AS	1.083.037	184279
(3) Removing firms with sales revenues below 10.000.000 NOK	155.478	927559
(4) Removing firms with missing municipal number	155.477	1
(5) Removing firms not matched with indicator scores	154.332	1145
(6) Removing firms with missing industry group	153.215	1117
(7) Removing firms with missing return on assets (ROA)	153.208	7
(8) Removing firms with missing return on equity (ROE)	153.195	13
(9) Removing indicator scores for score1 that are measured above 1	152.809	386
(10) Removing indicator scores equal to 0	152.776	33
(11) Complete sample	**152.776**	

I have a total number of 152.776 observations in my final sample. The number of firms is almost equal for all years. Each firm is identified by a unique nine-digit organisation number. The number of firms for each of the years 2010 to 2014 are presented in the table 2 below:

Table 2: Number of firms per year

2010	**2011**	**2012**	**2013**	**2014**	**Total**
27.747	29.770	30.911	31.547	32.801	152.776

I have a total number of 2094 observations at the municipal level in my final sample. Each municipality is identified by a unique municipal code. The number of municipalities for each year from 2010 to 2014 is presented in the table 3 below:

Table 3: Number of municipalities per year

2010	**2011**	**2012**	**2013**	**2014**	**Total**
425	416	411	421	421	2094

The number of municipalities in Norway change somewhat because of for example municipal mergers (Statistics Norway, 2017).

3.3 Variable descripton and measurement

In the following part, I present the variables included in the sample which are used in the empirical methodology and analysis in chapter four and five. I also provide arguments supporting the choice of dependent, independent and control variables.

3.3.1 Depentent variables

This thesis employs two measures of firm performance, where return on assets (ROA) and return on equity (ROE) are the main performance indicators. An industry adjusted ROA will be used when testing the robustness of the empirical model to increase the quality and reliability of the results.

Return on assets (henceforth ROA) is constructed from information in the SNF data on the firm profit/loss of the year divided by the total assets of the firm (*sumeiend*). In this thesis ROA is *aarsrs/sumeiend*. *aarsrs* is measured by deducting the tax expenses of the firm from the profit/loss before tax expenses (*resfs-sumskatt*) and equals the net income of the firm. ROA is a widely-used measure of firm performance and indicates how profitable a firm is relative to its assets. The higher the ROA, the more profits the firm is earning on its assets.

Return on equity (henceforth ROE) is as ROA constructed from information in the SNF data. It is determined by dividing the firm profit/loss of the year by the firm equity (*ek*), hence expressing the ratio of income to firm equity. ROE is expressing how much profits a firm generates with the money the shareholders have invested in the firm.

The industry-adjusted ROA is a variable indicating how well a firm performs compared to the other firms in the same industry. This is done by first creating a variable representing the mean ROA for each of the industries. This industry mean is then deducted from the firm ROA of each firm, creating a variable representing the firms' performance relative to its industry.

The chosen indicators are all expressing different firm performance measures and are used as proxies for firm financial performance. ROA and ROE are two of the most used measures for yearly accounting profitability (James G. Combs, 2005) and much used in studies investigating the relationship between diversity and performance (Q. Robertson et al., 2016). I therefore use ROA and ROE to explain firm performance. Both represents ratios, but are often presented as percentages. In this thesis, I primarily present ROA and ROE as ratios.

3.3.2 Independent variables

While the dependent variables are measured at the firm level, the independent variables are measured at a regional level (municipal level). In this thesis three indicators which are calculated based on fractions are used as proxies for gender diversity in firms. The indicators measure gender diversity at the employee level (*Diversity Employees, Diversity Businesses*) and at the management level (*Diversity Managers*). I assume the diversity at the firm level is correlated with the diversity at the municipal level, so I can use the regional indicators to make inference about firm level diversity.

The indicator *Diversity Employees* can represent a proxy for gender diversity at the firm level. It is calculated as the ratio between men and women's labour force participation rate and describes the difference in distribution of time between work and household care between men and women. One can argue that if a municipality has a high score on this indicator, meaning that women and men are equally active in the labour force[13], the firms located in that municipality should on average employ a high fraction of women. *Diversity Businesses* is also used as a proxy for gender diversity at the firm level. This indicator measures the degree of gender balance in all the businesses in a municipality. A high score on this indicator means that the businesses in a municipality are gender balanced. The opposite happens if some businesses are male dominated and others are female dominated, then the business structure in the municipality is not gender balanced. This can indicate horizontal segregation, meaning that men and women are differently distributed across occupations (Blau, 2014, p. 142).

At the employee level the indicators used (*Diversity Employees* and *Diversity Businesses*) measure the overall diversity in the firm and do not distinguish between occupations or positions. Even though the gender composition in the firm is mixed and the score on the indicators reveal a high level of equality, men and women can still be unequally distributed across occupations.

Diversity Managers represents the share of female managers in the firms in a municipality. This indicator can represent a proxy for gender diversity in management. If a municipality has a high score on the indicator representing the gender distribution among leaders, it could imply that the firms located in that municipality on average have a high fraction of female managers. A low value on this indicator can be a sign of vertical segregation where men and women systematically have different positions in the firm hierarchy (Blau, 2014, p. 142).

The definition of manager in the data set from SSB is based on the standard codes for occupational classification. All employees classified with “1. Managerial occupations” are counted as managers (Hamre & Egge-Hoveid, 2016). The data does not specify who belongs to the different levels of management. A broader definition of a manager that goes beyond the top management team members is therefore used in this thesis, consistent with (Dwyer et al., 2003).

[13] The labour force is the sum of persons in employment and unemployed (Hamre & Egge-Hoveid, 2016).

3.3.3 Control variables

The control variables added, are motivated by previous research on the relation between gender representation on boards and in firms, and firm performance (see for example Adams & Ferreira, 2009; Carter, Souza, Simkins, & Simpson, 2010; Labelle et al., 2015; Q. Robertson et al., 2016). Variables representing firm age, firm size and industry are added to control for other factors than diversity that can determine the financial performance of the firm.

Firm age (*alder*) represents the age of the firm and is generated by the difference between the current accounting year and the year of incorporation, retrieved from the SNF data (*stiftaar-aar*). The age of the firm has according to literature a negative effect on firm performance, meaning that firm performance gets worse with age (Conyon & He, 2017; Vafaei et al., 2015). Firm age is hence added as a control for potential firm life-cycle effects. Firms in earlier life stages might have less formalised structures and as a reason be better at capitalising on the positive effects of diversity (Ali, Metz, & Kulik, 2015). In the empirical analysis, the logarithm of firm age is used (*log_alder*).

Firm size can be measured by using data on total assets, sales revenues or number of employees. This study uses the logarithm of total assets as the measure of firm size (*log_str*). Sales revenues and number of employees are used in robustness tests. The variable representing the number of employees in the firms has a lot of missing values, indicating a poor data collection on this variable. Firm size has according to previous literature a positive effect on firm performance (Doğan, 2013). Because of entry barriers, larger firms can profit from a more effective production and economies of scale (Besanko, 2004, pp. 199-204). Some studies also find a negative link between firm size and performance (Vafaei et al., 2015), which can be due to conflicts of interest and information asymmetry in large firms (Labelle et al., 2015). This reveals that it is difficult to predict the direction of the effect of firm size, but firm size is clearly important for the level of firm performance.

Industry represents a dummy variable indicating which industry each firm in the sample belongs to. The firms in the data set are divided into 14 different industry groups (see table 5). The relation between gender diversity in firms and firm performance can vary between industries because men and women are differently distributed across industries (Frink et al., 2003; Herring, 2009). Furthermore, it is argued that a diverse workforce is especially valuable in service firms due to the interaction with customers and among employees (Ali, Kulik, & Metz, 2011; Ali et al., 2015). Industry dummies are added to control for industry effects.

3.4 Firm characteristics and outcomes

This part of the thesis presents summary statistics of the sample used in the empirical analysis. The relationship between the three diversity indicators and the two firm performance measures is also presented graphically.

Table 4 shows the mean statistics for the variables included in the data sample. Due to missing data for some of the firms, the total number of observations vary from the number in the complete sample (table 1, row (11)). The measures on the accounting characteristics express that the firms in the sample are on average doing well between 2010-2014. The average firm in the sample has a ROA of ~ 6 %, ROE of 34.6%, sales revenues of 133 M NOK, total assets of 171 M NOK, an average yearly profit of 9,8 M NOK. The average firm age is ~ 16 years.

Table 4: Summary statistics of the sample

	Mean	**p10**	**Median**	**p90**	**Std. Dev**	**Min.**	**Max.**
ROA	.0598777	-.0716591	.0659183	.2401916	7.109052	-2494.058	834
ROE	.3463892	-.2014987	.2328328	1.296113	21.33153	-5228.333	1214
Ind.adj ROA	-.000	-.1681025	-.0004029	.1779731	7.107462	-2492.702	834
Sales revenues	133587.6	11592	25107.5	139958	2906606	10000	4.80e+08
Total assets	171145.2	3817	12175	123314	4661562	1	7.80e+08
Profit/loss	9772.021	-913	801	7428	405641.7	-1.32e+07	7.00e+07
Equity	61183.23	301	3275	36721	1944685	-2964460	3.58e+08
Firm age	15.8761	3	13	30	13.57545	1	160
N	150318						

All numbers are in 1000 NOK. ROA and ROE are presented as ratios, not as percentages.

3.4.1 The dependent variables

Return on assets

The average ROA of ~0.060 implies that for every 1 NOK a firm invests in assets during the accounting year, 0.060 NOK of net income is generated. Compared to previous studies on gender diversity and firm performance using ROA as performance measure, the obtained mean

ROA is consistent with numbers that have been reported in other studies[14]. Whether a ROA of 6 % is respectable or not, depends on the industry the firm is operating in. Table 5 presents the mean and median of ROA for each of the 14 industry groups.

Return on equity

The average ROE of 0,346 means that for every 1 NOK shareholders invest in the firm, 0.34 NOK of net income is generated. In comparison to previous studies using ROE as a measure of firm performance, the mean ROE obtained from the sample is rather high[15].

Table 5: ROA and ROE by Industry group

	Industry group	Mean ROA	Median ROA	Mean ROE	Median ROE	*N*
1	Primary industries	.0607684	.0418455	.2916725	.173339	3024
2	Oil/Gas/Mining	-1.382309	.057778	.42076	.1848621	1470
3	Manufacturing industries	.0566751	.0548357	.0584861	.1617174	17145
4	Energy/Water/Sewage/Util.	.0481395	.0419726	-.3336703	.1056738	2360
5	Building / Construction	.1052843	.0805956	.4462802	.2842309	25630
6	Trade	.0545479	.0645899	.2876608	.2267541	51326
7	Shipping	-.0371356	.0119342	.5500711	.0993571	2441
8	Transport, Tourism	.0393671	.0546116	-.1576759	.2305825	11228
9	Telecom/IT/Media	.0770106	.0834062	.0974023	.2696221	7092
10	Finance, Insurance	-.0123432	.1271545	1.097668	.2705615	803
11	Real Estate, Services	.2674697	.0477519	.9416492	.1837315	5321
12	General services	.0953277	.0968046	.8288887	.3790009	16082
13	Research & Development	-.0040822	.0352465	.0499009	.1105321	342
14	Public sector/Culture	.0698674	.0589321	.7677172	.2425693	6054
Total		.0598777	.0659183	.3463892	.2328328	150318
N		150318				

Some of the industries have a negative ROA and ROE, which can indicate that the firm has a negative profit. One reason for this can be that the firms are newly established, which means that they have not started to generate profits yet (Pervan & Višić, 2012). When a firm has a positive ROA it does not mean the ROE is also positive. Although both ROA and ROE are generated with the same variable as the numerator, the denominators differ. Some industries

[14] Labelle et al. (2015)/Cross-country: 4.8 %, Carter et al. (2010)/U.S.: 3.9 %, Adams and Ferreira (2010)/U.S.: 4.52 %, Vafaei (2015)/Australia: 6.6%

[15] Vafaei et al. (2015)/Australia: 8.9%, Dwyer et al. (2003)/U.S.: 13 %

are known for having high assets such as oil and gas industries, whereas other industries do not require much assets such as firms in the service industry that mainly depend on human assets. The ROA might therefore be higher in the service firms, compared to firms in the oil and gas industry.

The summary statistics reveal high variation in the performance measures. As seen in table 4 some of the observations on ROA and ROE have an extreme minimum or maximum value which can imply a potential problem with outliers in the sample. Outliers are observations with large residuals i.e. observations with extreme values which in some cases can influence the regression results (R. Williams, 2016). This is accounted for in the empirical methodology.

3.4.2 The independent variables

The three diversity indicators used in this thesis have a value ranging between 0 and 1, where 0 indicates maximum gender inequality and 1 indicates maximum gender equality.

Table 6: Summary statistics of the gender diversity indicators used in the study

Indicator	Mean	Median	Std. Dev	Min.	Max.
Diversity Employees	.9294357	.93	.0183782	.65	1
Diversity Businesses	.6110858	.61	.0888354	.31	1
Diversity Managers	.7024907	.69	.076898	.3	1
N	150318				

Figure 1: Development of the gender diversity indicators 2010-2014

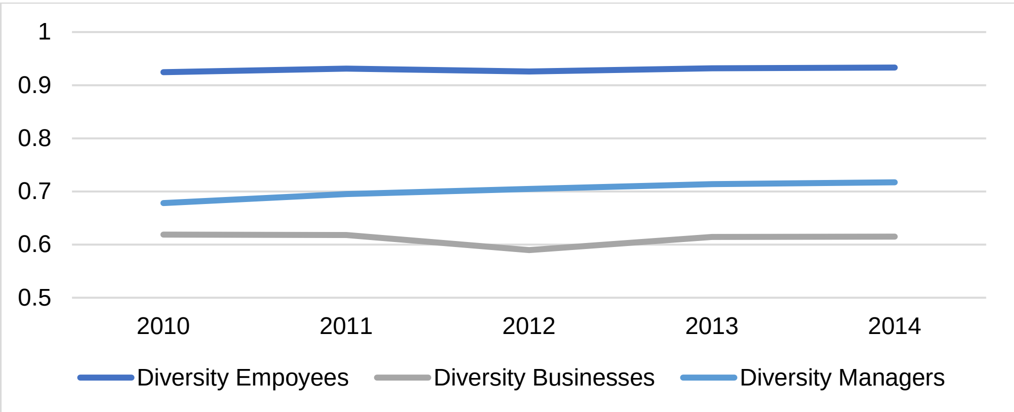


Figure 1 shows that the diversity indicators are stable in the event window investigated. Having stable, stationary indicators is a positive sign and makes them good to use in regressions.

Figure 2: Distribution of indicator Diversity Employees

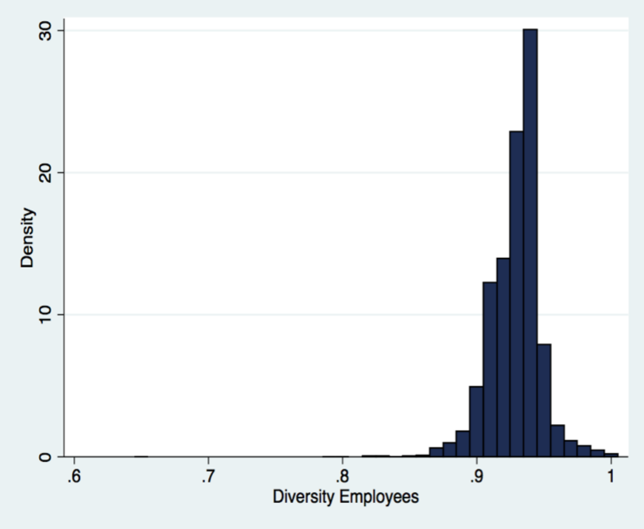


Figure 3: Distribution of indicator Diversity Businesses

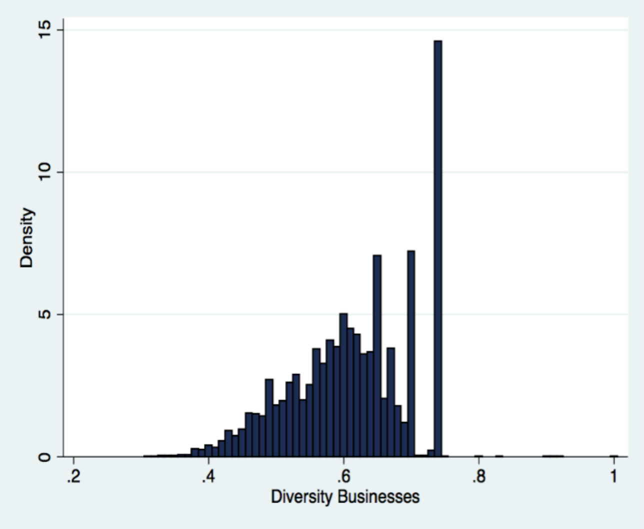


Figure 4: Distribution of indicator Diversity Managers

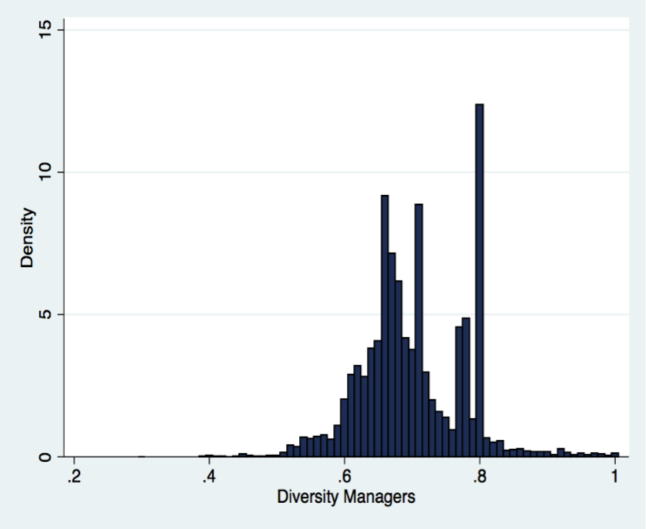


Figure 2, 3 and 4 show how the scores on the three indicators are distributed. The indicator representing the diversity at the employee level (Diversity Employees) has a mean of 0.92, which indicates that the average firm in the sample is located in a municipality with a relatively equal fraction of men and women in the labour force. The municipality with the lowest gender diversity, has a score of 0.65. One can therefore conclude that the gender diversity is relatively high in most of the firms in the data.

Diversity Businesses which also represents the employee-level diversity, varies between 0.31 and 1 which indicates a much larger spread in how the municipalities perform in terms of how gender balanced their business structure is. The mean value is 0.611, which suggests a medium level of gender diversity. The indicator representing diversity at the management level varies between 0.3 and 1. A mean value of 0.7 means that the average municipality has a relatively high gender diversity among its leaders, which suggests that the firms in the data have a relatively high level of diversity.

I conclude that there is enough variation in the indicators to use them in a regression analysis. Descriptions and summary statistics for all the gender equality indicators from SSB are listed in appendix A.

3.4.3 The correlation between the dependent and independent variables

Based on figures (5-10), it seems like there is a relationship between diversity (measured by the regional indicators) and firm performance (measured by ROA and ROE) using the firms in the sample. The red line visualises how gender diversity is related to firm performance. The dots represent the actual observations of ROA and ROE. In all graphs, the relationship between the diversity indicators and the performance measures appears to be slightly positive. The relationship seems to be stronger at the employee level (figure 5-8) compared to the management level (figure 9 and 10). To be able to see a clear relationship between the variables I had to restrict the values of ROA to values between -1 and 1 (ROA of -100 % and 100 %) and the values of ROE to values between -5 and 5 (ROE of -500 % and 500 %).

A correlation matrix showing how all the variables used in the data set are correlated can be found in table 11 in appendix A. Also, the correlation coefficients reveal a positive relationship between gender diversity and performance outcomes but all the correlation coefficients are small. Further evidence on the diversity-performance relationship is provided in the results chapter.

Figure 5: ROA and Diversity Employees

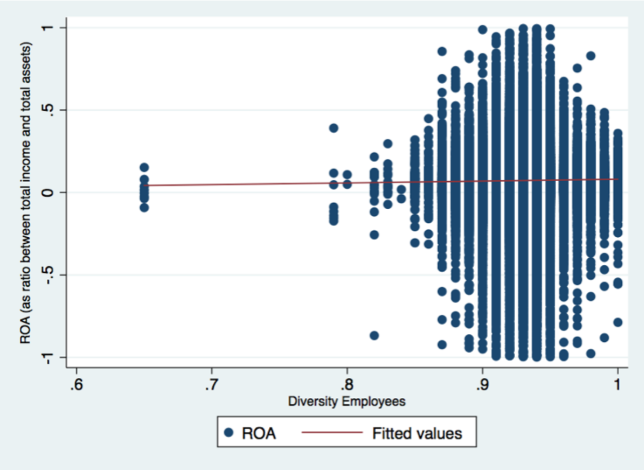


Figure 6: ROE and Diversity Employees

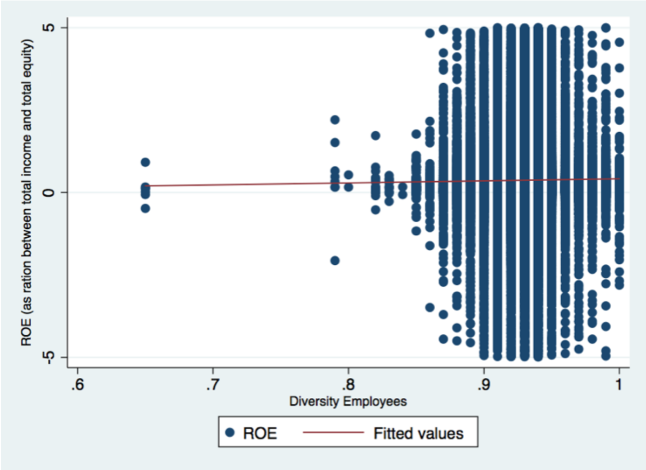


Figure 7: ROA and Diversity Businesses

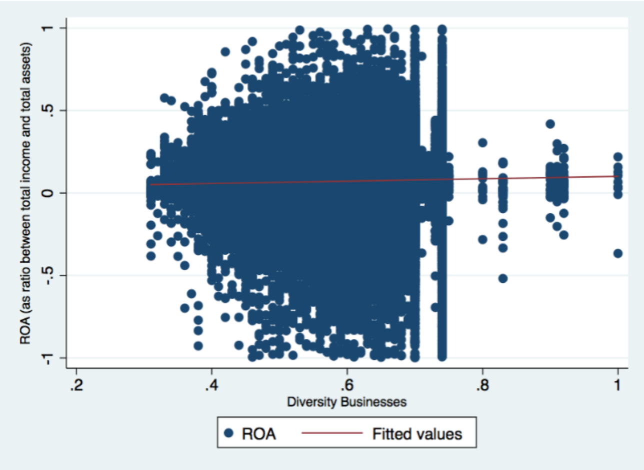


Figure 8: ROE and Diversity Businesses

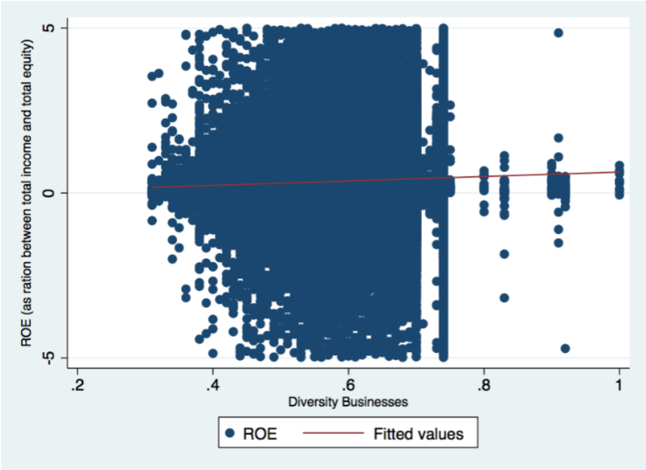


Figure 9: ROA and Diversity Managers

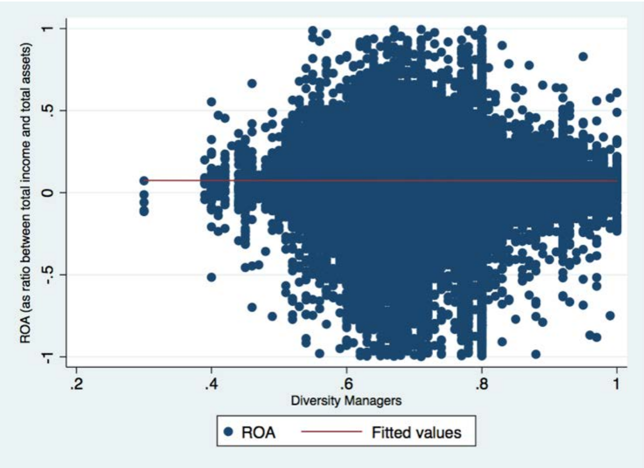
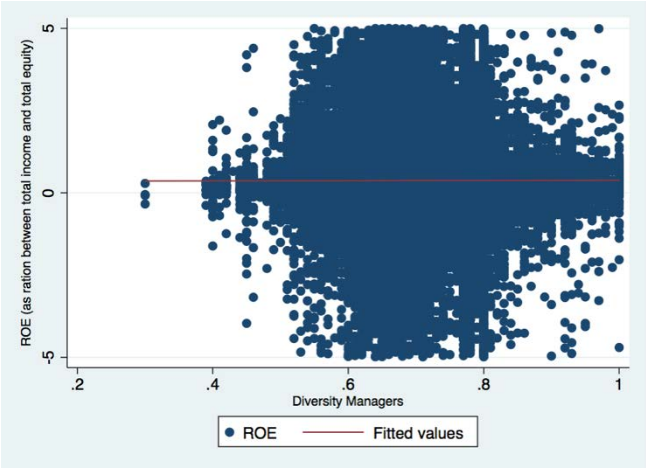


Figure 10: ROE and Diversity Managers



4. Empirical Methodology

In this part of the thesis, I present the methodological approach selected to investigate the relationship between gender diversity in firms and firm performance. The first part covers the theoretical approach, whereas the second part presents and explains the regression models.

4.1 Regression methods

The empirical analysis in this paper applies three different types of regression models to test whether an increase in diversity leads to improved firm performance, and to test the hypotheses presented in chapter two.

The first model is a pooled OLS regression model which predicts the average value of the dependent variable conditional on the independent variables. The second model is a fixed effects regression model which controls for unobserved firm heterogeneity. The third model is a quantile regression model which predicts the quantile of the dependent variable conditional on the independent variables.

4.1.1 Pooled OLS regression

Pooled OLS is often the starting point when using panel data. The method implies that all the years 2010-2014 are being pooled together, treating all the observations as independent from one another (J. M. Wooldridge, 2016, pp. 402-425). This means that an observation of a firm in one year will be independent of an observation of the same firm one year later. The pooled OLS regression equation can be written as follows:

$$Firm\,performance_{i,t} = \beta_0 + \beta_1 DIV_{k,t} + \beta_2 \boldsymbol{X}_{i,t} + v_{i,t} \tag{1}$$

$$v_{i,t} = \alpha_i + u_{i,t}$$

$Firm\,performance_{i,t}$ represents ROA and ROE for firm i in year t. $DIV_{k,t}$ represents the diversity indicators (Diversity Employees, Businesses and Managers) in municipality k in year t. $\boldsymbol{X}_{i,t}$ is a vector representing the control variables. The composite error term is $v_{i,t} = \alpha_i + u_{i,t}$. α_i represents the time-invariant, unobservable firm specific factors whereas $u_{i,t}$ represents the unobserved factors that change over time also called the idiosyncratic error. β_1

represents the change in $Firm\,performance$ caused by a one percentage point change in DIV.

In the pooled OLS model the error terms are pooled together in $v_{i,t.}$ For the model to give unbiased estimates, the composite error term $v_{i,t}\ = \alpha_i + u_{i,t}$ cannot be correlated with any of the independent variables in the model (J. M. Wooldridge, 2016, pp. 432-433). For this assumption to hold, all factors that could affect firm performance and gender diversity must be included in the model. By including control variables some of the differences in performance and gender diversity can be controlled for, but not all differences are observable or possible to add as variables to the model. Since the pooled OLS does not control for the unobservable, time-invariant firm specific factors, α_i, they will be absorbed by the error term and potentially be a source of omitted variable bias if correlated with the variables of interest. Examples of such unobserved characteristics can be management quality, management practices, production technology and company culture. Since these characteristics could be difficult to include as variables in the model, they will end up being absorbed by the error term. If an independent variable is correlated with the error term, it is referred to as an endogenous variable. If such variables are present in a model, an endogeneity problem may occur (J. M. Wooldridge, 2016, pp. 759).

Furthermore, serial correlation can also be a problem because the error terms of the different observations of the same firm can be correlated over time (J. M. Wooldridge, 2016, pp. 412-416). The unobserved factor α_i representing for example the management quality of the firm will most likely affect the firm performance in all the years the firm appears in the data. Substantial autocorrelation could lead to less efficient model estimates.

4.1.2 Fixed effects regression

Random effects and fixed effects estimations are two panel data methods used to control for the unobserved, time-invariant firm effects α_i. In this thesis, I use fixed effects estimation and not random effects estimation because I assume the unobserved firm effects (α_i) are correlated with the explanatory variables. Random effects assume α_i is random and uncorrelated with all the explanatory variables in all time periods (J. M. Wooldridge, 2016, pp. 435-451).

The main assumption for using fixed effects estimation is that the unobserved variables, α_i must be time-invariant (J. M. Wooldridge, 2016, pp. 412-413). Fixed effects estimation eliminates α_i by demeaning the variables using the fixed effects transformation.

I transform equation (1) by taking means:

$$\overline{Firm\ performance}_i = \beta_0 + \beta_1 \overline{DIV_k} + \beta_2 \overline{\boldsymbol{X}}_{\boldsymbol{i}} + \bar{\alpha}_i + \bar{u}_i \tag{2}$$

Then I subtract equation (2) from equation (1):

$$\left(Firm\ perofmance_{it} - \overline{Firm\ performance}_i\right) = \beta_0 + \beta_1 (DIV_{k,t} - \overline{DIV}_{k}) + \beta_2 (\boldsymbol{X}_{\boldsymbol{i,t}} - \overline{\boldsymbol{X}}_{\boldsymbol{i}}) + \cancel{(\alpha_i - \bar{\alpha}_i)} + (u_{it} - \bar{u}_i) \tag{3}$$

Fixed effects exploit how much each observation differs from the firm average (J. M. Wooldridge, 2016, pp. 435-451). The fixed effects transformation sweeps out all firm fixed, time-invariant variables α_i and leaves only the error term $u_{i,t}$.

Doing a fixed effects estimation is equivalent to adding a dummy variable for each of the firms to the regression model (J. M. Wooldridge, 2016, pp. 435-451). One drawback with the fixed effects estimation method is that time-invariant, observable factors such as industry type also are swept out from the model.

Since the pooled OLS model might suffer from omitted variable bias, I run a fixed effect regression to account for this under the assumption that the omitted variables such as company culture and management practices do not vary over time and are firm specific.

4.1.3 Quantile regression

Quantile regressions are used to capture the potential impact of gender diversity at different points of the distribution of the performance measures of ROA and ROE (Dang & Nguyen, 2014). Quantiles are used to describe the distribution of the dependent variable. The 0.50 quantile equals the 50th percentile, often referred to as the median. Compared to the OLS model which estimates the effects of gender diversity conditional on the mean of firm performance, the quantile model estimates the effects of gender diversity on firm performance conditional on different quantiles of firm performance (Dang & Nguyen, 2014; Koenker & Hallock, 2001). It is therefore possible to compare the firms with the lowest firm performance with the ones that have the highest firm performance. Many previous studies investigating the diversity-performance relationship assume the effect of gender diversity is constant across the distribution of the performance variable (Conyon & He, 2017). I test this assumption by using quantile regressions.

Furthermore, quantile estimates are more robust to outliers (J. M. Wooldridge, 2016, p. 300). Because I see a potential problem with outliers in my data, quantile regression is used to take account for the extreme values of the dependent variables. The median regression is therefore considered to be more efficient than the mean regression (OLS) (Koenker & Bassett, 1978).

$Q_{\tau}(Firm\,performance_i|X_i)$ represents the τth quantile regression function, Q(0.1), Q(0.25),Q(0.5), Q(0.75) and Q(0.90):

$$Q_{\tau}(Firm\,performance_i|X_i) = \beta_{\tau} + \beta_{\tau}DIV_k + \beta_{\tau}\boldsymbol{X_i} + u_i \tag{4}$$

$Firm\,performance_i$ represents ROA and ROE for firm i in year t. represents ROA and ROE at five different points of its distribution: quantile 0.1, 0.25, 0.50, 0.75 and 0.90. $DIV_{k,t}$ represents the diversity indicators: Diversity Employees, Businesses and Managers in municipality k in year t. $\boldsymbol{X}_i$ is a vector representing the control variables. The error term u_i represents the idiosyncratic error. β_{τ} represents the change in quantile τ of $Firm\,performance$ caused by one a one percentage point change in DIV.

4.2 Regression spesifications

In this section, the regression models used in the empirical analysis are developed and presented. I first present the model that could have been used if gender diversity indicators at the firm level would have been available, consistent with the reviewed literature. Second, I present my preferred model where the gender diversity indicators at the municipality level are used directly in the model as proxies for the gender diversity at the firm level. All the models are estimated using the statistical software STATA[16].

[16] I use the reg, xtreg and qreg commands to estimate the models. See the do-file in appendix C to see how the commands are used in more detail.

4.2.1 Model with diversity indicators at the firm level

To investigate the effect of gender diversity on a firm's financial performance I assume:

$$Firm\ performance_{i,t} = \beta_0 + \beta_1 DIV_{i,t} + \beta_j \boldsymbol{X}_{i,t,j} + \alpha_i + u_{i,t} \tag{5}$$

$Firm\ performance_{i,t}$ represents ROA and ROE for firm i in year t. $DIV_{i,t}$ represents the diversity indicators: Diversity Employees, Businesses and Managers in firm i in year t. $\boldsymbol{X}_{i,t,j}$ is a vector representing the j control variables. α_i represents the time-invariant, unobservable firm specific factors whereas $u_{i,t}$ represents the unobserved factors that change over time. $\beta_1$represents the change in firm performance resulting from one unit change in the firm level diversity indicators.

This model could have been used if the indicators were measured at the firm level. As I only have data regarding diversity at the regional level (for each municipality in Norway), the model must be adjusted.

Two endogeneity problems are often addressed in past diversity studies: omitted variables and reverse causality problems. In the model using the gender diversity indicators at the firm level, one could argue that there could be an endogeneity problem when examining the diversity-performance relationship, which means that the explanatory variable DIV could be correlated with the error term and cause biased estimates. For example, DIV could be correlated with other firm characteristics I do not have data on, or are difficult to measure such as good management practices or firm culture (Adams & Ferreira, 2009; J. M. Wooldridge, 2016, pp. 462-488). Having a diverse workforce might affect the management practices in the firm, but since the management practices are not controlled for in the model it will be absorbed by the error term. Parts of the estimated effects of DIV on firm performance would as a result come from the omitted variables in the error term which are correlated with DIV. The omitted factors could also impact $Firm\ performance$ directly. As previously explained, a fixed effects approach can be used to address this concern.

Furthermore, the causality between the dependent and independent variables can be problematic. It is difficult to examine whether firms with high financial performance allow for higher diversity, or if firms with a diverse workforce increase the firm financial performance. In the case of the variable DIV being an endogenous variable, the zero-conditional mean assumption is violated and the OLS regression results from equation (5) would give biased coefficient estimates (J. M. Wooldridge, 2016, pp. 61-92). In such a case an instrumental variable regression could be used to estimate a causal relationship between firm performance and diversity (Adams & Ferreira, 2009; Carter et al., 2010; Vafaei et al., 2015). An instrumental variable z, correlated with the endogenous variable DIV but not with the error term or the dependent variable, could be used in a two stage least squares estimation (2SLS) to address the possible endogeneity problem.

Instrumental variables have been used in a few studies investigating the relationship between diversity and performance (Adams & Ferreira, 2009; Carter et al., 2010; Parrotta et al., 2014; Vafaei et al., 2015). Parrotta et al. (2014) use diversity at the commuting area level as an instrument for workplace level diversity, arguing that firms located in areas where the labour diversity is high, are more likely to employ a more diverse workforce[17]. Based on Parrotta et al. (2014) one could argue that the indicators for regional diversity, $DIV_{k,t}$, where the subscript k, t represents the diversity indicator in municipality k in year t, could have been used as an instrument for $DIV_{i,t}$:

$$DIV_{i,t} = \pi_0 + \pi_0 DIV_{k,t} + \varepsilon_{i,t} \tag{6}$$

$DIV_{k,t}$ is assumed to be correlated with $DIV_{i,t}$, but not with the error term $\varepsilon_{i,t}$. The explanatory variable $DIV_{k,t}$is most likely not correlated with the unobserved firm characteristics in the error term. If I would have had data on diversity at the firm level, regional diversity could for the above mentioned reasons have been a good instrument for $DIV_{i,t}$.

4.2.2 Main model with diversity indicators at the municipal level

Since I use indicators measuring diversity at the municipal level, I adopt the following regression model in the empirical analysis of this thesis:

$$Firm\ performance_{i,t} = \beta_0 + \beta_1 DIV_{k,t} + \beta_j \boldsymbol{X}_{\boldsymbol{i},t,j} + \alpha_i + u_{i,t} \tag{7}$$

[17] Adams and Ferreira (2009) uses the fraction of male directors with board connections to female directors as an instrument. Vafaei et al. (2015) uses the fraction of total board seats in other firms with female directors as an instrument.

In this model, the municipal gender diversity variable $DIV_{k,t}$ is used directly in the regression model and represents the different diversity indicators in municipality k at time t. All firms located in the same municipality will as a result have the same score on the diversity indicators.

I intend to compare firms that are otherwise equal, but have different levels of employee and management diversity. I add control variables in stages to test the consistency of the results. The four different regression models used in the empirical analysis are presented in regression equation (8)-(11). The models are based on regression equation (7).

Regression model 1: with the diversity indicators and year dummies

The first regression is a simple linear regression estimating the relationship between firm performance (ROA and ROE) and the diversity indicators (Diversity Employees, Businesses and Managers). The coefficient β_1 represents the change in $Firm\ performance$ caused by a one percentage point change in DIV. $\boldsymbol{Year}_{c,t}$ is a vector representing year dummies for c =2011-2014. The base year is 2010 and is therefore omitted. t= 2011-2014 and when $c = t$ the dummy gets the value 1, otherwise 0. δ_c is the coefficient estimate for year c and captures time-spesific effects.

$$Firm\ performance_{i,t} = \beta_0 + \beta_1 DIV_{k,t} + \delta_c \boldsymbol{Year}_{c,t} + \alpha_i + u_{i,t} \tag{8}$$

Regression model 2: with age and size controls

I include firm size and firm age as controls in the second regression model. The coefficient on firm size represents the logarithm of the total assets of firm i in year t. The coefficient on firm age represents the logarithm of the difference between the year of incorporation and the current accounting year of firm i in year t. The coefficients $\frac{\beta_2}{100}$ and $\frac{\beta_3}{100}$ represent the unit change in $Firm\ performance$ caused by a 1% change in $Firm\ Size$ and $Firm\ Age$.

$$\begin{aligned} Firm\ performance_{i,t} & \\ &= \beta_0 + \beta_1 DIV_{k,t} + \delta_c \boldsymbol{Year}_{c,t} + \beta_2 Firm\ Size_{i,t} + \beta_3 Firm\ Age_{i,t} \\ &+ \alpha_i + u_{i,t} \end{aligned} \tag{9}$$

Regression model 3: with industry dummy

In regression 3 I also include dummy variables for the industry groups in the model, to control for industry effects. There are 14 different industry groups included and $\delta_g Industry\ Group_{i,g}$ gets the value 1 when firm i is in industry group g. The base group is industry group 1 (Primary industries). Men and women can be differently distributed across industries, and parts of that effect can be captured by controlling for industry effects. δ_g represents the increase or decrease in the expected firm performance from operating in an industry other than the base group.

$$\begin{aligned} &Firm\ performance_{i,t} \\ &\quad = \beta_0 + \beta_1 DIV_{k,t} + \delta_c \boldsymbol{Year}_{c,t} + \beta_2 Firm\ Size_{i,t} + \beta_3 Firm\ Age_{i,t} \\ &\quad + \delta_g Industry\ Group_{i,g} + \alpha_i + u_{i,t} \end{aligned} \tag{10}$$

Regression model 4: with firm fixed effects

In regression 4 I run regression model 3 controlling for firm fixed effects. Since the industry the firm is operating in does most likely not change over time, the industry coefficients cannot be recovered and will be swept out of the regression.

$$\begin{aligned} &Firm\ performance_{i,t} \\ &\quad = \beta_0 + \beta_1 DIV_{k,t} + \delta_c \boldsymbol{Year}_{\boldsymbol{c,t}} + \beta_2 Firm\ Size_{i,t} + \beta_3 Firm\ Age_{i,t} \\ &\quad + u_{i,t} \end{aligned} \tag{11}$$

Clustered standard errors

Clustered standard errors are used in the pooled OLS and fixed effects regressions to account for within-cluster correlation. The firm standard errors are assumed to be independent between the different firms, but because of the diversity indicators being equal for all the firms in a municipality this assumption is violated (J. M. Wooldridge, 2016, pp. 449-450). A cluster variable (*cid*) is generated using the municipal code and the organisation number, and is used as the cluster id. The standard errors are therefore clustered at the firm level. The clustered standard errors allow for correlation between the unobservable variables for all the firms located in the same municipality.

5. Results

In this chapter, I present the main findings from the regression analyses along with robustness tests. The results are discussed in the next chapter. My main approach has been to compare firms with various levels of diversity, to see if there are differences in performance resulting from different levels of gender diversity at the management and employee level.

5.1 Pooled OLS and fixed effects regression results

The regression tables 1.1-1.3 report results from the OLS and fixed effects regressions of model 1-4. In column (1) and (6) I run a OLS regression without the diversity indicators.

The results from the OLS and fixed effects regressions display the conditional mean effects of gender diversity (the three diversity indicators) on firm performance (ROA and ROE). The regression results are mixed, which makes it difficult to draw conclusions about the effects of gender diversity (both at the employee and management level) on firm performance.

Regression table 1.1 displays the effect of diversity at the employee level on firm performance. In column (1) and (6), only the control variables and industry effects are added to the regression to learn about the effect of different firm characteristics on performance. Both firm age and firm size have a positive effect on ROA and a negative effect on ROE. The coefficients on firm age are statistically significant for both ROA and ROE. The coefficient on firm size is only significant for ROE. The contradictory effects of firm size and firm age on firm performance can result from the way the performance measures are calculated. Firm age and firm size can have different effects on total assets (ROA) and equity (ROE). 1 % increase in firm size is associated with a 0.000174 percentage point increase in ROA and a -0.00107 percentage point decrease in ROE. 1 % increase in firm age is associated with a 0.000152 percentage point increase in ROA and a -0.000895 decrease in ROE. A small percentage change in firm size and firm age does not have a large effect on firm performance.

In column (2) and (7) the results from model 1 show that employee diversity has a positive effect on both ROA and ROE, but the relationship is not statistically significant. An increase in the diversity indicator from 0 to 1 (minimum to maximum gender diversity in firms) is associated with a 15 percentage points increase in ROA (e.g. from 0.06 to 0,21) and a 201.7 percentage points increase in ROE (e.g. from 0.346 to 2.363). Since none of the indicators included have values below 0.3, going from 0 to 1 on the diversity indicator is unrealistic. A better way to interpret the coefficients in this case can be the following: increasing the diversity indicator by 0.01 (1 percentage point) (e.g. from 0.3 to 0.31) is associated with a 0.15 percentage point increase in ROA (e.g. from 0.06 to 0.0615). For ROE, the average change is 2.017 percentage points (e.g. from 0.346 to 0.36617). The effect on firm performance will be the same, not matter how the initial level of the diversity indicator is (e.g. 0.50 to 0.51 will have the same effect on performance as 0.60 to 0.61).

In model 2 I control for the effects of firm age and firm size. The effect of diversity on ROA and ROE slightly decreases and still none of the relationships are significant. The effects of firm size and firm age are as in column (1) and (6) low of magnitude with the same levels of significance. It is not surprising that a 1% change in firm size and firm age do not have large effects on firm performance.

In model 3 I control for industry effects adding 14 industry dummies (group 1= primary industries is the base group). When controlling for industry effects the sign on the diversity indicator in the model with ROA changes and becomes negative, but still not significant. In the model with ROE, the magnitude also decreases. Some of the variation in firm performance can be explained by effects related to industry specific factors.

In model 4 I control for firm effects by running a fixed effects regression. The effects of diversity on firm performance become negative for ROA, and even more negative for ROE. The coefficients on firm size also change signs. Some of the variation in firm performance is explained by firm effects that are time invariant and not included in the model, such as management quality or corporate culture. When these effects are controlled for, the effects of diversity are no longer as strong. Still, none of the coefficients are statistically significant at any level.

Regression table 1.2 also displays the effects of diversity at the employee level on firm performance, but measured with the diversity indicator representing how men and women are distributed across industries. The diversity-performance relationship is positive in all the models, expect for in model 3 when the dependent variable is ROA. When firm specific factors are controlled for in model 4, the sign on the diversity coefficient becomes positive for ROA, and decreases for ROE. In model 2 (see column (8)) the diversity-performance relationship is significant at the 10%-level, but this effect becomes non-significant when industry and firm specific factors are controlled for (model 3 and 4). The magnitude, sign and significance of firm size and firm age are similar to the regression results in table 1.1.

Regression table 1.3 displays the effects of diversity at the management level. All the coefficients on management diversity are positive, except for in model 4 when firm effects are added to the model with ROA as the dependent variable (column 5). The coefficient on diversity in column (10) doubles when firm effects are added. The magnitude, sign and significance of firm size and firm age are similar to the results in regression table 1.1 and 1.2.

The error terms in model 1-4 are rather high for the diversity indicators which can be one of the reasons behind the non-significant diversity-performance relationships. This suggests that the model has weaknesses in representing the actual diversity-performance relationship. Since the OLS model predicts the average value of the dependent variable conditional on the independent variables the extreme values can also affect the coefficient estimates.

R^2 represents the proportion of the variance in firm performance that is explained by the model. Adjusted R^2 adjusts for the number of variables in the model (J. M. Wooldridge, 2016, pp. 756,766). In model 1, 2 and 4 the adjusted R^2 has a negative sign when ROA is the dependent variable[18]. The sign is positive in the regressions in column (1) and (6) when the diversity indicators were not included. Adjusted R^2 turns negative when the unexplained part in the model is larger than the total variation. If R^2 is low, an adjustment for the number of predictors can lead to an adjusted R^2 below 0. One of the reasons behind the negative adjusted R^2 can come from the fact that firms can have plants located in different regions which can lead to a multicollinearity problem. I cannot distinguish between single- and multi-plant firms in the data. Still when the adjusted R^2 is positive (columns (4), (7), (8), (9)) it is not very high. This can imply that there are other variables not included in the model that could explain the diversity-performance relationship.

The results from the OLS and fixed effects regressions are mixed and do not suggest a significant relationship between the chosen gender diversity indicators and firm performance measured in ROA and ROE when taking the mean of the whole distribution of firm performance. It is therefore difficult to draw conclusions about the relationship between ROA

[18] When running the regressions without the clustering of the standard errors, the adjusted R^2 is still negative.

or ROE, and the gender diversity indicators. I do not have enough evidence to conclude on hypothesis 1a and 1b.

Regression table 1.1: OLS and fixed effects regression results with Diversity Employees as the independent variable

	Model 1-4									
	Dependent variable: ROA					Dependent variable: ROE				
	(1) **Without indicator**	(2) **Model 1**	(3) **Model 2**	(4) **Model 3**	(5) **Model 4**	(6) **Without indicator**	(7) **Model 1**	(8) **Model 2**	(9) **Model 3**	(10) **Model 4**
Diversity Employees		0.150	0.138	-0.100	-0.236		2.017	2.237	1.886	-1.876
		(0.3838)	(0.4525)	(0.6763)	(0.6692)		(2.3382)	(2.3395)	(2.2105)	(6.3052)
Log(Firm Age)	0.0174**		0.0172**	0.0175**	0.0265	-0.107*		-0.145**	-0.108*	-0.0343
	(0.0074)		(0.0084)	(0.0074)	(0.0442)	(0.0597)		(0.0577)	(0.0597)	(0.4165)
Log(Firm Size)	0.0152		0.000514	0.0152	-0.386***	-0.0895**		-0.0730**	-0.0903**	0.868***
	(0.0667)		(0.0413)	(0.0670)	(0.0249)	(0.0381)		(0.0296)	(0.0382)	(0.2345)
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	No	No	Yes	No	Yes	No	No	Yes	No
Firm fixed effects	No	No	No	No	Yes	No	No	No	No	Yes
R^2	0.000484	0.000022	0.000027	0.000485	0.002288	0.000298	0.000043	0.000118	0.000300	0.000155
Adjusted R^2	0.000358	-0.000011	-0.000020	0.000352	-0.405123	0.000171	0.000010	0.000072	0.000167	-0.408128
Observations	150318	150318	150318	150318	150318	150318	150318	150318	150318	150318

Standard errors in parentheses
Robust standard errors, adjusted for clustering at the municipality level, are presented in parentheses.
* p<0.10, ** p<0.05, *** p<0.01

Regression table 1.2: OLS and fixed effects regression results with Diversity Businesses as the independent variable

	Model 1-4									
	Dependent variable: ROA					Dependent variable: ROE				
	(1) **Without indicator**	(2) **Model 1**	(3) **Model 2**	(4) **Model 3**	(5) **Model 4**	(6) **Without indicator**	(7) **Model 1**	(8) **Model 2**	(9) **Model 3**	(10) **Model 4**
Diversity Businesses		0.0576	0.0586	-0.0620	0.179		0.886	0.985*	0.667	0.565
		(0.2067)	(0.2650)	(0.4104)	(0.2342)		(0.5604)	(0.5786)	(0.5615)	(2.2062)
Log(Firm Age)	0.0174**		0.0174**	0.0174**	0.0263	-0.107*		-0.142**	-0.106*	-0.0353
	(0.0074)		(0.0079)	(0.0076)	(0.0442)	(0.0597)		(0.0584)	(0.0601)	(0.4165)
Log(Firm Size)	0.0152		0.000231	0.0157	-0.386***	-0.0895**		-0.0778**	-0.0949**	0.868***
	(0.0667)		(0.0426)	(0.0700)	(0.0249)	(0.0381)		(0.0306)	(0.0400)	(0.2345)
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	No	No	Yes	No	Yes	No	No	Yes	No
Firm fixed effects	No	No	No	No	Yes	No	No	No	No	Yes
R^2	0.000484	0.000022	0.000027	0.000485	0.002288	0.000298	0.000043	0.000118	0.000300	0.000155
Adjusted R^2	0.000358	-0.000011	-0.000020	0.000352	-0.405123	0.000171	0.000010	0.000072	0.000167	-0.408128
Observations	150318	150318	150318	150318	150318	150318	150318	150318	150318	150318

Standard errors in parentheses
Robust standard errors, adjusted for clustering at the municipality level, are presented in parentheses.
* p<0.10, ** p<0.05, *** p<0.01

Regression table 1.3: OLS and fixed effects regression results with Diversity Managers as the independent variable

	Model 1-4									
	Dependent variable: ROA					Dependent variable: ROE				
	(1) **Without indicator**	(2) **Model 1**	(3) **Model 2**	(4) **Model 3**	(5) **Model 4**	(6) **Without indicator**	(7) **Model 1**	(8) **Model 2**	(9) **Model 3**	(10) **Model 4**
Diversity Managers		0.0899	0.0890	0.0124	-0.0132		0.895	0.951	0.836	1.614
		(0.1121)	(0.1317)	(0.1640)	(0.2479)		(0.6825)	(0.6870)	(0.6445)	(2.3357)
Log(Firm Age)	0.0174**		0.0173**	0.0174**	0.0264	-0.107*		-0.144**	-0.107*	-0.0330
	(0.0074)		(0.0083)	(0.0074)	(0.0442)	(0.0597)		(0.0578)	(0.0596)	(0.4165)
Log(Firm Size)	0.0152		0.000382	0.0151	-0.386***	-0.0895**		-0.0742**	-0.0913**	0.869***
	(0.0667)		(0.0414)	(0.0670)	(0.0249)	(0.0381)		(0.0299)	(0.0386)	(0.2345)
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	No	No	Yes	No	Yes	No	No	Yes	No
Firm fixed effects	No	No	No	No	Yes	No	No	No	No	Yes
R^2	0.000484	0.000023	0.000028	0.000484	0.002287	0.000298	0.000051	0.000126	0.000306	0.000158
Adjusted R^2	0.000358	-0.000011	-0.000019	0.000351	-0.405125	0.000171	0.000017	0.000079	0.000173	-0.408123
Observations	150318	150318	150318	150318	150318	150318	150318	150318	150318	150318

Standard errors in parentheses
Robust standard errors, adjusted for clustering at the municipality level, are presented in parentheses.
* p<0.10, ** p<0.05, *** p<0.01

5.2 Quantile regression results

The regression tables 2.2-1.3 report results from the quantile regressions of regression model 3.

The results suggest that the relationship between firm performance and gender diversity is increasing with the quantile (Q10-Q90). The higher the quantile, the stronger is the relationship. This supports hypothesis 2a and 2b. Gender diversity and the female representation in management has a larger positive effect on firm performance in high-performing firms.

When gender diversity is measured at the employee level (see regression table 2.1 and 2.2) the diversity-performance relationship is significant for almost all quantiles. The relationship is positive for quantile Q50-Q90, and the magnitude of the coefficients is increasing with the quantile. At the median level (Q50) when the diversity indicator is measured by the Diversity Employees indicator (table 2.1, column 3) I find that a one percentage point increase in gender diversity is associated with a 0.042 percentage point increase in ROA (e.g. from 0.06 to 0.06042), and a 0.160 percentage point increase in ROE (e.g. from 0.346 to 0.3476). At the median level the magnitude of the diversity coefficient on ROA lies above the mean regression

(OLS) coefficient which is -0.100 and above the coefficient on ROE which is 1.886 (see column (4) and (9) in table 1.1).

In regression table 2.1 and 2.2 column (10) the coefficients on the diversity indicators at the employee level for quantile 0.9 (Q90) are almost four times larger than for quantile 0.75 (Q75). An increase in the diversity indicator from e.g. 0.9 to 0.91 is associated with an increase in ROE from e.g. 0.06 to 0.082 which is an evident change. This can imply that the firms located in this part of the performance distribution are similar in characteristics, such as level of equity and type of industry which makes them benefit more from a gender equal workforce.

Gender diversity at the management level exhibits different results (see regression table 2.3). The results are negative and significant for all the quantiles, except Q90 in column (5). When the dependent variable is ROE, the coefficients on the diversity indicators turn positive, which can imply that gender diversity in management is only positively related to firm performance in the highest performing firms. A one percentage point increase in diversity at the management level (e.g. from 0.8 to 0.81 on the indicator) is associated with a 0.236 percentage point increase in ROE (e.g. from 0.346 to 0.34836). In percent, this would mean that the ROE would increase from 34.6 % to 34.836 %.

As seen in regression table 2.1-2.3, firm age and firm size decrease when the quantile increases, indicating that the relationship between firm age or firm size, and firm performance turns negative for high values of the performance measure. Firm performance decreases when firm age and firm size increases. The magnitudes of the coefficients on firm size and firm age are low, as in the OLS regressions. At the median, 1 % increase in firm size is associated with a -0.00007 percentage point decrease in ROA (column (3)).

Compared to the OLS and fixed effects regressions the error terms are much smaller and almost all the diversity-performance relationships are statistically significant. I find evidence supporting hypothesis 2a. The effect of gender diversity on firm performance is not constant across the performance distribution of the firms. The firms in the upper part of the distribution tend to have a stronger effect of increased gender diversity in the workforce. Furthermore, I find that gender diversity among managers is associated with higher firm performance for the firms in the highest quantile (Q90) of the performance distribution, which supports hypothesis 2b.

The Pseudo R^2 is the R^2 used in quantile regression and describes how much of the variation in the quantile the model is explaining. The Pseudo R^2 is highest for the highest quantiles, (approximately 3% of the variation in the quantile is explained by the variables included in the model).

Regression table 2.1: Quantile regression results with Diversity Employees as the independent variable

	Model 3									
	Dependent variable: ROA					Dependent variable: ROE				
	(1) Q10	(2) Q25	(3) Q50	(4) Q75	(5) Q90	(6) Q10	(7) Q25	(8) Q50	(9) Q75	(10) Q90
Diversity Employees	-0.129**	-0.008	0.042**	0.171***	0.221***	-0.481**	-0.037	0.160**	0.623***	2.288***
	(0.052)	(0.016)	(0.019)	(0.026)	(0.040)	(0.217)	(0.052)	(0.065)	(0.139)	(0.458)
Log(Firm Age)	0.018***	0.005***	0.002***	-0.006***	-0.013***	0.061***	-0.011***	-0.063***	-0.121***	-0.213***
	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.004)	(0.001)	(0.001)	(0.003)	(0.009)
Log(Firm Size)	0.014***	0.001***	-0.007***	-0.014***	-0.020***	0.025***	-0.006***	-0.026***	-0.057***	-0.133***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.003)	(0.001)	(0.001)	(0.002)	(0.006)
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	No	No	No	No	No	No	No	No	No	No
Pseudo R^2	0.0129	0.0031	0.0095	0.0223	0.0304	0.0027	0.0014	0.0094	0.0195	0.0273
Observations	150318	150318	150318	150318	150318	150318	150318	150318	150318	150318

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Regression table 2.2: Quantile regression with Diversity Businesses as the independent variable

	Model 3									
	Dependent variable: ROA					Dependent variable: ROE				
	(1) Q10	(2) Q25	(3) Q50	(4) Q75	(5) Q90	(6) Q10	(7) Q25	(8) Q50	(9) Q75	(10) Q90
Diversity Businesses	-0.132***	-0.010***	0.058***	0.155***	0.230***	-0.275***	0.026**	0.306***	0.827***	2.134***
	(0.011)	(0.004)	(0.004)	(0.006)	(0.009)	(0.047)	(0.011)	(0.014)	(0.031)	(0.099)
Log(Firm Age)	0.018***	0.005***	0.002***	-0.006***	-0.012***	0.059***	-0.011***	-0.062***	-0.118***	-0.208***
	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.004)	(0.001)	(0.001)	(0.003)	(0.009)
Log(Firm Size)	0.015***	0.001***	-0.007***	-0.015***	-0.022***	0.027***	-0.006***	-0.029***	-0.063***	-0.148***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.003)	(0.001)	(0.001)	(0.002)	(0.006)
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	No	No	No	No	No	No	No	No	No	No
Pseudo R^2	0.0140	0.0031	0.0101	0.0254	0.0348	0.0028	0.0014	0.0101	0.0216	0.0311
Observations	150318	150318	150318	150318	150318	150318	150318	150318	150318	150318

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Regression table 2.3: Quantile regression results with Diversity Managers as the independent variable

	Model 3									
	Dependent variable: ROA					Dependent variable: ROE				
	(1) Q10	(2) Q25	(3) Q50	(4) Q75	(5) Q90	(6) Q10	(7) Q25	(8) Q50	(9) Q75	(10) Q90
Diversity Managers	-0.070***	-0.019***	-0.022***	-0.016**	-0.002	-0.200***	-0.054***	-0.054***	-0.069**	0.236**
	(0.012)	(0.004)	(0.004)	(0.006)	(0.010)	(0.052)	(0.012)	(0.015)	(0.033)	(0.111)
Log(Firm Age)	0.018***	0.005***	0.002***	-0.006***	-0.013***	0.060***	-0.011***	-0.063***	-0.122***	-0.211***
	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.004)	(0.001)	(0.001)	(0.003)	(0.009)
Log(Firm Size)	0.014***	0.001***	-0.007***	-0.014***	-0.020***	0.025***	-0.006***	-0.026***	-0.057***	-0.133***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.003)	(0.001)	(0.001)	(0.002)	(0.006)
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	No	No	No	No	No	No	No	No	No	No
Pseudo R^2	0.0131	0.0031	0.0095	0.0222	0.0303	0.0028	0.0014	0.0094	0.0195	0.0271
Observations	150318	150318	150318	150318	150318	150318	150318	150318	150318	150318

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

The results from the three regression methods can be presented graphically (see figure 11, 12 and 13). I examine if the results from the OLS regressions are sensitive to the outliers of ROA and ROE. I compare the quantile 0.5 (median regression) with the OLS (mean regression). The coefficients are not similar for all the diversity indicators and ROA or ROE which can imply that some of the results are driven by the outliers.

Figure 11: ROA/ROE and gender diversity at the employee level - Quantile and OLS estimates

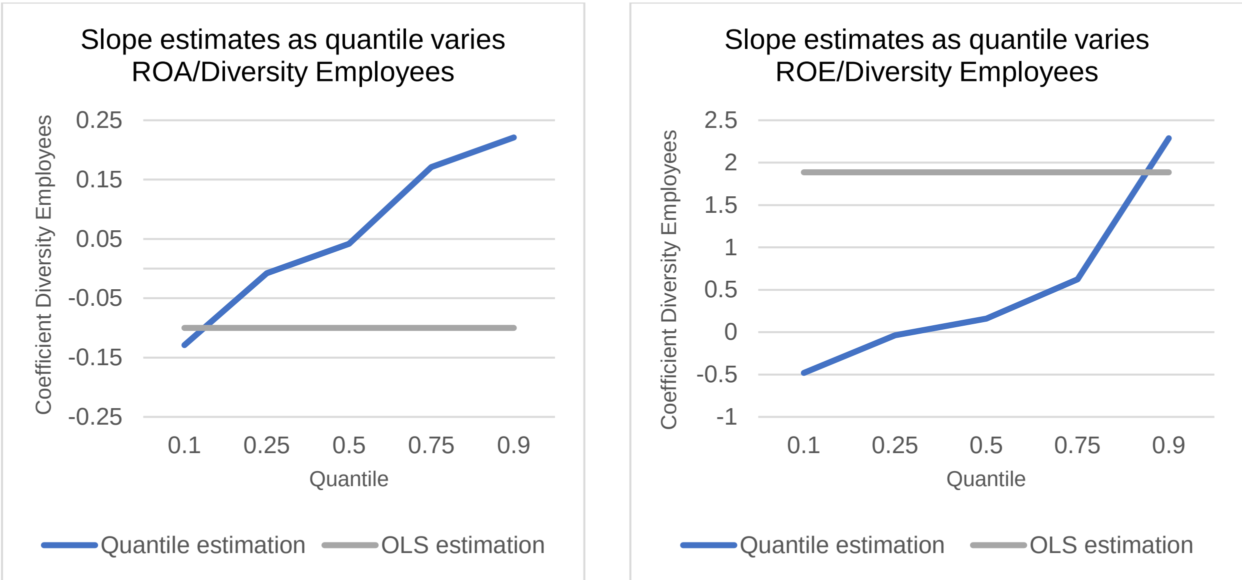


Figure 12: ROA/ROE and gender diversity at the employee level - Quantile and OLS estimates

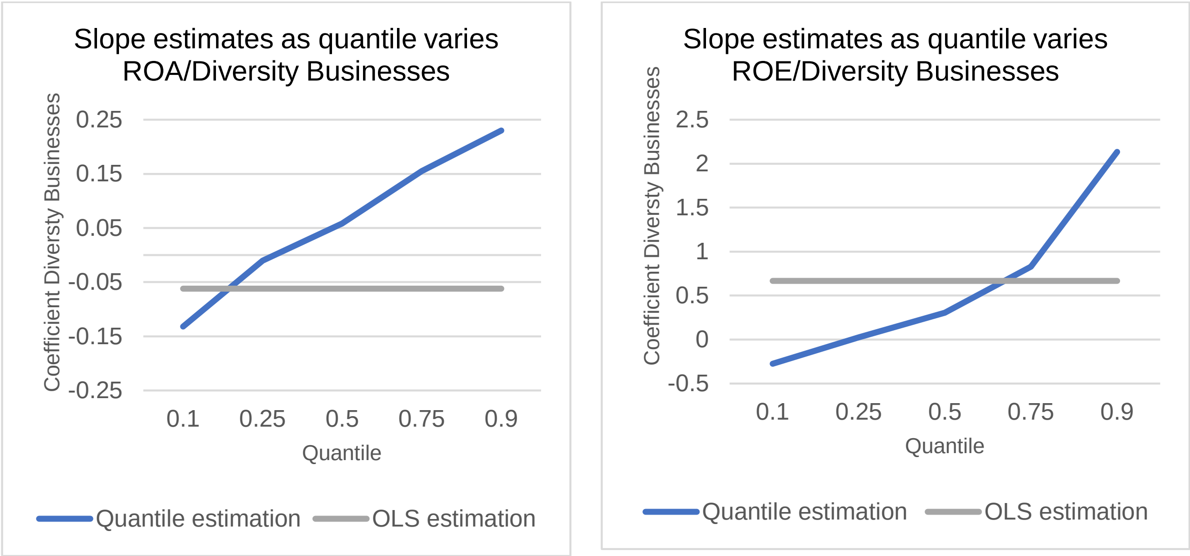
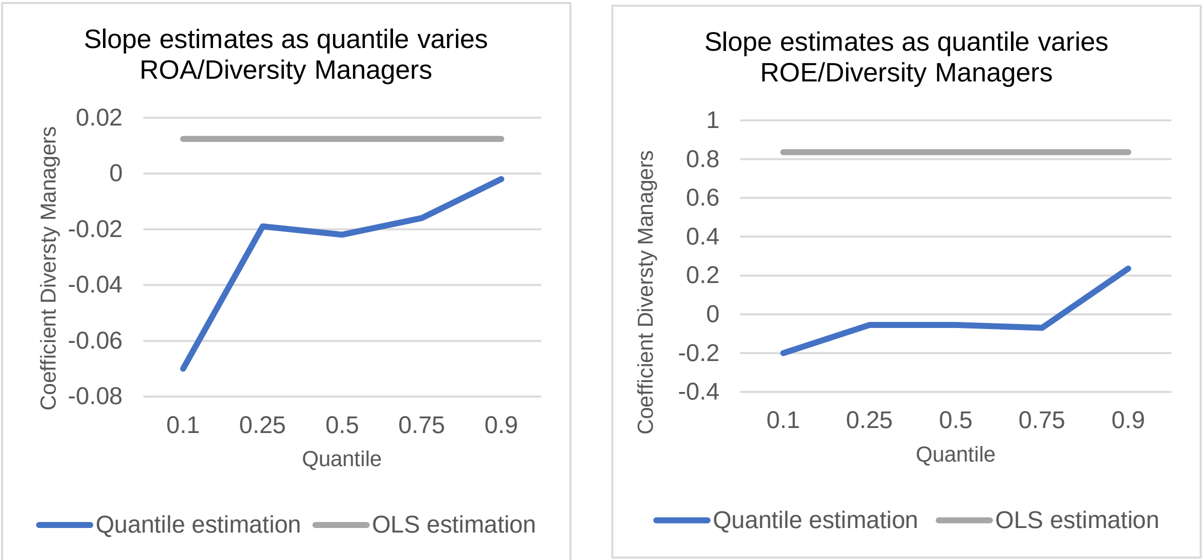


Figure 13: ROA/ROE and gender diversity at the management level - Quantile and OLS estimates



Furthermore, all the figures also display that the effect of diversity (blue line) increases with the quantile.

5.3 Robustness testing

In this section, the robustness of the results is tested by using an industry-adjusted return on assets as the dependent variable. Furthermore, two alternative measures of firm size are applied and different ways to measure firm age are tested.

5.3.1 Alternative dependent variable

I account for industry differences in ROA by using an industry adjusted ROA which reports the firms' return on assets relative to the industry it is operating in. The expected mean of the industry-adjusted ROA is 0. The results from the quantile regressions using the industry-adjusted ROA are presented in regression tables 3.1-3.3. I run the regression without the industry dummies, since I use the industries to calculate the industry adjusted ROA.

The results are pulling in the same direction as the regression results from the quantile regressions (regression tables 2.1-2.3). When looking at the employee level (regression table 3.1 and 3.2) the results indicate that firms in the quantiles 0.5-0.9 (Q50-Q90) are performing better than the mean in the industry they are operating in i.e. the coefficient on the gender diversity indicator has a value above 0. Firms in the upper part of the performance distribution of ROA have a positive significant relationship between firm performance and gender diversity.

At the median level a one percentage point increase in the Diversity Employees indicator at the median level of ROA (table 3.1 column (3)) is associated with a 0.033 percentage point increase in ROA. If a firm has a performance level equal to the mean performance in the industry, the firm would now go from having an industry-adjusted ROA of 0 to a value of 0.00033 (absolute values).

At the quantile 0.9 (Q90) the coefficient on the Diversity Managers indicator is positive, but not significant. I conclude that evidence exists that gender diversity at the employee level is positively associated with increased firm performance for the right-hand side of the performance distribution (hypothesis 2a). I do not have enough evidence to draw conclusions about the management level (hypothesis 2b).

In regression table 3.4 in appendix B I have run the OLS regression of model 2 replacing ROA with the industry adjusted ROA. None of the diversity-performance relationships are significant at any level. I do not find strong enough evidence supporting hypothesis 1a and 1b.

Regression table 3.1: Quantile regression results with Diversity Employees as the independent variable

	Model 2 Dependent variable: Industry-adjusted ROA				
	(1) Q10	(2) Q25	(3) Q50	(4) Q75	(5) Q90
Diversity Employees	-0.346***	-0.057**	0.033*	0.171***	0.204***
	(0.059)	(0.022)	(0.020)	(0.026)	(0.046)
Log(Firm Age)	0.032***	0.011***	0.002***	-0.007***	-0.019***
	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)
Log(Firm Size)	-0.002**	-0.001***	-0.005***	-0.009***	-0.008***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)
Year dummy	Yes	Yes	Yes	Yes	Yes
Industry dummies	No	No	No	No	No
Firm fixed effects	No	No	No	No	No
Pseudo R^2	0.0057	0.0018	0.0014	0.0047	0.0044
Observations	150318	150318	150318	150318	150318

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Regression table 3.2: Quantile regression results with Diversity Businesses as the independent variable

	Model 2 Dependent variable: Industry-adjusted ROA				
	(1) Q10	(2) Q25	(3) Q50	(4) Q75	(5) Q90
Diversity Businesses	-0.262***	-0.044***	0.050***	0.151***	0.242***
	(0.012)	(0.005)	(0.004)	(0.005)	(0.010)
Log(Firm Age)	0.031***	0.010***	0.002***	-0.007***	-0.019***
	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)
Log(Firm Size)	0.001	-0.001***	-0.006***	-0.010***	-0.009***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)
Year dummy	Yes	Yes	Yes	Yes	Yes
Industry dummies	No	No	No	No	No
Firm fixed effects	No	No	No	No	No
Pseudo R^2	0.0092	0.0019	0.0019	0.0074	0.0081
Observations	150318	150318	150318	150318	150318

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Regression table 3.3: Quantile regression results with Diversity Managers as the independent variable

	(1) Q10	(2) Q25	(3) Q50	(4) Q75	(5) Q90
	Model 2 Dependent variable: Industry-adjusted ROA				
Diversity Managers	-0.158***	-0.034***	-0.024***	-0.012*	0.011
	(0.014)	(0.005)	(0.005)	(0.006)	(0.011)
Log(Firm Age)	0.032***	0.010***	0.002***	-0.007***	-0.019***
	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)
Log(Firm Size)	-0.001	-0.001***	-0.005***	-0.009***	-0.008***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)
Year dummy	Yes	Yes	Yes	Yes	Yes
Industry dummies	No	No	No	No	No
Firm fixed effects	No	No	No	No	No
Pseudo R^2	0.0062	0.0014	0.0015	0.0045	0.0044
Observations	150318	150318	150318	150318	150318

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

5.3.2 Different measures of firm size and firm age

In previous studies investigating the relationship between gender diversity and firm performance, different measures of firm size are used[19]. I have used the logarithm of total assets in the regressions in this thesis. Regression table 4.1 in appendix B presents the effect of diversity at the employee level on ROA when firm size is measured by the logarithm of sales and the logarithm of the number of employees. Also, when using sales and number of employees as firm size proxies, the relationship remains similar as for total assets. The sample size is reduced by 12 951 observations due to missing values of the number of employees/number of employees reported as zero which are not included when taking logs. I conclude that my findings are robust to alternative measures of firm size.

In previous studies the logarithm of firm age is used as a proxy for firm age[20]. When using the firm age in levels or as a squared term, the magnitude of the coefficient estimates of the diversity variable are almost unchanged. Only the firm age measured in logs, which has been used in all the regression analyses in this thesis, is significantly related to firm performance.

[19] E.g., Frink et al. (2003) is using the total number of employees as a proxy for firm size, whereas Adams and Ferreira (2009) is using sales revenues.
[20] See e.g. Vafaei et al. (2015)

See regression table 4.2 in appendix B. I conclude that my findings are robust to alternative functional forms of firm age.

5.4 Summary of the results

Hypothesis 1a and 1b proposed a positive relationship between gender diversity (at the employee and management level) and firm performance. The results from the pooled OLS and fixed effects regressions do not find statistically significant results supporting the hypotheses. However, when running the quantile regression, I find evidence supporting both hypothesis 1a and 1b, but only applicable for the upper part of the performance distribution. Hypothesis 2a and 2b proposed that gender diversity has a larger positive impact on firm performance in high-performing firms. The quantile regressions find evidence supporting both hypothesis 2a and 2b. Finally, since the mean and median results are not similar for all the estimated coefficients, it can indicate that the mean results are affected by the outliers in the data set suggesting that the quantile estimation is more efficient.

6. Discussion

In the introduction, I motivated the study by presenting arguments for why business leaders should care about the gender composition in their firms. I also presented previous literature on the topic, finding that existing empirical evidence present mixed results on the effect of gender diversity on firm performance. Previous literature reveals that the choice of performance measures, estimation strategy, firm sample and context can affect the results. This part of the thesis discusses the main findings from the regression analyses in chapter five, followed by suggestions for future research.

6.1 Discussion of empirical strategy and findings

The main goal of this thesis has been to examine the effects of gender diversity by answering the research question: "*What is the effect of gender diversity in firms and firm management on firm financial performance?*" Consistent with previous research, I also get mixed results and not one clear answer. Overall, I do not find statistically significant positive effects of gender diversity on firm performance, except for the firms in the upper part of the performance distribution. All estimations are conditional on firm age, firm size and industry. The results indicate that the relationship between gender diversity and firm performance is not equal for the whole performance distribution, but differs between the highest and the lowest performing firms. Furthermore, I find differences between the results at the employee and management level.

Contrary to many previous studies using smaller samples of firms, I investigate a population of firms including all limited companies (AS) and public limited companies (ASA) in Norway having sales revenues above 10 million NOK. The firms in the population vary in many aspects, such as size, age, financial performance and industry. Having such a large and detailed data set provided from SNF, increases the reliability of the results compared to other studies using small samples often based on surveys.

Furthermore, past research often uses firm level data to measure gender diversity at different organisational levels. I have used three regional gender equality indicators which are calculated based on detailed information from the workforce composition in all the Norwegian municipalities to measure the employee composition at the firm level. When using firm level measures of diversity directly, previous studies (Adams & Ferreira, 2009; Parrotta et al., 2014), report that the estimations could be biased due to the correlation of the diversity variable with the error term. Omitted variables in the error term could also be correlated with firm performance directly. By using a regional diversity indicator, I try to overcome the presence of the endogenous explanatory variable.

When estimating the conditional mean effects of gender diversity on firm performance I get high standard errors and consequently non-significant coefficients indicating that the estimated model is not the best to make predictions about the population. The conditional mean regression (such as OLS) only derives one estimate to describe the correlation between firm performance and gender diversity and it assumes that the relationship is constant for all parts of the performance distribution. Since my data set consist of population data and the firms in the data set vary a lot, estimating the quantile (Q10-Q90) of firm performance conditional on gender diversity appears to be a better estimation strategy. Not surprisingly, I find that the diversity-performance relationship differs between different points of the performance distribution. As presented in the literature review, many previous studies are using OLS estimation assuming the effect of diversity is equal for all performance levels.

At the management level, the effects of gender diversity are negative for the whole distribution, except for firms in the upper part of the performance distribution of ROE. This supports the initial hypothesis stating that only the firms with the highest firm performance have a positive relationship between gender diversity in management and firm performance. Having a strong female representation in the firm management will only improve the performance of firms already performing well. This finding is consistent with Conyon and He (2017) and Solakoglu (2013). Both studies find that the gender diversity effect differs at different points of the conditional distribution. Conyon and He (2017) argue that high-skilled women will be matched with high-performing firms. Because high performing firms are likely to be better managed they will most likely also be better at utilising the talent of the high-skilled women, resulting in stronger effects of adding more women to the workforce.

The high performing firms might also have more resources to support their female managers by introducing family friendly work practices in favour of diversity and having an organisational environment that supports diversity. Ali et al. (2015) find that at the management level, diversity could have a negative effect on firm performance if the firm has few work-family programs, such as flexible hours and paid parental leave. Gonzales and Denisi (2009) also find that a non-supportive diversity climate can lead to a negative diversity-performance relationship. If the lower performing firms have less resources to allocate to diversity, this can be one of the reasons why the effect of diversity is low in below average performing firms. However, once good management practices are controlled for, the effect of work-family programs has no effect on performance (Bloom, Kretschmer, & Van Reenen, 2011), implying ambiguous results on the effect of diversity-programs.

At the employee level, my findings indicate that greater gender diversity improves performance for average and above-average performing firms. It is not surprising that the findings on the employee level differ from the management level. At the employee level, maximum gender diversity means that overall, no matter which position the employee has, the representation of men and women is equal. At the management level I compare employees in the same positions (all have the position as manager). The results could have been different if I could compare employees in the same positions. I do not know whether the male and female employees are equally distributed across the working teams, but the highest performance levels will probably be found in the gender equal working teams (Apesteguia et al., 2010; Hoogendoorn et al., 2013).

The effect of the control variables is also interesting. I find that firm size both has a positive and negative effect on firm performance, depending on the part of the performance distribution investigated. Both findings are supported by past studies (Ali et al., 2011; Vafaei et al., 2015). When I use the industry-adjusted ROA as the dependent variable, firm size appears to be negatively correlated with firm performance across the whole distribution. This means that large firms do not always perform better than small firms, despite all the benefits of being large such as more effective production and economies of scale (Besanko, 2004, pp. 199-204).

Furthermore, I find that the effect of firm age on firm performance varies across the performance distribution. The best performing firms are negatively correlated with firm age and the worse performing firms are positively correlated with firm age. Another study using the quantile approach finds that firm age negatively affects firm performance in all firms (Conyon & He, 2017). The finding suggesting positive effects of being in a later life-cycle stage is therefore a bit peculiar.

The firms in the data set used in this study belong to 14 different industry groups. Some industries might be more dependent on human capital (service oriented firms), whereas others are more capital intensive (manufacturing firms). The industry groups representing the service firms (see for example group 11 and 12 in table 5) are also the ones having an above average ROA and ROE, which can indicate that the firms are positioned in the upper part of the performance distribution. Since the firms with the highest ROA and ROE also are the ones with the strongest diversity-performance relationship, it could be that many of those firms are service firms. Ali et al. (2011) argues that service oriented firms will benefit more from a gender diverse workforce because service oriented firms are better at capitalizing on the positive effects of gender diversity, due to their greater interaction among employees and with customers. This result suggests that gender diversity can be more beneficial in service-oriented firms with high interaction between customers and employees.

In the OLS regression I do not control for time-constant unobserved and observed firm effects, such as management practices and corporate culture. Some past studies do not control for firm effects, and conclude that the direct effect of gender diversity on firm performance is positive. (Frink et al., 2003; Herring, 2009). When I use the fixed effects model, time-invariant firm effects are swept out, resulting in a change in some of the diversity indicator coefficients. This can imply that when controlling for unobserved firm effects, such as good management practices, diversity is no longer positively related to firm performance. It is not given that all firms having a gender diverse workforce will experience greater performance, after controlling for firm effects (Adams & Ferreira, 2009).

Furthermore, contextual factors such as growth strategy, entrepreneurial orientation, life-cycle or organisational culture (see Dwyer et al., 2003; O. Richard et al., 2004; O. C. Richard et al., 2006) can also impact the results. This thesis obtains non-significant results when using OLS and fixed effects estimation which is also found in past studies using the same estimation strategy (Dwyer et al., 2003; O. Richard et al., 2004; O. C. Richard et al., 2006). When including contextual factors that could affect the diversity-performance relationship, the relationship becomes significant. These findings suggest that the relationship between diversity and performance is complex. It is difficult to conclude based only on direct effects or without controlling for firm fixed effects and contextual factors, as the results can change when including those factors in the model.

Lastly, as seen throughout the past literature most researchers emphasise that it is difficult to estimate a causal relationship between gender diversity and firm performance. It can also be that firms that are more successful and have more available resources, pay more attention to diversity than low-performing firms. The results from the quantile estimation support both approaches. Firm diversity can lead to better performance, but better performance can also result in increased diversity.

6.2 Limitations and suggestions for future research

The limitations in this thesis can give directions for future research. The gender equality index produced by SSB consist of 12 different indicators measuring different aspects of gender equality in Norwegian municipalities. I have used three of these indicators as proxies for firm gender diversity, both at the employee level and at the management level. Having access to the detailed firm level employee data the indicators are based on, it could be tested if the indicators used in this thesis are indeed the best measures of gender diversity at the firm level. By running a first-stage 2SLS regression with a regional indicator as an instrument (equation 6), it could be tested if diversity at the regional level indeed is a good instrument for diversity at the firm level. If this is the case, I could have estimated equation 5 using the regional diversity indicator as an instrument. Similar is done by Parrotta et al. (2012). They are using diversity at the commuting area level as an instrument for workforce level diversity.

Having access to detailed employee-employer data including information on occupations, employee age, tenure, wages and education would allow to select on groups that are more homogenous. It would be interesting to see what happens to the effect of diversity on performance when controlling for these employee level characteristics. Having access to such employee variables would allow to look at diversity in the same positions, also at the employee level.

7. Conclusion

In this study, I have estimated the effect of gender diversity using evidence from Norway from 2010-2014. I have used detailed firm level data to calculate firm performance measures, and gender equality indicators at the municipality level as measures for the different levels of gender diversity. The analysis reveals that the relationship between gender diversity and firm performance varies across the performance distribution. At the employee level, gender diversity is positively related to firm performance for the firms having average or above-average performance. Gender diversity in firm management is only positively related to firm performance in the best performing firms.

The diversity-performance relationship is complex, which is reflected in the different estimation methods and inconsistent empirical findings presented in previous studies. This thesis tries to explain some of the mixed findings by using a quantile approach on a whole population of firms. Quantile estimates are also more robust to outliers. Furthermore, using a regional variable to measure diversity at the firm level can help to overcome the endogeneity problems discussed in many past studies.

The evidence in this paper adds to the debate about the effects of gender diversity in firms and in firm management. It provides new insights into how the workforce composition in Norwegian firms affects the performance levels of the firms. Even though Norwegian firms on average are gender equal, the findings still reveal differences between the firms. The gender composition in firms is an important and relevant topic for business leaders today because it can affect several firm outcomes, such as the bottom line. Gender diversity is no longer only a matter of equality, but is also proven to have an impact on firm performance.

References

Adams, R. B., & Ferreira, D. (2009). Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics, 94*(2), 291-309. doi:10.1016/j.jfineco.2008.10.007

Ali, M., Kulik, C. T., & Metz, I. (2011). The gender diversity– performance relationship in services and manufacturing organizations. *The International Journal of Human Resource Management, 22*(7), 1464-1485. doi:10.1080/09585192.2011.561961

Ali, M., Metz, I., & Kulik, C. T. (2015). The Impact of Work– Family Programs on the Relationship between Gender Diversity and Performance. *Human Resource Management, 54*(4), 553-576. doi:10.1002/hrm.21631

Altinn. (2017). Who has an accounting obligation? Retrieved 4 May 2017, from https://www.altinn.no/en/Start-and-Run-a-Business/Operation/Accounts-and-auditing/Who-has-an-accounting-obligation/

Apesteguia, J., Azmat, G., & Iriberri, N. (2010). The Impact of Gender Composition on Team Performance and Decision- Making: Evidence from the Field. *IDEAS Working Paper Series from RePEc*.

Berner, E., Mjøs, A., & Olving, M. (2015). *Norwegian corporate accounts - documentation and quality assurance of SNF's and NHH's database of accounting and company information for Norwegian companies*: SNF.

Besanko, D. (2004). *Economics of strategy* (3rd ed. ed.). Hoboken, N.J: Wiley.

Blau, F. D. (2014). *The economics of women, men, and work* (7th ed. ed.). Upper Saddle River, N.J: Pearson.

Bloom, N., Kretschmer, T., & Van Reenen, J. (2011). Are family- friendly workplace practices a valuable firm resource? *Strategic Management Journal, 32*(4), 343-367. doi:10.1002/smj.879

Carter, D. A., Souza, F., Simkins, B. J., & Simpson, W. G. (2010). The Gender and Ethnic Diversity of US Boards and Board Committees and Firm Financial Performance. *Corporate Governance: An International Review, 18*(5), 396-414. doi:10.1111/j.1467-8683.2010.00809.x

Catalyst. (2004). *Connecting Corporate Performance and Gender Diversity*. Retrieved 20 May 2017, from http://www.catalyst.org/system/files/The_Bottom_Line_Connecting_Corporate_Performance_and_Gender_Diversity.pdf

Catalyst. (2014a). Diversity Matters. *Knowledge Center*. Retrieved 23 May 2017, from http://www.catalyst.org/knowledge/diversity-matters

Catalyst. (2014b). *First Step: Women In The World*. Retrieved from catalyst.org: http://www.catalyst.org/system/files/firststeps_womenintheworld.pdf

Conyon, M. J., & He, L. (2017). Firm performance and boardroom gender diversity: A quantile regression approach. *Journal of Business Research*. doi:10.1016/j.jbusres.2017.02.006

Dang, R., & Nguyen, D. (2014). Does Board Gender Diversity Make a Difference? New Evidence from Quantile Regression Analysis. *IDEAS Working Paper Series from RePEc*.

Devillard, S., de Zelicourt, A., Kossoff, C., & Sancier-Sultan, S. (2016). *Women Matter 2016: Reinventing the workplace to unlock the potential of gender diversity* Retrieved 31 May 2017, from http://www.mckinsey.com/global-themes/women-matter/reinventing-the-workplace-for-greater-gender-diversity

Doğan, M. (2013). Does Firm Size Affect The Firm Profitability? Evidence from Turkey. *Research Journal of Finance and Accounting, 4*(4).

Dwyer, S., Richard, O. C., & Chadwick, K. (2003). Gender diversity in management and firm performance: the influence of growth orientation and organizational culture. *Journal of Business Research, 56*(12), 1009-1019. doi:10.1016/S0148-2963(01)00329-0

Egge-Hoveid, K. (2013). *Likestilling – avhengig av hvor vi bor*. Retrieved 16 May 2017, from Statistics Norway: https://www.ssb.no/befolkning/artikler-og-publikasjoner/likestilling-avhengig-av-hvor-vi-bor

Frink, D. D., Robinson, R. K., Reithel, B., Arthur, M. M., Ammeter, A. P., Ferris, G. R., . . . Morrisette, H. S. (2003). Gender Demography and Organization Performance. *Group & Organization Management, 28*(1), 127-147. doi:10.1177/1059601102250025

Gentry, R. J., & Shen, W. (2010). The Relationship between Accounting and Market Measures of Firm Financial Performance: How Strong Is It? *Journal of Managerial Issues, 22*(4), 514-530.

Gonzalez, J. A., & Denisi, A. S. (2009). Cross- Level Effects of Demography and Diversity Climate on Organizational Attachment and Firm Effectiveness. *Journal of Organizational Behavior, 30*(1), 21-40. doi:10.1002/job.498

Hamre, K., & Egge-Hoveid, K. (2016). Indicators for gender equality in municipalities , 2015. Retrieved 12 May, 2017 from https://www.ssb.no/en/befolkning/statistikker/likekom/aar/2016-12-20?fane=om - content)

Harrison, D. A., & Klein, K. J. (2007). What's the difference? Diversity constructs as separation, variety, or disparity in organizations. *Academy of Management Review, 32*(4), 1199. doi:10.5465/AMR.2007.26586096

Herring, C. (2009). Does Diversity Pay?: Race, Gender, and the Business Case for Diversity. *American Sociological Review, 74*(2), 208-224. doi:10.1177/000312240907400203

Hirsch Aaby, A., & Lillegård, M. (2009). Hvordan måle likestilling mellom kvinner og menn i kommunene? Statistisk Sentralbyrå: Avdeling for personstatistikk/Seksjon for levekårsstatistikk.

Hoogendoorn, S., Oosterbeek, H., & van Praag, M. (2013). The Impact of Gender Diversity on the Performance of Business Teams: Evidence from a Field Experiment. *Management Science, 59*(7), 1514-1528. doi:10.1287/mnsc.1120.1674

James G. Combs, T. R. C. C. L. S. (2005). *The Dimensionality of Organizational Performance and its Implications for Strategic Management Research* (Vol. 2): Emerald Group Publishing Limited.

Joecks, J., Pull, K., & Vetter, K. (2013). Gender Diversity in the Boardroom and Firm Performance: What Exactly Constitutes a "Critical Mass?&#034. *Journal of Business Ethics, 118*(1), 61-72. doi:10.1007/s10551-012-1553-6

Joshi, A., & Roh, H. (2009). The Role of Context in Work Team Diversity Research: A Meta-Analytic Review. *The Academy of Management Journal, 52*(3), 599-627. doi:10.5465/AMJ.2009.41331491

Kanter, R. M. (1977). Some Effects of Proportions on Group Life: Skewed Sex Ratios and Responses to Token Women. *American Journal of Sociology, 82*(5), 965-990. doi:10.1086/226425

Koenker, R., & Bassett, G. (1978). Regression Quantiles. *Econometrica, 46*(1), 33-50. doi:10.2307/1913643

Koenker, R., & Hallock, K. F. (2001). Quantile Regression. *Journal of Economic Perspectives, 15*(4), 143-156. doi:10.1257/jep.15.4.143

Labelle, R., Francoeur, C., & Lakhal, F. (2015). To Regulate Or Not To Regulate? Early Evidence on the Means Used Around the World to Promote Gender Diversity in the Boardroom. *Gender, Work & Organization, 22*(4), 339-363. doi:10.1111/gwao.12091

McMahon, A. (2010). Does Workplace Diversity Matter? A Survey Of Empirical Studies On Diversity And Firm Performance, 2000-09. *Journal of Diversity Management, 5*(2), 37-48. doi:10.19030/jdm.v5i2.808

OECD (2004). *Female Labour Force Partic**ipation: Past trends and main determinants in OECD Countries*** Retrieved 20 May 2017, from https://www.oecd.org/eco/labour/31743836.pdf

OECD.stat. (2017). Labour force participation rate. *LFS by sex and age - indicators.* Retrieved 20 May, 2017 from https://stats.oecd.org/Index.aspx?DataSetCode=LFS_SEXAGE_I_R

Parrotta, P., Pozzoli, D., & Pytlikova, M. (2014). Labor diversity and firm productivity. *European Economic Review, 66*, 144-179. doi:10.1016/j.euroecorev.2013.12.002

Pervan, M., & Višić, J. (2012). Influence of firm size on its business success. In (Vol. 3). Croatian Operational Research Review (CRORR): University of Split, Faculty of Economics.

Plantenga, J., Remery, C., Figueiredo, H., & Smith, M. (2009). Towards a European Union Gender Equality Index. *Journal of European Social Policy, 19*(1).

Richard, O., Barnett, T., Dwyer, S., & Chadwick, K. (2004). Cultural Diversity in Management, Firm Performance, and The Moderating Role Of Entrepreneurial Orientation Dimensions. *Academy of Management Journal, 47*(2), 255-266.

Richard, O. C., Ford, D., & Ismail, K. (2006). Exploring the performance effects of visible attribute diversity: the moderating role of span of control and organizational life cycle. *The International Journal of Human Resource Management, 17*(12), 2091-2109. doi:10.1080/09585190601000246

Robertson, Q., Holmes, O., & Perry, J. (2016). Transforming Research on Diversity and Firm Performance: A Dynamic Capabilities Perspective. *Academy of Management Annals, 11*(1).

Robertson, Q. M. (2013). *The Oxford handbook of diversity and work*. Oxford: Oxford University Press.

Statistics Norway. (2017). Endringer i de regionale inndelingene. *Kommunekatalog*. Retrieved 10 May 2017, from https://www.ssb.no/offentlig-sektor/kommunekatalog/endringer-i-de-regionale-inndelingene

Unite, A., Sullivan, M., & Shi, A. (2016). Gender Diversity in Boards and Performance of Philippine Publicly Traded Firms: Do Women Matter?, 38. Retrieved from https://www.researchgate.net/publication/302955151_Gender_Diversity_in_Boards_and_Performance_of_Philippine_Publicly_Traded_Firms_Do_Women_Matter doi:DOI: 10.13140/RG.2.1.1587.2888

Vafaei, A., Ahmed, K., & Mather, P. (2015). Board Diversity and Financial Performance in the Top 500 Australian Firms. *Australian Accounting Review, 25*(4), 413-427. doi:10.1111/auar.12068

Williams, K. Y., & O'Reilly III, C. A. (1998). *Demography and Diversity in Organizations: A review of 40 years of research*.

Williams, R. (2016). Outliers. In Outliers (Ed.). University of Notre Dame: University of Notre Dame.

Wooldridge, B., & Floyd, S. W. (1990). The strategy process, middle management involvement, and organizational performance. *Strategic Management Journal, 11*(3), 231-241. doi:10.1002/smj.4250110305

Wooldridge, J. M. (2016). *Introductory econometrics : a modern approach* (6th ed. ed.). Boston, Mass: Cengage Learning.

Appendix A – Variables

Table 7: The firm specific variables used in the analysis and to generate new variables

Variable name	**Description**
orgnr	Nine-digit organisation number
aar	Accounting year
aktiv	Whether the company is active
kommnr	Municipal code
selskf	Legal form of the firm
Industry/bransjegr_07	Industry group
stiftaar	Year of incorporation
ansatte	Number of employees
aarsrs	Profit/loss of the year
salgsinn	Sales revenues
ek	Total equity. Used to generate ROE.
sumeiend	Total assets
ROA	Representing the performance of the firm. Return on assets.
ROA_industry	Industry adjusted return on assets
ROE	Representing the performance of the firm. Return on equity.
alder	Age of the firm
alder_sqr	Age of the firm. Squared term.
log_alder	Logarithm of alder
log_str_ans	Logarithm of number of ansatte
log_str_salg	Logarithm of salgsinn
log_str	Logarithm of sumeiend
cid	Cluster id ((orgnr*10000)+kommnr)

Table 8: All the gender equality indicators available from Statistics Norway

Indicator name	Description
score1	Share of children aged 1-5 years in kindergarten
score2	Gender distribution among municipality representatives
score3	Ratio between the share of men and women with higher education
score4/Diversity Employees	Ratio between men and women's share in the labour force
score5	Ratio between men and women's average gross income
score6	Ratio between the share of men and women in part-time employment
score7	Share of fathers taking full statutory paternity leave or more before the child is three years old
score8/Diversity Businesses	Level of gender balanced business structure
score9	Gender balance in public sector
score10	Gender balance in private sector
score11/Diversity Managers	Gender distribution among leaders
score12	Level of gender balance in educational programs in upper secondary school

Table 9: Summary statistics for all the indicators and the total gender equality index

	Mean	**Median**	**Std. Dev**	**Min.**	**Max.**
score1	.8965524	.9	.0398273	.53	1
score2	.806075	.82	.1190343	.1	1
score3	.8215159	.84	.114932	.38	1
score4	.9294357	.93	.0183782	.65	1
score5	.6660284	.67	.0542996	.26	1
score6	.4304062	.41	.1171107	.14	.83
score7	.6613234	.66	.0599872	.17	1
score8	.6110858	.61	.0888354	.31	1
score9	.5963463	.6	.0958694	.26	.98
score10	.7401141	.74	.0740711	.35	.84
score11	.7024907	.69	.076898	.3	1
score12	.6795418	.69	.0599119	.36	.79
Total index	.7233027	.7245	.0477789	.54	.8115
N	150318				

Table 10: All the variables used in the regression models

Dependent Variables: firm performance		
Variable name	**Proxy**	**Measurement**
ROA	Return on Assets	Ratio total income/total assets (aarsrs/sumeiend)
ROE	Return on Equity	Ratio total income/total equity (aarsrs/ek)
ROA_Industry	Industry adjusted return on assets	ROA-mean ROA in industry

Independent Variables: gender diversity		
Variable name	**Proxy**	**Measurement**
Diversity Employees/Score4	Ratio between men and women's share in the labour force	Based on indicator score.
Diversity Businesses/Score8	Level of gender balanced business structure	Based on indicator score.
Diversity Managers/Score11	Gender distribution among leaders	Based on indicator score.

Control variables		
Variable name	**Proxy**	**Measurement**
aar	Accounting year	2010-2014
log_alder	How long the firms exist	Logarithm of the number of years since the firm was founded Log(aar-stiftaar)
log_str	Size of the firm	Logarithm of total assets Log(sumeiend)
Industry	Industry group	Based on industry group code (1-14)

Table 11: Correlation matrix

	ROA	ROE	salgsinn	sumeiend	aarsrs	ek	alder	score4	score8	score11
ROA	1									
ROE	0.0168***	1								
salgsinn	0.00162	0.000664	1							
sumeiend	-0.0000157	-0.000185	0.927***	1						
aarsrs	0.00731**	0.00251	0.836***	0.808***	1					
ek	0.00131	-0.000298	0.895***	0.962***	0.728***	1				
alder	0.00165	-0.00472	0.0340***	0.0271***	0.0168***	0.0276***	1			
score4	0.00105	0.00233	0.00125	0.00188	0.000014	0.00344	0.0236***	1		
score8	0.000633	0.00286	0.0109***	0.0119***	0.00501	0.0126***	0.0177***	0.369***	1	
score11	0.00151	0.00379	-0.00336	-0.00119	-0.00540*	0.00122	0.0151***	0.353***	0.379***	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix B – Tables robustness tests

Regression table 3.4: OLS regression results with the industry-adjusted ROA

	Model 2 Dependent variable: Industry-adjusted ROA		
	(1)	(2)	(3)
Diversity Employees	-0.073 (0.454)		
Diversity Businesses		-0.041 (0.265)	
Diversity Managers			0.017 (0.132)
Log(Firm age)	0.018** (0.008)	0.018** (0.008)	0.018** (0.008)
Log(Firm size)	0.013 (0.041)	0.013 (0.043)	0.013 (0.041)
Year dummy	Yes	Yes	Yes
R^2	0.000036	0.000036	0.000036
Adjusted R^2	-0.000011	-0.000011	-0.000011
Observations	150318	150318	150318

Standard errors in parentheses
Robust standard errors, adjusted for clustering at the municipality level, are presented in parentheses.
* p<0.10, ** p<0.05, *** p<0.01

Regression table 4.1: OLS regression results with different measures of firm size

	Model 3 Dependent variable: ROA		
	(1) Total assets	(2) Number of employees	(3) Sales revenues
Diversity Employees	-0.605 (0.676)	-0.502 (0.570)	-0.510 (0.544)
Log(Total assets)	0.058 (0.065)		
Log(Number of employees)		0.022 (0.030)	
Log(Sales revenues)			0.024 (0.016)
Firm Age	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Firm fixed effects	No	No	No
R^2	0.000768	0.000663	0.000664
Adjusted R^2	0.000623	0.000518	0.000519
Observations	137860	137860	137860

Standard errors in parentheses
Robust standard errors, adjusted for clustering at the municipality level, are presented in parentheses.
* p<0.10, ** p<0.05, *** p<0.01
Note: The sample is reduced due to missing observations of number of employees.

Regression table 4.2: OLS regression results with different functional forms of firm age

	Model 3 Dependent variable: ROA		
	(1) Log	(2) Level	(3) Squared
Diversity Employees	-0.1001 (0.6763)	-0.0996 (0.6721)	-0.0897 (0.6680)
Log(Firm Age)	0.0175** (0.0074)		
Firm Age		0.0008 (0.0005)	
(Firm Age)^2			0.0000 (0.0000)
Firm size	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Firm fixed effects	No	No	No
R^2	0.000485	0.000482	0.000480
Adjusted R^2	0.000352	0.000349	0.000347
Observations	150318	150318	150318

Standard errors in parentheses
Robust standard errors, adjusted for clustering at the municipality level, are presented in parentheses.
* p<0.10, ** p<0.05, *** p<0.01

Appendix C – Do-files STATA

C.1 – Descriptives

```
set more off
ssc install estout

*Define paths
global datafiles = "/... /Data"
global workfiles = "/... /Working Data"
global results = "/... /Results"

if c(os) == "MacOSX" {
*Definition of paths Macbook
global datafiles = "/... /Data"
global workfiles = "/... /Working Data"
global results = "/... /Results"
}

***///Import dataset//***

use "$workfiles/Utvalg_OLS.dta",clear

*Change directory
cd "$results/"

***//Sample//***

*Use scalars from Sample and run if first

display alle_obs
display eks_ikkeaktiv
display eks_selskf
display eks_1000
display eks_kommnr
display eks_score
display eks_bransjegr
display eks_ROA
display eks_ROE
display eks_largescore1
display eks_score0
display data_sample

***//Descriptives//***
//For the whole sample//

//Number of firms per year
tabstat orgnr,by(aar)stat (count)

//Number of kommune per year//
sort aar kommnr
bys aar kommnr: gen nfirst=_n
tabstat kommnr if nfirst==1,by(aar)stat(count)

*Table 1: Whole sample
estpost tabstat ROA ROE ROA_industry salgsinn sumeiend aarsrs ek alder if e(sample), listwise ///
  statistics(mean p10 p50 p90 sd min max) columns(statistics)
esttab, using table_1.rtf,replace cells("mean p10 p50 p90 sd min max")nomtitle nonumber

*Table 4: ROA per industry
estpost tabstat ROA if e(sample),by(Industry)stat(mean median count)
esttab using table_4.rtf,replace cells("mean p50 count") nomtitle nonumber
```

```
*Table 5: ROE per industry
estpost tabstat ROE if e(sample),by(Industry)stat(mean median count)
esttab using table_5.rtf,replace cells("mean p50 count") nomtitle nonumber

*Table 6: ROA_Industry per industry
estpost tabstat ROA_ny if e(sample),by(Industry)stat(mean median count)
esttab using table_6.rtf,replace cells("mean p50 count") nomtitle nonumber

*Table 7: Equality indicators: score4, score8, score11
quietly estpost tabstat score4 score8 score11 if e(sample), listwise ///
   statistics(mean p50 sd min max) columns(statistics)
esttab using table_7.rtf,replace cells("mean p50 sd min max ") nomtitle nonumber

*Appendix
*Table 8: Equality indicators and total index
quietly estpost tabstat score1-score12 index if e(sample), listwise ///
   statistics(mean p50 sd min max) columns(statistics)
esttab using table_8.rtf,replace cells("mean p50 sd min max ") nomtitle nonumber

//Robustness//
*Table 9: Using sales revenues as measure of firm size
quietly estpost tabstat ROA salgsinn sumeiend drmarg log_str_salg log_alder if e(sample), listwise ///
   statistics(mean p50 sd min max) columns(statistics)
esttab using table_9.rtf,replace cells("mean p50 sd min max ") nomtitle nonumber

*Table 10: Using number of employees as measure of firm size
quietly estpost tabstat ROA salgsinn sumeiend drmarg log_str_ans log_alder if e(sample), listwise ///
   statistics(mean p50 sd min max) columns(statistics)
esttab using table_10.rtf,replace cells("mean p50 sd min max ") nomtitle nonumber

//Correlation matrix
estpost correlate ROA ROE ROA_industry salgsinn sumeiend aarsrs ek alder score4 score8 score11, matrix listwise
esttab using table_11.rtf, replace unstack not noobs compress

*Distribution Score4, Score8, Score11
histogram score4, discrete
histogram score8, discrete
histogram score11, discrete

*Label scores
label variable score4 "Diversity Employees"
label variable score8 "Diversity Businesses"
label variable score11 "Diversity Managers"

*Relationship ROA/ROE and diversity indicators
twoway scatter ROA score4 if ROA>-1&ROA<1 || lfit ROA score4 if ROA>-1&ROA<1
twoway scatter ROA score8 if ROA>-1&ROA<1 || lfit ROA score8 if ROA>-1&ROA<1
twoway scatter ROA score11 if ROA>-1&ROA<1 || lfit ROA score11 if ROA>-1&ROA<1

twoway scatter ROE score4 if ROE>-5&ROE<5 || lfit ROE score4 if ROE>-5&ROE<5
twoway scatter ROE score8 if ROE>-5&ROE<5 || lfit ROE score8 if ROE>-5&ROE<5
twoway scatter ROE score11 if ROE>-5&ROE<5 || lfit ROE score11 if ROE>-5&ROE<5
```

C.2 – Regression models

```
set more off
ssc install estout
ssc install coefplot
set matsize 800

*Define paths
global datafiles = "/... /Data"
global workfiles = "/... /Working Data"
global results = "/... /Results"

if c(os) == "MacOSX" {
*Definition of paths Macbook
global datafiles = "/... /Data"
global workfiles = "/... /Working Data"
global results = "/... /Results"
}

***//Define lists of variables//***

*Selected scores
global scorelist score4 score8 score11

*All scores
global scorelist_all score1 score2 score3 score4 score5 score6 score7 score8 score9 score10 score11 score12

***//Importer datasett//***
use "$workfiles/Utvalg_OLS.dta",clear

*Change directory
cd "$results/"

***OLS***

//MODEL 0//
*OLS without diversity indicators
*Model 0a
reg ROA log_alder log_str i.aar i.Industry,vce(cluster cid)
est store reg_0a

*Model 0b
reg ROE log_alder log_str i.aar i.Industry if e(sample) ,vce(cluster cid)
est store reg_0b

//MODEL 1//
*OLS with no controls

*Model 1a
foreach var of varlist $scorelist{
reg ROA `var' i.aar if e(sample),vce(cluster cid)
est store `var'reg_1a
}

*Model 1b
foreach var of varlist $scorelist{
reg ROE `var' i.aar if e(sample),vce(cluster cid)
est store `var'reg_1b
}

//MODEL 2//
*OLS with firm age and firm size controls and year dummy

*Model 2a
foreach var of varlist $scorelist{
reg ROA `var' log_alder log_str i.aar if e(sample),vce(cluster cid)
```

```
est store `var'reg_2a
}

*Model 2b
foreach var of varlist $scorelist{
reg ROE `var' log_alder log_str i.aar if e(sample),vce(cluster cid)
est store `var'reg_2b
}

//MODEL 3//
*OLS with firm age and firm size controls and year and industry dummy

*Model 3a
foreach var of varlist $scorelist{
reg ROA `var' log_alder log_str i.aar i.Industry ,vce(cluster cid)
est store `var'reg_3a
}

*Model 3b
foreach var of varlist $scorelist{
reg ROE `var' log_alder log_str i.aar i.Industry ,vce(cluster cid)
est store `var'reg_3b
}


*** FIXED EFFECTS***
*FE: MODEL 4

*Model 4a
foreach var of varlist $scorelist{
xtreg ROA `var' log_alder log_str i.aar ,fe
est store `var'reg_4a
}

*Model 4b
foreach var of varlist $scorelist{
xtreg ROE `var' log_alder log_str i.aar if e(sample), fe
est store `var'reg_4b
}

***QUANTILE***
*Quantile regressions - ROA - model 3
*Q10
foreach var of varlist $scorelist{
qreg ROA `var' log_alder log_str i.aar i.Industry ,q(0.10)nolog
est store `var'reg_q10
}

*Q25
foreach var of varlist $scorelist{
qreg ROA `var' log_alder log_str i.aar i.Industry if e(sample),q(0.25)nolog
est store `var'reg_q25
}


*Q50
foreach var of varlist $scorelist{
qreg ROA `var' log_alder log_str i.aar i.Industry if e(sample),quantile(.50)nolog
est store `var'reg_q50
}

*Q75
foreach var of varlist $scorelist{
qreg ROA `var' log_alder log_str i.aar i.Industry if e(sample),q(0.75)nolog
est store `var'reg_q75
}
```

```
*Q90
foreach var of varlist $scorelist{
qreg ROA `var' log_alder log_str i.aar i.Industry if e(sample),q(0.90)nolog
est store `var'reg_q90
}

*Quantile regressions - ROE - model 2/3

*Q10
foreach var of varlist $scorelist{
qreg ROE `var' log_alder log_str i.aar i.Industry ,q(0.10)nolog
est store `var'reg_q10b
}

*Q25
foreach var of varlist $scorelist{
qreg ROE `var' log_alder log_str i.aar i.Industry if e(sample),q(0.25)nolog
est store `var'reg_q25b
}

*Q50
foreach var of varlist $scorelist{
qreg ROE `var' log_alder log_str i.aar i.Industry if e(sample),quantile(.50)nolog
est store `var'reg_q50b
}

*Q75
foreach var of varlist $scorelist{
qreg ROE `var' log_alder log_str i.aar i.Industry  if e(sample),q(0.75)nolog
est store `var'reg_q75b
}

*Q90
foreach var of varlist $scorelist{
qreg ROE `var' log_alder log_str i.aar i.Industry if e(sample),q(0.90)nolog
est store `var'reg_q90b
}

***ROBUSTNESS***
*Model 2 - ROA industry adjusted
*Q10
foreach var of varlist $scorelist{
qreg ROA_industry `var' log_alder log_str i.aar,q(0.10)nolog
est store `var'reg_q10c
}

*Q25
foreach var of varlist $scorelist{
qreg ROA_industry `var' log_alder log_str i.aar,q(0.25)nolog
est store `var'reg_q25c
}

*Q50
foreach var of varlist $scorelist{
qreg ROA_industry `var' log_alder log_str i.aar,q(.50)nolog
est store `var'reg_q50c
}

*Q75
foreach var of varlist $scorelist{
qreg ROA_industry `var' log_alder log_str i.aar,q(0.75)nolog
est store `var'reg_q75c
}

*Q90
foreach var of varlist $scorelist{
qreg ROA_industry `var' log_alder log_str i.aar,q(0.90)nolog
```

```
est store `var'reg_q90c
}

*OLS
foreach var of varlist $scorelist{
reg ROA_industry `var' log_alder log_str i.aar,vce(cluster cid)
est store `var'reg_OLS_ind
}


*Regression with different measures of firm size
*Log of sales revenues and log of number of employees

*OLS with number of employees as measure of firm size
foreach var of varlist $scorelist{
reg ROA `var' log_alder log_str_ans i.aar i.Industry ,vce(cluster cid)
est store `var'reg_empl
}

*OLS with sumeiend as measure of firm size
foreach var of varlist $scorelist{
reg ROA `var' log_alder log_str i.aar i.Industry if e(sample),vce(cluster cid)
est store `var'reg_eiend
}

*OLS with salgsinn as measure of firm size
foreach var of varlist $scorelist{
reg ROA `var' log_alder log_str_salg i.aar i.Industry if e(sample),vce(cluster cid)
est store `var'reg_salg
}

*Regression with different forms of firm age
*In levels
foreach var of varlist $scorelist{
reg ROA `var' alder log_str i.aar i.Industry if e(sample),vce(cluster cid)
est store `var'reg_3a_level
}

*Squared term
foreach var of varlist $scorelist{
reg ROA `var' alder_sqr log_str i.aar i.Industry if e(sample),vce(cluster cid)
est store `var'reg_3a_sq
}

//REGRESSION TABLES
//Fixed effets + pooled OLS
*Model 1-4: score4
#d ;
esttab score4reg_1a score4reg_2a score4reg_3a reg_0a score4reg_4a score4reg_1b score4reg_2b score4reg_3b reg_0b
score4reg_4b using reg1_OLS_FE.rtf,replace
rtf
indicate("Year dummy = *aar" "Industry dummies = *Industry")
starlevels(* 0.10 ** 0.05 *** 0.01)
se(%8.4f)
keep(score* log_str log_alder)
ar2(6) label
r2(6) sfmt(0)
title("Regression table 1.1")
numbers
obslast mtitles()compress
addnotes("Robust standard errors, adjusted for clustering at the municipality level, are presented in parentheses.")
;
#d cr

*Model 1-4: score8
#d ;
```

```
esttab score8reg_1a score8reg_2a score8reg_3a reg_0a score8reg_4a score8reg_1b score8reg_2b score8reg_3b reg_0b
score8reg_4b using reg2_OLS_FE.rtf,replace
rtf
indicate("Year dummy = *aar" "Industry dummies = *Industry")
starlevels(* 0.10 ** 0.05 *** 0.01)
se(%8.4f)
keep(score* log_str log_alder)
ar2(6) label
r2(6) sfmt(0)
title("Regression table 1.2")
numbers
obslast mtitles()compress
addnotes("Robust standard errors, adjusted for clustering at the municipality level, are presented in parentheses.")
;
#d cr

*Model 1-4: score11
#d ;
esttab score11reg_1a score11reg_2a score11reg_3a reg_0a score11reg_4a score11reg_1b score11reg_2b score11reg_3b
reg_0b score11reg_4b using reg3_OLS_FE.rtf,replace
rtf
indicate("Year dummy = *aar" "Industry dummies = *Industry")
starlevels(* 0.10 ** 0.05 *** 0.01)
se(%8.4f)
keep(score* log_str log_alder)
ar2(6) label
r2(6) sfmt(0)
title("Regression table 1.3")
numbers
obslast mtitles()compress
addnotes("Robust standard errors, adjusted for clustering at the municipality level, are presented in parentheses.")
;
#d cr

//QUANTILE REGRESSION
*MODEL 3

*Model Quantile regression: score 4
#d ;
esttab score4reg_q10 score4reg_q25 score4reg_q50 score4reg_q75 score4reg_q90  score4reg_q10b score4reg_q25b
score4reg_q50b score4reg_q75b score4reg_q90b using regQREG_SCORE4.rtf,replace
rtf
indicate("Year dummy = *aar" "Industry dummies = *Industry")
starlevels(* 0.10 ** 0.05 *** 0.01)
b(%8.3f) se(%8.3f)
keep(score* log_str log_alder)
pr2(6) label
r2(6) ar2(6)sfmt(0)
title("Regression table 2.1")
numbers
obslast mtitles()compress
addnotes("Robust standard errors, adjusted for clustering at the municipality level, are presented in parentheses.")
;
#d cr

//QUANTILE REGRESSION
*Model Quantile regression: score 8
#d ;
esttab score8reg_q10 score8reg_q25 score8reg_q50 score8reg_q75 score8reg_q90  score8reg_q10b score8reg_q25b
score8reg_q50b score8reg_q75b score8reg_q90b using regQREG_SCORE8.rtf,replace
rtf
indicate("Year dummy = *aar" "Industry dummies = *Industry")
starlevels(* 0.10 ** 0.05 *** 0.01)
b(%8.3f) se(%8.3f)
keep(score* log_str log_alder)
pr2(6) label
r2(6) ar2(6)sfmt(0)
```

```
title("Regression table 2.2")
numbers
obslast mtitles()compress
addnotes("Robust standard errors, adjusted for clustering at the municipality level, are presented in parentheses.")
;
#d cr

//QUANTILE REGRESSION
*Model Quantile regression: score 11
#d ;
esttab score11reg_q10 score11reg_q25 score11reg_q50 score11reg_q75 score11reg_q90  score11reg_q10b
score11reg_q25b score11reg_q50b score11reg_q75b score11reg_q90b using regQREG_SCORE11.rtf,replace
rtf
indicate("Year dummy = *aar" "Industry dummies = *Industry")
starlevels(* 0.10 ** 0.05 *** 0.01)
b(%8.3f) se(%8.3f)
keep(score* log_str log_alder)
pr2(6) label
r2(6) ar2(6)sfmt(0)
title("Regression table 2.3")
numbers
obslast mtitles()compress
addnotes("Robust standard errors, adjusted for clustering at the municipality level, are presented in parentheses.")
;
#d cr

//ROBUST
*Industry adjusted ROA

* Model 2 - Quantile regression: score 4
#d ;
esttab score4reg_q10c score4reg_q25c score4reg_q50c score4reg_q75c score4reg_q90c using
regQREG_INDUSTRY_score4.rtf,replace
rtf
indicate("Year dummy = *aar")
starlevels(* 0.10 ** 0.05 *** 0.01)
b(%8.3f) se(%8.3f)
keep(score* log_str log_alder)
pr2(6) label
r2(6) ar2(6)sfmt(0)
title("Regression table 3.1")
numbers
obslast mtitles("Q10" "Q25" "Q50" "Q75" "Q90")compress
addnotes("Robust standard errors, adjusted for clustering at the municipality level, are presented in parentheses.")
;
#d cr

* Model 2- Quantile regression: score 8
#d ;
esttab score8reg_q10c score8reg_q25c score8reg_q50c score8reg_q75c score8reg_q90c using
qregQREG_INDUSTRY_score8.rtf,replace
rtf
indicate("Year dummy = *aar")
starlevels(* 0.10 ** 0.05 *** 0.01)
b(%8.3f) se(%8.3f)
keep(score* log_str log_alder)
pr2(6) label
r2(6) ar2(6)sfmt(0)
title("Regression table 3.2")
numbers
obslast mtitles("Q10" "Q25" "Q50" "Q75" "Q90")compress
addnotes("Robust standard errors, adjusted for clustering at the municipality level, are presented in parentheses.")
;
#d cr

*Model 2 - Quantile regression: score 11
#d ;
```

```
esttab score11reg_q10c score11reg_q25c score11reg_q50c score11reg_q75c score11reg_q90c using
regQREG_INDUSTRY_score11.rtf,replace
rtf
indicate("Year dummy = *aar")
starlevels(* 0.10 ** 0.05 *** 0.01)
b(%8.3f) se(%8.3f)
keep(score* log_str log_alder)
pr2(6) label
r2(6) ar2(6)sfmt(0)
title("Regression table 3.3")
numbers
obslast mtitles("Q10" "Q25" "Q50" "Q75" "Q90")compress
addnotes("Robust standard errors, adjusted for clustering at the municipality level, are presented in parentheses.")
;
#d cr

*Model 2 - OLS: score4-score11
#d ;
esttab score4reg_OLS_ind score8reg_OLS_ind score11reg_OLS_ind using regOLS_INDUSTRY.rtf,replace
rtf
indicate("Year dummy = *aar")
starlevels(* 0.10 ** 0.05 *** 0.01)
b(%8.3f) se(%8.3f)
keep(score* log_str log_alder)
pr2(6) label
r2(6) ar2(6)sfmt(0)
title("Regression table 3.4")
numbers
obslast mtitles("")compress
addnotes("Robust standard errors, adjusted for clustering at the municipality level, are presented in parentheses.")
;
#d cr

*Different measures of firm size
*Model 4
*Score 4 - Log
#d ;
esttab score4reg_eiend score4reg_empl score4reg_salg  using reg_size.rtf,replace
rtf
indicate("Year dummy = *aar" "Firm Age = log_alder" "Industry dummies = *Industry" )
starlevels(* 0.10 ** 0.05 *** 0.01)
b(%8.3f) se(%8.3f)
keep(score* log_str log_str_ans log_str_salg)
ar2(6) label
r2(6) sfmt(0)
title("Regression table: Different measures of firm size ")
numbers
obslast mtitles("Total assets" "Number of employees" "Sales revenues")compress
addnotes("Robust standard errors, adjusted for clustering at the municipality level, are presented in parentheses.")
;
#d cr

*Different forms of firm age
*Score4
#d ;
esttab score4reg_3a score4reg_3a_level score4reg_3a_sq  using regAGE.rtf,replace
rtf
indicate("Year dummy = *aar" "Firm size = log_str" "Industry dummies = Industry")
starlevels(* 0.10 ** 0.05 *** 0.01)
b(%8.4f) se(%8.4f)
keep(log_alder score* alder*)
ar2(6) label
r2(6) sfmt(0)
title("Regression table 13: Pooled OLS with score 4 - different forms of firm age - Ratio between men and women’s share
in the labour force")
numbers
obslast mtitles("Log" "Level" "Sqr")compress
```

```
addnotes("Robust standard errors, adjusted for clustering at the municipality level, are presented in parentheses.")
;
#d cr
```