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Gender Diversity in the Boardroom and Financial Performance

A quantitative analysis of female presence in listed firms in the Nordic region

Bachelor Thesis 15 hp

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Abstract

This study aims to investigate whether gender diversification on the board of directors in Nordic-listed firms affect the firms´ financial performance. To provide theoretical explanations for the potential relationship, this study uses agency-, critical mass-, and resource dependence theory. The retrieved data set consists of 298 companies operating in the Nordic region, and the analysis focuses on the relationship between the years 2018 and 2021. Four regression models are run by using the random effect generalized least squares (GLS) method. To assess the financial performance of the firms, two commonly used measures, Tobin's Q and return on assets (ROA), are employed. Female presence on the board is measured in two ways, in percentage form and as a binary variable taking the value 1 when 30% or more females are present. The results find no significant relationship between either Tobin's Q or ROA and female presence on the board. This indicates that there is not enough evidence to conclude that female representation influences Nordic firms' financial performance.

Keywords: Gender Diversity; Board of Directors; Financial Performance; Critical Mass; Agency Theory, Resource Dependence Theory

JEL Classifications: G30, G32, G34, G39

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1. Introduction

1.1 Background

Throughout history, women have traditionally been underrepresented in the corporate sector, specifically in business leadership roles and economic decision-making. The intangible obstacle known as "the glass ceiling" is commonly referred to as the explanation for this occurrence. The phenomenon refers to a barrier that prevents women the possibility to advance within the corporate hierarchy (Ryan & Haslam, 2007).

In attempts to address the occurrence, there have been various initiatives in recent years to improve the participation of females with legal instruments, with some nations implementing female quotas. In November 2012, The European Commission proposed legislation aiming to speed up the process of including more women on the corporate boards of European countries. More specifically, the proposal suggested that by the year 2020, the minimum accepted objective of the under-represented gender in listed companies was 40% (European Commission, 2012).

The Nordic countries have emerged as leading advocates for this gender diversification, and they consistently rank among the most gender-equal nations in the world according to Global Gender Gap Index (2022). However, despite their achievements, there is still work to be done to achieve complete gender diversity on the boards (Danbolt, 2016). The proposal from the Swedish government to introduce gender quotas for corporate boards demonstrates the ongoing debate and attention regarding gender diversity, even in countries with relatively high levels of gender equality (Swedish Government, 2016)

The introduction of these initiatives has sparked important discussions regarding whether gender diversification on corporate boards has a positive effect on the firm's financial performance or not. Recent years have seen a substantial increase in studies investigating this potential relationship. According to some research, gender diversity on company boards can enhance financial performance. Companies that prioritize diversity on their boards and implement proactive strategies to increase representation could be more likely to reap benefits (Hunt et al. 2020). Bennouri et al. (2018) assert that the inclusion of more women on corporate boards leads to value creation due to the diverse array of resources they bring to the company. On the other hand, some studies suggest that increased female representation may lead to reduced cohesion in the boardroom. DiTomaso et al. (2007) suggest that

differences in perspectives and backgrounds may lead to conflicts and therefore impede the decision-making process.

1.2 Problem description and problem analysis

The corporate board is entrusted with numerous responsibilities, including monitoring the management and providing guidance to the company. Among these responsibilities, one of the primary roles of the board is to ensure that the company handles its financials appropriately, and moreover, to generate value for its stakeholders and shareholders (Talerico, 2023). As the board of directors plays a crucial role in strategic decision-making, Guluma (2021) highlights the significance of establishing a good corporate governance structure within the firm.

Reguera-Alvarado et al. (2017) discuss the growing importance of these structures of the board of directors and highlight the importance of board diversity. They suggest that having members of different backgrounds and experiences can benefit the firm's performance. However, several studies have been conducted on the specific relationship between gender diversification on the board and the firm's financial performance. Some research presents a positive impact on financial performance, while other reports indicate a negative or no significant relationship. As gender diversity gains more attention in the corporate sector, one relevant question to ask is whether a correlation between gender diversity and the financial performance of listed companies does exist.

Our study aims to investigate if female board members have an impact on the financial performance of firms in the Nordic countries. Since the natural progression of gender diversification is being examined in this thesis, without the intervention of regulations or gender quotas, a choice was made to not include Norway. Excluding the country allows for analysis solely based on the countries where female representation on the corporate boards has evolved without such implementations.

Furthermore, the authors have identified a significant gap in the availability of peer-reviewed studies within this specific area of interest. In addition, the existing literature on this topic is limited as it primarily concentrates on a single country within the Nordic region, rather than providing a comprehensive perspective across the region. The lack of existing research in the area justifies our choice of subject for this study.

1.3 Aim of the study

The purpose of this bachelor thesis is to investigate the potential relationship between gender diversification on corporate boards and the financial performance of mid-cap and large-cap firms listed on the Nasdaq Nordic Main Market in Sweden, Finland, and Denmark. The study seeks to explore whether increased gender diversity has an impact on financial performance and to what extent this relationship exists.

Furthermore, the aim is to provide insights from a financial standpoint, highlighting the economic rationale for discussing gender diversification on the boards, in addition to the already established moral arguments. By exploring the potential advantages or disadvantages of gender diversity, the study aims to shed light on the subject and provide further insights into the discussion regarding gender representation in corporate leadership.

To fulfill the purpose of the study the objective is to answer the following research question:

Does gender diversification on corporate boards affect financial performance?

2. Theoretical Framework

2.1 Critical Mass Theory

The Critical mass theory is a recurring theory within the studies of female representation and the financial performance of companies. The theory suggests that a "trigger point" exists, at which a specific amount of minority individuals is needed to have an impact (Shelling, 1971). The economist, Thomas Schelling (1971), developed mathematical models to describe how segregation can arise based on individual preferences for homogeneity by studying race. His studies led to the development of the theory and its applicability in other contexts.

Kanter (1977) describes the dynamics of groups that affect financial performance. Moreover, the author found that the relative number of a specific minority within a group has an impact. Kanter (1977) introduced a framework consisting of four group compositions, each illustrating a proportional representation of the minority and the more dominant group. For the purpose of this study, the groups will be exemplified based on women and men. *Uniform* groups only consist of one kind of people, in other words, these groups are homogenous regarding gender. The proportion of a uniform group is 100:0, indicating that it only consists of men. *Skewed* groups are those in which one type is predominant over the other, for example with a proportion of 85:15. Men in skewed compositions are dominant and controlling, therefore it is difficult for the minority to become powerful in the group. Women can be labelled as tokens or symbols as they often are treated as representatives for their minority. Furthermore, *Tilted* groups have a less extreme distribution, for instance with a ratio of 65:35. In these groups a majority does exist, but the members of the minority (women) can begin to have an impact on the culture and the dynamics of the group. Lastly, *balanced* groups typically consist of a ratio of approximately 60:40 or 50:50. Sub-groups based on individual competencies and capabilities will start to emerge instead of groups associated with minorities and dominants. Within the balanced groups, the focus can shift from gender to the members' actual knowledge, skills, and experiences (Kanter, 1977).

In accordance with Schelling (1971) and the suggestion of a "trigger point", a group needs to reach critical mass to be able to observe women's effect on the group and subsequently, on the performance. If there are fewer women than the critical mass in the group, either the performance will suffer or there will be no noticeable difference (Joecks et al., 2013). Multiple studies have been made to possibly observe the critical value of women in the boardroom. Konrad et al. (2008) concluded that the number of women on corporate boards makes a difference. On boards with three or more women,

the female presence becomes normalized. Joecks et al. (2013), later stated the conclusions that only after a critical mass of approximately 30% women can be associated with higher firm performance. Given the sample used in their study, this percentage translated to about three women on the board. Liu et al. (2014) presented the same absolute number as a result in accordance with the ones previously mentioned.

Although it has been suggested that the effect of female representation becomes observable when the trigger point is reached, it is important to note that this may not always be the case. According to the findings of Broome et al. (2011), who concluded interviews on the subject, an increased number of women on the board may indeed increase the comfort level for the minority. However, most of the interviewed females perceive themselves as pathbreakers in their positions. All the respondents reported that they possess the ability to effectively function as a contributing board member, even when they are the sole female or minority representative. Nevertheless, when the representation of females or minorities increases, so does the variety of opinions in the group which can create conflict and thus affect the daily operations.

2.2 Agency Theory

The Agency theory was developed by Jensen and Meckling in 1976. The authors defined an agency relationship as a contract where one or multiple persons (the principal) engage with another (the agent) to perform a commitment on their behalf. This commitment involves decision-making authority to the agent. The principal can limit decisions that deviate from its interest through established incentives pointed at the agent and by incurring monitoring costs as a restriction of aberrant activities. Jensen and Meckling (1976) states that it is generally impossible for the principal to ensure that the agent will make optimal decisions from his or her point of view, without any cost since most agency relationships include monitor and bonding costs.

An *agency problem* arises in situations when there is a conflict of interest between the two parties because contracts are not costlessly written and enforced (Fama & Jensen, 1983). Monitoring- and control processes can play an important role when the party that initiates and implements important decisions are not the major residual claimant. In such cases, he or she does not bear a major share of the possible wealth effects of their decisions. Without effective control procedures, decision makers are more likely to act in ways that deviate from the interest of the residual claimants (Fama & Jensen, 1983).

The separation between shareholders and executives indicates that CEOs and subordinate managers have more insight into the daily operations compared to the shareholders. This separation creates an information gap where the executive (the agent) holds the favourable position with more knowledge about the operational activities of the firm, and possibilities to act according to their own interests (Merendino & Melville, 2019). To limit the gap of information and the agent's possibility to act against the interest of the shareholders, the principal can use the board of directors as a monitor. (Fama & Jensen, 1983; Merendino & Melville, 2019). The information asymmetry may create circumstances that have damaging effects on the valuation of the economic capital in the organization. Therefore the "monitoring function" of the board is the primary function to protect and consult shareholder investments.

According to Merendino and Melville (2019) it is reasonable to conclude that the board of directors actively influences firm performance given that boards are responsible for the direction and leadership of their firms. The board shall act in the interest of the shareholders by reviewing and monitor decisions that are made within the company. The board will thereby limit the consequences caused by the agent's conflicting behaviour by providing essential control mechanisms for mitigating the asymmetric information and conflict of interest between shareholders and the management (Fama & Jensen, 1983).

However, critique against the Agency theory exists. According to Mallin (2006), the most popular criticism points out the fact that the theory only focuses on two stakeholders. It is not reasonable to neglect all other stakeholders such as suppliers or managers' subordinates as they are significant functions of the corporation. Furthermore, the theory does not directly predict the relationship between gender diversity and financial performance. Instead, it provides suggestions on how gender-diverse boards may reduce agency problems, affect performance and value in the long run (Carter et al., 2010). Female directors are expected or more likely to raise questions than other directors. These questions can in turn improve the quality of decisions and subsequently the performance.

2.3 Resource Dependence Theory

Resource Dependence theory (RDT) emphasizes that organizations strive to decrease their reliance on external resources by developing strategies to secure and exert control over those resources. This perspective was first introduced by Jeffrey Pfeffner and Gerald Salancik (1978) in their book "*The External Control of Organizations: A Resource Dependence Perspective."*. Organizations are

dependent on different resources, including financial, physical and information. These external resources are essential for the organization's ability to grow, succeed and survive (Pfeffner & Salancik, 1978). However, organizations are vulnerable to changes in the external environment, including market conditions. Shifts in market dynamics could impact the ability to secure the needed resources.

The fundamental assumption of RDT is that the dependence on critical and important resources influence the actions of organizations. These actions can be understood within the context of the specific dependency situation (Pfeffer & Salancik, 1978). This concept was further developed by Barney (1991). The author suggested that companies consist of multiple resources that can be used for the development of value-creating strategies such as attributes, information, and knowledge. Board members provide organizational advantages that, in accordance with the theory, generates assets in the form of social and human capital through diversified expertise, reputation and resource availability (Pfeffer & Salancik, 1978).

Female board members offer perspectives and resources that differ from those of men. Anderson et al. (2011) argue that the diverse perspectives and skills that heterogeneous boardrooms generate are the source of the potential advantages that can emerge. The authors argue that heterogenous boards improve managerial monitoring through the expansion of board capital which can improve profitability. However, heterogeneity can incur costs due to communication or coordination problems. Particularly, varied perspectives brought by directors may increase conflict among the members and delay the decision-making process (Anderson et al., 2011). Furthermore, the theory has met several theoretical challenges and critiques (Pfeffer & Salancik, 2003). Researchers have argued that the theory has a large focus on transactional interdependence. This overlooks other important environmental effects on organizations such as social class, organizational structure, and culture.

3. Previous research

Corporate governance, and particularly in relation to gender diversity, has been subject to numerous studies over the past years. However, there is no consensus among the findings of the studies as they vary between positive, negative, and non-existent relationships. In Table 1 below, a summary of previous studies within this area is presented.

Table 1. Previous research

Positive relationship	**Country & Period**	**Dependent variable**	**Independent variable**
Noland et al. (2020)	Global, 2014	ROE	Female directors & executives
Dankwano & Hassan (2018)	India, 2017	ROE	Female directors
Carter et al. (2010)	US, 1998-2002	ROA	Female directors
Bennouri et al. (2018)	France, 2001-2010	ROA & ROE	Female directors
Belaounia et al. (2020)	Global, 2007- 2016	ROA & Tobin's Q*	Female directors
Negative relationship			
Dankwano & Hassan (2018)	India, 2017	ROA	Female directors
Bennouri et al. (2018)	France, 2001-2010	Tobin's Q	Female directors
Belaounia et al. (2020)	Global, 2007- 2016	ROA & Tobin's Q**	Female directors
Non existent relationship			
Campbell & Minguez- Vera (2008)	US, 1995-2000	Tobins'Q	Female directors
Carter et al. (2010)	US, 1998-2002	Tobins'Q	Female directors
Marinova et al. (2016)	Netherlands/ Denmark, 2007	Tobin's Q	Female directors

* Positive for gender equal countries
** Negative for gender inequal countires

Previous research within the area of study. The table presents studies that have found a positive, negative, or non-existent relationship between the proportion of women on corporate boards and financial performance, measured by ROA, ROE, or Tobin's Q.

Among the research showing a positive result between the financial performance and female representation on corporate boards, different performance measures have been used. Noland et al. (2016) studied gender balance in corporate leadership to observe if the presence of females affects firm performance. By conducting a global survey with almost 22,000 firms across the world, a positive correlation between gender diversity on corporate boards and firm profitability was found. The study showed that higher levels of gender diversity on the board of directors led to higher

profitability, measured by return on equity (ROE). The same conclusion was presented later by Dankwano & Hassan (2018). Carter at al. (2010), did also find a significant positive relationship but with ROA as the dependent variable.

Bennouri et al. (2018) investigated the same relationship using a sample of 349 firms in the CAC All-Shares index listed on Euronext Paris. The sample regarded the years 2001-2010, a time in which the firms in France had no requirements regarding gender inclusion. The study argues that the French setting provides a unique opportunity to examine the female impact on the boards. The French firms are operating in an environment with relatively low shareholder protection, indicating that attributes of female directors may be particularly important when discussing the performances of the firms. The findings in the paper showed that female participation significantly increased ROA and ROE. In 2020, Belaounia et al. used a sample including firms from 24 countries between the years 2007-2016. The global study included country characteristics such as a gender equality index, GDP per capita growth and unemployment rate, due to potential differences. Firm overall performance was measured by ROA and Tobin's Q. By using firm-level panel data they found that countries with great gender equality, such as Scandinavian countries, improved the financial performance though the presence of female directors.

Noland et al. (2016) suggest that the positive relationship can be based on that gender diverse boards are able to use the full range of talent available among them. This in turn leads to better decision making and ultimately, improved financial performance. Another suggestion discussed was that a board with increased gender diversity can more efficiently monitor and supervise the firm (Belaounia et al., 2020; Noland et al., 2016).

In 2018, Dankwano & Hassan studied the correlation on the Indian market. The research used cross-sectional data during 2017, including 220 companies spread across different industry segments. As mentioned at the beginning of this chapter, the study concluded that gender diversity in the boardroom has a positive effect on ROE. However, the authors found that companies with fewer female directors reported higher ROA, thus a negative relationship. Furthermore, Bennouri et al. (2018) discovered a negative relationship between female directors and the market-based performance measure Tobin's Q as it significantly decreased with the presence of more females. Furthermore, Belaounia et al. (2020) concluded that in countries with lower gender equality, female directors did not appear to have any real impact on board performance.

Dankwano & Hassan (2018) proposed a possible reason for the negative impact, specifically on ROA. The authors suggested that the negative effect might have occurred due to the sample used did

not appear to reach the critical mass with a minimum of three female directors. Bennouri et al. (2018) highlighted the importance of attributes that align with the two main missions of the board; to advise and control, as well as how they are perceived by outsiders. The attributes of female board members are important indicators to consider as they might have a significant impact on financial performance.

Although many studies have presented significant relationships between gender diversity and financial performance, several studies demonstrate a non-existent relationship. The non-existent relationship indicates that more females on the board of directors do not result in a better, or worse firms' financial performance. One study investigating the Spanish market demonstrated that, by itself, female presence on the board has no effect on the firm's value measured by Tobin's Q (Campbell & Minguez-Vera, 2008). The authors emphasized that the Spanish companies should focus on the balance between genders, rather than the presence of females only. Carter et al. (2010) made the same conclusion as their study of major US companies showed no empirical evidence of the relationship between Tobin's Q and the number of female board members. However, it was highlighted that even though no positive effect could be observed, the results simultaneously indicated no evidence of a negative relationship. In addition to these conclusions, Marinova et al. (2016) stated the same results when observing the Dutch and Danish boardrooms.

3.1 Hypothesis development

As studies examining the relationship between gender diversification and financial performance provide varying results, it is difficult to draw specific conclusions. However, by observing the studies presented above, it is shown that several of the more recent ones have found a positive relationship, particularly when using an accounting-based measurement. Several studies report that heterogenous boards tend to outperform homogenous groups through increased perspectives, knowledge, and efficiency. According to Konrad et al. (2008) and Noland et al. (2016), these factors affect the decision-making and problem-solving processes.

According to the Agency theory, the most important function of the board is to handle conflict of interest between shareholders and the management. As presented, some suggest that gender-diverse boards might have the ability to reduce conflict of interest and influence long-term performance through better monitoring and control processes. (Carter et al., 2010). In alignment with the Resource Dependence theory, female board members can reduce potential risks and add valuable resources. Bennouri et al. (2018) suggest that females offer character traits different from those of men. These

traits are assets in the form of social and human capital (Pfeffer & Salancik, 1978). However, despite the potential benefits of gender-diverse corporate boards, the increased diversity of knowledge and opinions can be a contributing factor to conflict. Varied perspectives can create disputes in the group that prevents the decision-making process from moving forward (Anderson et al., 2011).

The purpose of the hypotheses is to analyse whether the presence of women on boards affects financial performance. To be able to study whether the presence of females affects profitability, it is important to observe the occurrence of female directors among the sample used. The study's first hypothesis is in line with the previously mentioned theories. These theories enable discussion regarding the possible effect female directors have on performance. Based on this knowledge, the first hypothesis is formulated as:

H0: Representation of female board members does not affect the firm's financial performance.

Furthermore, the relationship between female board representation and performance will be investigated based on the critical mass theory. The critical mass is reached when the board consists of three or more females (Konrad et al., 2008, Liu et al., 2014). When this level is reached the female presence becomes normalized and a noticeable difference in performance can be observed (Joecks et al., 2013). As board size might differ across companies it is an important factor to consider. Dahlerup (2006) points out that the critical level for the impact of women on performance is 30%, which was also concluded by Joecks et al. (2013).

Due to these findings, the second hypothesis is constructed with the critical mass theory as a base. The aim is to investigate whether the critical level of female board members affects financial performance. Based on the findings, the second hypothesis is formulated as:

H_0: A critical mass of female board members does not affect the firm's financial performance.

4. Methodology

4.1 The method in general

This thesis adopts a quantitative methodology to examine whether gender diversification influences financial performance. To test the proposed hypotheses, random effect General Least Squares models (GLS) are employed on panel data. Since our models incorporate several control variables, multiple linear regression models are used. By including these relevant variables, the aim is to mitigate the risk of endogeneity in the models. Additionally, fixed effects are used to further address the potential issue of endogeneity. The statistical software program STATA is used to conduct the regression analyses, along with their appurtenant tests. Lastly, the regressions and their associated p-values are examined. By assessing the significance levels, it is possible to determine whether our hypotheses can be rejected or not and draw conclusions regarding the impact of gender diversification.

4.2 Justifications for the model

The Hausman test is a valuable tool when selecting between a fixed effect model and a random effect model when performing analyses on panel data. This test is conducted to examine whether there is a correlation between unobservable heterogeneity and the explanatory variables in our data. The null hypothesis indicates that the preferred model is the random effect, while the alternative hypothesis states that the fixed effect model is more appropriate (Quin & Amin, 2023). The results of the test indicate that using the random effect specification when running our regressions is preferred. The results can be seen in appendix 1.

Furthermore, to determine the importance of including the industry-fixed effect variable in our models, a PARM test was performed, see appendix 2. Subsequently, we rejected the null hypothesis since the fixed variable was statistically significant. Based on the results, the industry-fixed effect variable was considered essential and added to the third-run regression, for each of our models. Furthermore, to test whether the year-fixed effect variable had to be included in our model, another PARM test was conducted. As with the industry variable, we rejected the null hypothesis and conclude that the inclusion of year-fixed effect was necessary to include in each of the four final models.

4.3 Standard errors

Serial correlation, also referred to as autocorrelation, relates to the violation of the assumption of uncorrelated error terms between different observations. The serial correlation suggests that the error terms' value in one period exhibits a systematic relationship with the value of the error terms value in another period. Hence, it is often presented in data sets characterized by panel data and time-series data (Studenmund & Johnson, 2017). Studenmund and Johnson (2017) highlight the importance of identifying and mitigating serial correlation to ensure the validity of the statistical inferences. It is important as the correlation can lead to a reduction of the reliability of hypothesis testing by showing deceptive coefficients and t-statistics that appear more significant than they are. To examine the serial correlation in our panel data, a Woolridge test is performed, see appendix 3. The result shows that the null hypothesis, saying that there is no autocorrelation, is rejected. Subsequently, this indicates that there is autocorrelation in our data.

To address this correlation in our error terms, a generalized least squares (GLS) estimation is used, which is in line with prior studies (Bøhren & Strøm, 2010). GLS is a more appropriate method to use in this case compared to OLS since it considers the structure of the error terms and produces more accurate estimates of the regression coefficients (Studenmund & Johnson, 2017). It is done by weighting the observations in the regression model based on the degree of autocorrelation in the residuals (Wooldridge, 2002). By assigning higher weights to observations with lower autocorrelation, the method effectively reduces the influence of serial correlation on the results (Studenmund & Johnson, 2017). Therefore, this chosen method provides a more reliable framework when making our statistical inferences and drawing conclusions regarding female representation's impact on the firm's financial performance.

In addition to autocorrelation, it is of importance to address the problems with heteroskedasticity in regression analyses. Heteroskedasticity violates the assumption of constant error variance and occurs when the variability of the error term is not consistent across different levels of the independent variables. (Studenmund & Johnson, 2017). To examine the presence of heteroskedasticity in our models, a Breusch-Pagan test is performed, see appendix 4. At a significance level of 5 %, the null hypothesis is rejected, and we conclude that heteroscedasticity exists in all our regression models. To mitigate this issue and to obtain more accurate estimations, robust standard errors are employed in our GLS method.

5. Data

5.1 Data collection

The primary source of financial data for our thesis is the database Refinitiv Eikon. The platform provides an extensive coverage of historical financial data of thousands of firms worldwide, making it a commonly used source for both professionals and researchers (Refinitiv n.d.) The database has been used to collect all data regarding the firms' key financials and some of the control variables. The gathered information regards total assets, total debt, ROA, price per share and total shares outstanding. Tobin's Q and leverage has manually been calculated based on the retrieved data. Additionally, the firm's age has also been calculated by counting the number of years that have passed since the establishment of the firm.

Furthermore, data on board composition has manually been collected by using the firms' own published annual reports and corporate governance reports for each year. When gathering information concerning the firms' board sizes, deputy members have been excluded as their role primarily involves substituting for ordinary board members in case of their absence (Bolagsverket, 2021). Regarding gender diversification, the number of female directors has been determined by analysing their given names and cross-referencing them with published photos. Independent board members have been counted by adhering to the definition that an independent director is a member who maintains independence in relation to the firm, its management and the firm's major shareholders (Swedish Corporate Governance Board, 2020). Finally, data concerning industry fixed effect and country fixed effect were retrieved from Nasdaq's own reported industry and country classifications.

5.2 Sample data

The initial sample consisted of all mid-cap and large-cap firms listed on the Nasdaq Nordic Main market. However, in line with previous studies, the thesis has a delimitation that regards the exclusion of financial institutions and banks. Firms that operate in the banking sector and offer financial services face stricter regulations and structural differences which can affect the analysis (Bennouri et al., 2018). This suggests that all firms belonging to Nasdaq's division "Financials" have been excluded. Foreign firms that are listed on Nasdaq Nordic are also excluded since the purpose of this thesis is to investigate the Nordic markets and that other countries may be subject to different regulations and corporate governance systems (Carter et al., 2010).

Following the data cleaning process, our final sample comprises data from 298 firms. Out of these firms, 144 of them are classified as large-cap, while the remaining 154 are classified as mid-cap. The firms are based in Sweden, Finland, and Denmark, and the observations span the period from 2018 to 2021. Prior to any winzorization procedure, the dataset contains 1,192 observations in total. All gathered data have been compiled and organized in Excel before being exported into Stata. To construct the data as panel, Stata commands were applied to convert it from wide shape to long shape.

5.3 Model specification

To elucidate the relationship between female board presence and firm performance, we estimate four different regression models. The initial two models in our analysis refer to the hypotheses concerning the proportion of female directors on the board. These models have the following formation:

$$ROA_{it} = \beta_0 + \beta_1 Female\%_{it-1} + \beta_2 Board\_size_{it} + \beta_3 (ln) Firm\_size_{it} + \beta_4 (ln) Firm\_age_{it} + \beta_5 Leverage_{it} + \beta_6 Ind\_members_{it} + \sum \beta_{7-13} IndustryD_{it} + \Sigma \beta_{14-16} YearD_{it} + \varepsilon_{it}$$

$$Tobin's\ Q_{it} = \beta_0 + \beta_1 Female\%_{it-1} + \beta_2 Board\_size_{it} + \beta_3 (ln) Firm\_size_{it} + \beta_4 (ln) Firm\_age_{it} + \beta_5 Leverage_{it} + \beta_6 Ind\_members_{it} + \sum \beta_{7-13} IndustryD_{it} + \Sigma \beta_{14-16} YearD_{it} + \varepsilon_{it}$$

The subsequent two models refer to our second hypothesis which regards critical mass. These models have the following specification:

$$ROA_{it} = \beta_0 + \beta_1 D\_CM_{it-1} + \beta_2 Board\_size_{it} + \beta_3 (ln) Firm\_size_{it} + \beta_4 (ln) Firm\_age_{it} + \beta_5 Leverage_{it} + \beta_6 Ind\_members_{it} + \sum \beta_{7-13} IndustryD_{it} + \Sigma \beta_{14-16} YearD_{it} + \varepsilon_{it}$$

$$Tobin's\ Q_{it} = \beta_0 + \beta_1 D\_CM_{it-1} + \beta_2 Board\_size_{it} + \beta_3 (ln) Firm\_size_{it} + \beta_4 (ln) Firm\_age_{it} + \beta_5 Leverage_{it} + \beta_6 Ind\_members_{it} + \sum \beta_{7-13} IndustryD_{it} + \Sigma \beta_{14-16} YearD_{it} + \varepsilon_{it}$$

The dependent variables are ROA and Tobin's Q, of firm *i* at year t. Female% and D_CM are the variables of interest for each model, consisting of 1-year lagged values of the female directors on the board. Board size, Firm size, Firm age, Leverage and Ind_members are the control variables of firm *i* in year t. IndustryD and YearD are the fixed effect dummies, where the year 2018 and the industry Technology are used as reference groups. Lastly, ε is the error term. The term is the difference between the actual value and the predicted value of the dependent variable. Hence, it captures the unexplained part of our model.

5.4 Variables

5.4.1 Dependent variables

This thesis incorporates two different dependent variables to examine and illustrate financial performance. Tobin's Q, a market-based variable is included, and return on assets (ROA) is utilized as an accounting-based variable.

Consistent with prior studies regarding corporate governance, Tobin's Q is included to capture the firm's performance in the financial market. The variable provides a broader perspective of the firm's value by incorporating investor perceptions and market expectations (Brahma et al., 2021). Furthermore, since it focuses on the market value of the firm's assets, it is less influenced by accounting standards and reporting distortions, which may be subject to manipulation (Bennouri et al., 2018).

Tobin's Q is calculated by dividing the market value of the company by the replacement cost of its assets. The market value is given by the firm's market capitalization, which is calculated as share price times the total number of shares outstanding. The replacement costs of assets are represented by the total assets of the firm. A ratio greater than 1 show that the market values of the firm's assets are higher than its book values, indicating positive expectations for future profitability. On the contrary, a value of Tobin's Q less than 1 implies that the market considers the firm to be of lower value than its reported book value (Campbell & Minguez-Vera, 2008).

$$Tobin's\ Q = \frac{Market\ value}{Replacement\ costs\ of\ assets}$$

In line with previous research conducted by Bennouri et al. (2018) and Brahma et al. (2021), this study will include ROA to add an accounting-based perspective of the firm's performance, alongside Tobin's Q. ROA is a financial ratio which measures the firm's profitability relative to its total assets. It is a widely used metric since it provides insight into the firm ability to generate profits from its investments in assets. To calculate ROA, the net income of the firm is divided by its total assets and the result is expressed in percentage form (Brahma et al., 2021). A higher ROA indicates that the company is more efficient since it generates more income per unit of assets. On the contrary, a lower ROA is an indication that the firm is less efficient in utilizing its assets.

$$ROA = \frac{Net\ income}{Total\ assets}$$

Campbell and Minguez-Vera (2008) suggest that ROA is based on historical data, and thus offer a view of past performance, while Tobin's Q captures the expectations of future performances of the firm. By including both variables in our analysis allows them to complement each other and provide a more comprehensive understanding of a firm's financial performance.

5.4.2 Independent variables

Two independent variables are used to observe the effect of female presence, since the aim is to test for the correlation between gender diversity and financial performance. The first independent variable is measured as the percentage of female board members for each company. The proportion of female board members is used instead of the absolute number which is a recurring decision amongst previous research (Campbell & Minguez-Vera, 2008; Bennouri et al., 2018; Dankwano & Hassan, 2018).

$$Proportion\ of\ female\ board\ members = \frac{Number\ of\ female\ board\ members}{Total\ number\ of\ board\ members}$$

The second independent variable connects to the critical mass theory. This variable is formulated as a dummy variable that takes on the value of one when the percentage of female board members equals to 30 percent or more, otherwise zero.

Both independent variables are lagged one year. This approach is adopted because it is unreasonable to expect financial profitability to arise immediately after female board members takes office. Carter et al. (2010) lagged all their independent variables with one period to address that the effect of diversity is a process, rather than direct. Therefore, excluding lagged variables can lead to poor produced estimates of the dependent variables, as highlighted by Wilkins (2017).

5.4.3 Control variables

As our independent variables are most likely not the only factors that can affect changes in the company's financial performance, control variables are included. These variables do, according to existing literature, correlate with the dependent and will thus be accounted for in the model. Below, the affected variables are presented with explanation and justification.

Firm size

Firm size is a commonly used control variable amongst previous research as it is believed to influence financial performance. To measure firm size in this study, the variable is approximated by using the natural logarithm of the book value of total assets (Campbell & Minguez-Vera, 2008; Carter et al., 2010; Bennouri et al., 2018). Expressing the firm size as the natural logarithm enables a better response to skewness towards larger values that exist in the sample. Bennouri et al. (2018) found that firm size had a positive relation with financial performance, while Campbell and Minguez-Vera (2008) observed a negative relationship.

Board size

The size of the firm's board is included in our analysis as a control variable since the number of directors may have an impact on the firm's performance (Lipton & Lorsch, 1992; Jensen, 1993). Jensen (1993) argues that an increased number of directors may have a negative effect on the firm's value as it can obstruct the effectiveness of the board. The author suggests that the ideal board consists of seven or eight directors. By further increasing the number of directors, the financial performance starts to decrease as the board becomes more costly. In this study, the board size is measured as the total number of directors on the firm's board.

Firm age

A control variable that represents the age of the firm in accordance with prior empirical studies. Kunacová, Hedija and Fiala (2016) state that the age of a firm could affect economic performance, however, the final effect is not clear. Mature companies can generate benefits due to their establishment, experience, and networks, which could have a positive final effect on the performance. On the other hand, younger firms might be more flexible, less bureaucratic, and actively seeking market opportunities, which could generate a positive effect (Kunacová et al., 2016). The age of the firms is measured as the number of years since its establishment until each of the observed years. Furthermore, this control variable is calculated as the natural logarithm of age.

Leverage

Previous research has used leverage as a control variable as it is reported to correlate with firm performance (Bennouri et al., 2018; Campbell & Minguez-Vera, 2008). The leverage is calculated as the ratio of total debt to total assets and reflects how the firm finances its obligations. According to Ibhaguia and Olokoyob (2018), higher leverage can increase profit possibilities as the use of external capital creates the opportunity to develop the operational activities. However, a higher

leverage can also entail financial problems and increase risk, which in turn could lower stakeholders' confidence in the firm (Ibhaguia & Olokoyob, 2018).

$$Leverage = \frac{Total\ debt}{Total\ assets}$$

Independent directors

As independent directors can be observed as a control mechanism, the variable is included in the study. From the standpoint of the agency theory, independent directors have the tendency to monitor the managers of the company in a better way (Fama & Jensen, 1983). Brahma et al. (2020) argues that independent directors create more efficient boardrooms and controlled structures of the organization. However, Wallison (2006) points out that the role of independent directors is not directly associated with performance but rather with better governance. In this study, the variable is expressed as the percentage of independent directors of the board.

5.4.4 Fixed effects

To control unobservable heterogeneity and to help to minimize the potential risk of omitted variables that can affect financial performance, previous research typically includes fixed effects in their regression models (Adams & Ferreira, 2009). By including fixed effects, we aim to isolate the relationship between female representation and financial performance while accounting for the heterogeneity that may exist.

Year

Since there might be differences in the underlying economic circumstances between the studied years, a year-fixed effect is controlled for. Each of the four years is represented by a dummy variable. By including a time-fixed effect for each year, we remove the potential macroeconomic factors that might have an influence on financial performance. The fixed effects are presented as fixed with respect to the year 2018 as it is the reference group.

Industry

A dummy variable is added to represent the industry fixed effect due to the possibility of varying relationships between female directors and performance, across industries. Adding a set of dummy variables enables control of industry specific attributes that do not vary across time. As previously

mentioned, the financial industry has been omitted from the sample. Furthermore, industries consisting of fewer than 10 companies have been placed in a common category named “Other”. These industries are Utilities, Energy and Telecommunication. Lastly, the technology industry is used as the reference category for the purpose of the fixed effect. Table 2 presented below shows the different industry classifications and the frequency for each of them.

Table 2: Industry Classification

Industry	Frequency	Quantity
Basic Materials	13	4,36%
Consumer Goods	37	12,42%
Consumer Service	38	12,75%
Health Care	50	16,78%
Industrials	89	29,87%
Other	17	5,70%
Real Estate	26	8,72%
Technology	28	9,40%
Total	298	100%

Table 2. presents the industry classifications and the frequency for each in our data set. The category “Other” includes the industries “Utilities”, “Energy” and “Telecommunication”.

5.5 Descriptive statistics

Table 3 presents the descriptive statistics of the variables used in the study. The table provides information such as the number of observations, mean values, standard deviation, as well as the minimum- and maximum values. From the table it appears that the collected data is balanced as the number of observations stays consistent for all variables. However, it is worth noting that this table does not include the lagged values of the independent variables, critical mass, and the female percentage. When these variables are lagged, data from 2021 will be excluded. Additionally, the table presents the actual values, without any variables calculated using the natural logarithm.

Table 3: Descriptive Statistics

Variable	Obs	Mean	Std. dev.	Min	Max
TobinsQ	1,192	1.948442	2.473271	0	21.375
ROA	1,192	.0589771	.1487419	-1.6029	2.3116
D_CM	1,192	.5394295	.4986521	0	1
Female%	1,192	.310741	.1310206	0	1
TotalA	1,192	32977.05	87279.86	14	1537885
Leverage	1,192	.2362757	.1645162	0	.8681
Ind_Members	1,192	.7256078	.210432	.18	1
Age	1,192	62.83557	52.48495	1	372
Boardsize	1,192	7.698825	2.255859	3	17
wTobinsQ	1,192	1.925653	2.297851	.001	10.233
wROA	1,192	.05985	.0898134	-.27105	.27265
wTotalA	1,192	27273.68	48787.88	322.15	233479
wLeverage	1,192	.2345386	.1599185	0	.59315

Table 3. Details for each variable, the total number of observations, the mean of the observations, standard deviation, as well as the minimum and maximum values. Both pre and- post winsorized values can be observed. The winsorized variables is displayed by a "w" in front of the variable name. Variables presented has not been transformed.

As presented above, it appears that Tobin's Q has a maximum value of 21.375 and a minimum of 0 before applying winsorization. ROA shows extreme values with a maximum of 2.3116 (231.16%) and a minimum value of –1.6929 (-169.29%). According to Sullivan et al (2021), outliers indicate that the data contains extreme values which in turn could distort the results and have disproportionate impact on the data. By applying winsorization, the extreme values can be handled. The method limits the effect of extreme values by replacing the smallest and largest values with observations closer to the mean (Sullivan et al. 2021). To reduce the effect of outliers, the continuous variables ROA, Tobin's Q, leverage, and total assets have been transformed by using the Winsor method at a 2.5% and 97,5% level.

Through Table 3 it is shown that the Winsorization method changes the descriptive statistics. The variables denoted with a "w" in front of their names are the variables that initially showed signs of outliers. After the method is applied, the maximum value of Tobin's Q changes to 10.233 and a minimum value of 0.001. Regarding ROA, a maximum value of 0.27265 (27.225%) and a minimum value of –0.27105 (-27.105%) can be observed. In addition to this, the observable data of total assets and leverage becomes less extreme, while retaining much of the original data. The mean value of the winsorized variables drops slightly due to the application.

Regarding the proportion of female board members, independent board members and the critical mass variable, no winsorization has been applied. The percentage of female and independent directors are calculated as the percentage of the total board, without any adjustments made. The same goes for the critical mass as it is a binary variable that only takes on the values of 0 and 1. The maximum value of female proportion indicates that a board with only female directors exists in our data set. The mean however lies slightly above 30%. The mean of the number of board members can be approximated to 8 directors and the minimum can be observed as 3 directors. The minimum amount is in accordance with the corporate governance codes of each country (Securities Market Association, 2020; Danish Committee on Corporate Governance, 2020; Swedish Corporate Governance Board, 2020).

As previously mentioned, the control variables Firm age and Firm size have been logarithmized. However, the table shows the actual values for all variables. Before the natural logarithm of these variables was applied, Firm age had a maximum value of 372 years and a minimum of 1 year, implying that the oldest company was established in 1649. Firm size illustrated as total assets and expressed in million SEK can also be observed in Table 3. The value of this variable stands out among the data before the application of the Winsorization method and the natural logarithm.

Table 4 presented below is a Pearson's correlation matrix for the variables after they have been winsorized or logged. The correlation between the two dependent variables, Tobin's Q and ROA is relatively strong. This relationship is not surprising as both variables measure financial performance. Therefore, it can be assumed that there would be a positive relationship between the accounting- and market-based measurements of profitability. Furthermore, this correlation does not affect the study since the variables are not included in the same models. The strongest correlation presented exists between the proportion of female directors and critical mass. This is reasonable since both variables are based on the same data. Once again, these two are not included in the same regression model and therefore the high correlation of the coefficients will be neglected.

The correlation between the dependent and independent variables displays a weak negative relationship. By this, it can be interpreted that boards with a higher proportion of female directors or above the critical mass experiences lower financial performance for both financial measurements. The correlation between board size and the natural logarithm of total assets is approximately 50%, which is fairly strong. This relationship indicates that firms of larger sizes have a greater number of board members. Furthermore, the correlation between the natural logarithm of total assets and

Tobin's Q demonstrates a negative relationship, around 40%. However, this relationship can be explained since Tobin's Q is partly based on total assets and the correlation is not alarming. According to Westerlund (2005), a strong correlation between variables that can create skewed results are at a value of 0.80 (+/-) or above. The relationships between the other variables are thus not considered to have a strong correlation.

Table 4: Pearson's Correlation Matrix

	TobinsQ	ROA	D_CM	Female %	(ln)TotalA	(ln)Leverage	(ln)Age	boardsize	Ind_Members
TobinsQ	1.0000								
ROA	0.4556	1.0000							
D_CM	-0.1040	-0.0661	1.0000						
Female %	-0.0924	-0.0721	0.7742	1.0000					
(ln)TotalA	-0.4013	0.0670	0.1009	0.0998	1.0000				
(ln)Leverage	-0.2487	-0.0498	0.0283	0.0478	0.1762	1.0000			
(ln)Age	-0.1556	0.0853	0.0364	0.0120	0.2154	0.0425	1.0000		
boardsize	-0.1475	-0.0252	-0.0003	-0.0239	0.5126	-0.0582	0.2420	1.0000	
Ind_Members	0.0510	-0.0539	0.0742	0.0819	-0.0866	-0.0909	-0.1354	-0.2209	1.0000

Table 4. presents a Pearson's correlation matrix that measures the correlation between the variables.

In addition to the Pearson's correlation matrix, the variables' variance inflation factor (VIF) values have been tested. This test has been made for all models included in the study to ensure that the models do not contain multicollinearity. According to Brooks (2014) the problem with multicollinearity occurs when the regression model consists of independent variables that have a strong linear correlation. The VIF test showed that the values lie around one and two, which indicates slight signs of multicollinearity (Nokeri, 2021). However, this is acceptable as values of five or higher are typically considered critical (James et al., 2013). The results from the test can be found in the appendix.

6. Results

6.1 Regression results

Table 5 below presents the results from running random effect GLS multiple regressions with the dependent variables Tobin's Q and ROA, and the one-year lagged percentage of female directors as the variable of interest. The purpose of the model is to test the first null hypothesis, that the representation of female board members does not affect the firm's financial performance.

Table 5: Results from using random effects GLS models. Female percentage as the independent variable.

	1 TobinsQ	2 TobinsQ	3 TobinsQ	4 TobinsQ	1 ROA	2 ROA	3 ROA	4 ROA
Female %	0.0465	0.0887	-0.0392	-0.430	0.000361	0.00147	0.000076	0.000160
	(0.566)	(0.568)	(0.571)	(0.541)	(0.00585)	(0.00544)	(0.00530)	(0.00525)
(ln) Firm Size		-0.349***	-0.305***	-0.366***		-0.00271***	-0.00243***	-0.00249***
		(0.0617)	(0.0630)	(0.0666)		(0.000502)	(0.000512)	(0.000499)
Leverage		-1.176**	-0.981*	-1.346***		-0.0239***	-0.0243***	-0.0237***
		(0.516)	(0.507)	(0.517)		(0.00387)	(0.00398)	(0.00401)
Boardsize		0.0285	0.0241	0.0349		0.000275	0.000243	0.000266
		(0.0464)	(0.0474)	(0.0479)		(0.000336)	(0.000342)	(0.000340)
(ln) Firm Age		-0.0923	0.0437	-0.0796		-0.00308***	-0.00225***	-0.00221***
		(0.128)	(0.121)	(0.118)		(0.000879)	(0.000786)	(0.000789)
Ind_Members		0.783*	0.736*	0.413		-0.00336	-0.00305	-0.00271
		(0.418)	(0.408)	(0.372)		(0.00340)	(0.00333)	(0.00335)
Constant	1.911***	4.863***	4.502***	5.355***	0.0115***	0.0530***	0.0441***	0.0444***
	(0.227)	(0.876)	(0.832)	(0.835)	(0.00202)	(0.00716)	(0.00662)	(0.00662)
IndustryFE	No	No	Yes	Yes	No	No	Yes	Yes
YearFE	No	No	No	Yes	No	No	No	Yes
Observations	894	894	894	894	894	894	894	894
R-Squared	0.0077	0.1861	0.2832	0.3121	0.0022	0.2089	0.2784	0.2798
#Companies	298	298	298	298	298	298	298	298

Robust standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*

Column 1 for each performance measure displays the regression results of the random effects GLS model using one- year lagged female percentage. Column 2 adds the control variables. Column 3 includes the control variables and adds the industry fixed effect. Finally, column 4 adds the year fixed effect. [1]

[1] [1] The coefficient of determination presents low values for both final models. The overall value is 31.21% for the model including Tobin's Q and 29.78% when using ROA. The statistical measure determines the proportion of variance in the dependent variable that can be explained by the variables included in the model.

The regressions performed using Tobin's Q as the financial performance measure are displayed to the left of Table 5. The leftmost column shows the output when only the variable of interest is included in the regression. As can be seen above, this relationship does not reach statistical significance at the 5% level. The second model, which incorporates the control variables, but does not account for any of the fixed effects, indicates a positive relationship between the percentage of females and the performance metric. However, the relationship remains statistically insignificant.

As mentioned in the Method section, the inclusion of industry-fixed effects was found necessary based on the PARM test. Adding the fixed effect variable in the third regression now reveals a negative relationship. Nevertheless, it continues to stay insignificant. The final model in the fourth column includes a year-fixed effect, consistent with the previous PARM test. However, the coefficient remains statistically insignificant. Consequently, based on the selected model, our analysis does not provide sufficient evidence to reject the null hypothesis. Therefore, we cannot confidently conclude that increased female board representation has a significant influence on Tobin's Q.

When examining the control variables, it becomes evident that only firm size and leverage are statistically significant in the final model. Both variables display a negative correlation with Tobin's Q. This suggests that when firm size (total assets) increases by 1%, Tobin's Q decreases by 0.00366. Similarly, when leverage increases by 1%, Tobin's Q will decrease by 1.346. It is worth noting that the remaining control variables lack statistical significance. Therefore, their impact will not be interpreted in this analysis.

The regression output on the right side of Table 5 presents the results conducted using ROA as the financial performance measure. Similar to Tobin's Q, the initial regression including only the female percentage as a variable does not yield statistically significant results. As we progress through the subsequent models, gradually incorporating the control variables and fixed effect variables, the relationship between female percentage and ROA continues to lack statistical significance at a 5% level. Based on these findings, we are unable to reject the null hypothesis, indicating that there is not sufficient evidence to conclude that the presence of female board members influences ROA.

When examining the control variables in the final model, it becomes apparent that firm size, firm age, and leverage have a statistically significant impact on ROA. These coefficients are negative, suggesting that increases in firm size, firm age, and leverage are associated with decreases in ROA.

Specifically, a 1% increase in firm size leads to a decrease in ROA by 0.0000249, a 1% increase in firm age results in a decrease of 0.0000221, and a 1% increase in leverage is associated with a decrease in ROA by 0.0237. However, the magnitude of these significant control variables is minuscule, indicating that they are not economically significant. In other words, while they have a statistically significant impact on ROA, their practical influence on financial performance is minimal.

Table 6 below presents the relationship between the dependent variables and the one-year lagged critical mass of females (D_CM) as the variable of interest. The objective of these models is to examine the second null hypothesis, that critical mass of female board members does not affect the firm's financial performance.

Table 6: Results from using random effects GLS models. Critical mass as the independent variable.

	1 TobinsQ	2 TobinsQ	3 TobinsQ	4 TobinsQ	1 ROA	2 ROA	3 ROA	4 ROA
D_CM	-0.113	-0.0827	-0.128	-0.123	0.000350	0.000155	0.000346	0.000335
	(0.116)	(0.111)	(0.112)	(0.108)	(0.00116)	(0.00108)	(0.00106)	(0.00107)
(ln) Firm Size		-0.424***	-0.376***	-0.412***		-0.00242***	-0.00209***	-0.00220***
		(0.0717)	(0.0744)	(0.0771)		(0.000497)	(0.000500)	(0.000491)
Leverage		-1.785***	-1.495**	-1.381**		-0.0210***	-0.0209***	-0.0207***
		(0.647)	(0.643)	(0.638)		(0.00410)	(0.00418)	(0.00416)
Boardsize		0.0205	0.0136	0.0201		0.000182	0.000128	0.000170
		(0.0533)	(0.0546)	(0.0557)		(0.000372)	(0.000370)	(0.000369)
(ln) Firm Age		-0.220*	-0.0671	-0.123		-0.00302***	-0.00218***	-0.00221***
		(0.123)	(0.117)	(0.116)		(0.000916)	(0.000806)	(0.000808)
Ind_Members		-0.0218	0.0109	-0.167		-0.00461	-0.00380	-0.00363
		(0.430)	(0.414)	(0.401)		(0.00335)	(0.00330)	(0.00336)
Constant	2.087***	7.013***	6.525***	6.847***	0.0113***	0.0514***	0.0421***	0.0429***
	(0.152)	(0.970)	(0.947)	(0.944)	(0.00111)	(0.00734)	(0.00659)	(0.00663)
IndustryFE	No	No	Yes	Yes	No	No	Yes	Yes
YearFE	No	No	No	Yes	No	No	No	Yes
Observations	894	894	894	894	894	894	894	894
R-Squared	0.0115	0.2213	0.3064	0.3120	0.0017	0.1839	0.2529	0.2553
#Companies	298	298	298	298	298	298	298	298

Robust standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*

Column 1 for each performance measure displays the regression results of the random effects GLS model using one- year lagged critical mass of female percentage. Column 2 adds the control variables. Column 3 includes the control variables and adds the industry fixed effect. Finally, column 4 adds the year fixed effect.[2]

[2] The coefficient of determination presents once again, low values for both final models. The overall value is 31.20% for the model including Tobin's Q and 25.53% when using ROA. Thus, the explanatory power is low when the critical mass is used as the independent variable.

As in line with previously presented results regarding Tobin's Q, no significant relationship can be detected between the critical mass of female directors and the market-based variable. The coefficient of the critical mass variable remains negative throughout the steps of adding the control variables in column 2 and the fixed effects in column 3 and 4. As the relationship is not significant, we cannot reject the null hypothesis and imply that the critical mass of women affects the firm's financial performance. Therefore, we do not have enough evidence to conclude that a relationship does exist.

As regards the control variables, firm size, and leverage have a negative impact on Tobin's Q in the fourth and final model. This indicates that when firm size increases by 1%, Tobin's Q will decrease by 0.00421. Furthermore, when the leverage increases by 1%, the dependent variable will decrease by 0.01381. The remaining control variables, board size, firm age and independent board member has a p-value greater than 0,05 and thus not considered to be statistically significant. Therefore, the interpretation of their coefficients will not be considered.

In terms of the model for critical mass and ROA as the dependent variable, the results are observable on the right-hand side of Table 6. According to the presented results, the one-year lagged critical mass has no statistically significant impact on the accounting-based variable ROA throughout the process of adding both control variables and fixed effects. In comparison to Tobin's Q, the coefficient has a positive sign, even though very small. However, due to its insignificance, it is not possible to conclude that a relationship exists between the variable of interest and the accounting- based performance measure ROA.

Furthermore, the control variables firm size, firm age, and leverage are once again proven to be statistically significant. The coefficient of firm size in the final model is –0.0022. This indicates that when the firm size increases by 1%, ROA would decrease by 0.000022. The same relationship and effect can be approximated between firm age and ROA. When it comes to leverage, an increase of 1% will decrease the performance measure by 0.0207. These variables are once again not economically significant as the magnitude is relatively small as mentioned in the previous results. Board size and independent board members remain insignificant.

7. Discussions

The purpose of this study is to investigate whether a potential relationship exists between gender diversification on corporate boards and the financial performance of firms. The financial performance is measured as ROA and Tobin's Q for Danish, Finnish, and Swedish firms listed on Nasdaq Nordic Main Market. After conducting regressions and analyzing the results, is revealed that the presence of female board members, as well as the critical mass of female board members, are not statistically significant when considering the financial performance measurements. Based on these findings, there is insufficient evidence to support the conclusion that female representation has an impact on firm performance, neither positively nor negatively.

The lack of significance in the relationship between the market–based measurement of Tobin's Q and the proportion of females is in alignment with several previous empirical studies (Campbell & Minguez-Vera, 2008; Carter et al., 2018; Marinova et al., 2016). Marinova et al. (2016) suggested that this result indicates that having an increased number of women on the board, does not result in better or worse firm performance. Moreover, previous research within the area of interest has also revealed different results regarding the relationship between the proportion of female directors and the accounting-based performance measure return on assets (ROA). While Dankwano and Hassan (2018) found a negative correlation, others have reported a positive relationship between these variables (Carter et al., 2010; Bennouri et al., 2018). As presented in the previous chapter, an insignificant relationship was found between the percentage of female board members and ROA.

It is important to acknowledge that potential differences in diversity across countries can have an influence on the relationship between board gender diversity and firm financial performance (Carter et al., 2010). Supporting this notion, Belaounia et al. (2020) showed through their global study that gender-equal countries tend to exhibit a positive relationship between the variables, while unequal countries tend to show a negative relationship. However, this conclusion cannot be established with certainty in this study, even though the countries included in the analysis have high rankings in terms of gender equality. One aspect that may have influenced the results is the potential diminishing effect of having more female directors on boards. Considering that Denmark, Finland, and Sweden are already considered gender equal, the firms in these countries may already be relatively diverse. As a result, the incremental effect of further increasing the number of female directors may be less pronounced or has no effect at all on the financial performance.

Furthermore, the result of our study may be attributed to the period under investigation. Carter et al. (2010) noted that the relationship between diversity and financial performance cannot be explained by the Agency theory directly. However, gender-diverse boards can reduce potential agency problems, which in turn can affect the long-term financial performance of the firm. It is possible that the effects of gender-diverse corporate boards take time to materialize and translate into measurable financial outcomes, which may not be fully captured in this analysis, especially if there have been recent changes in the board compositions. At the same time, multiple studies have proven significant relationships without the need for a notably longer observation period (Dankwano et al., 2018; Noland et al., 2020; Carter et al., 2020).

In accordance with the resource dependence theory, Barney (1991) suggests that businesses are made up of a variety of resources that can be utilized in value-creating strategies. According to the theory, the organizational structure of the board is crucial as the characteristics of each member influence the resources that can be provided for the business and its strategies (Pfeffer & Salancik, 1978). The findings of this study did not uncover any statistically significant associations, although various studies have demonstrated that women's distinctive features can be associated with improved profitability (Carter et al., 2010; Noland et al., 2020; Bennouri et al., 2018; Belaounia et al., 2020). However, it is essential to note that diversification does not guarantee a positive effect or any effect at all. A highly efficient board does not necessarily require a greater degree of gender diversity.

One possible explanation for the lack of consistent evidence regarding the assumption that higher diversity leads to higher profitability, both demonstrated in prior research and in this study, is that the differences between the genders may not always be as tangible or evident as initially presumed. It is plausible to argue that individual attributes or experiences alone may not fully account for the relationship between the board composition and performance. The inability to directly measure these attributes reinforces the notion that there might be other unobservable elements that affect the direction of the relationship.

The critical mass theory suggests that a specific level is required before the effects of female board representation become observable. In alignment with what some researchers have found, this level corresponds to 30% representation (Joecks et al., 2013; Liu et al., 2014). In this study, the observed mean value of the female percentage is approximately 31%. Despite surpassing the required level, the result did not prove to be significant for any performance measure. This could be an indicator that the critical level associated with the data observed in this study is even higher.

Furthermore, the mean value of 31% indicates that, on average, the firms of this study belong to a *tilted group* according to Kanter (1977) and her description of different compositions. While the distribution of these groups is less extreme compared to groups with a lower proportion of females, a majority still exists and retains "control". However, females can slowly begin to affect the culture and dynamics in the group. Therefore, there might be chances that females are still being perceived as symbols of their minority rather than individuals with relevant attributes and competence for the job. This in turn could make the effect of their presence unobservable or have no effect on the performance at all, especially when the female directors do not possess the ability to affect the decision-making processes to the same extent as the majority.

Broome et al. (2011), present that an increased comfort level occurs when the proportion of female directors increases. However, despite this, women experience themselves as pioneers, possessing the knowledge and abilities to efficiently function as a contributing factor to the group, even when they are the first representative or belongs to a homogenously skewed group. With this as a background, one could assume that the critical mass does not always need to be reached to affect the performance. A board with 10% female directors could therefore be able to perform as well (or bad) as a board of the same size with 40% females.

7.1 Limitations

As regards any potential limitations of this study, the small sample size is important to acknowledge. Due to time constraints and the manual acquisition of data, the sample consists of observations from the years 2018-2021. However, as the independent variables are lagged, only three years are used in the regressions. The study could possibly lead to another result, or at least an improved investigation by integrating a longer period with more observable data. However, it is not possible to predict what the exact results could have been.

Furthermore, the issue of endogeneity, with reverse causality and omitted variable bias, is a common concern when studying the relationship between gender diversity and financial performance. According to Adams and Ferreira (2009), endogeneity problems arise because of omitted variables that affect both the selection of diverse directors and firm performance. The second problem associated is the reverse causality association of variables. On one hand, a positive correlation could imply that boards with higher female representation do perform better. On the other hand, it could also indicate that firms with stronger financial performances are more likely to appoint more women

to their boards. A limitation is therefore that we did not include an instrumental variable in our models which would have mitigated the issue of endogeneity. Moreover, the study may have been improved further by integrating additional variables, allowing for more in- depth investigation.

Lastly, a limitation worth mentioning regards the manual data collection process, as it is subject to the human factor. For instance, despite carefulness when retrieving data on the gender composition of board members, potential miscalculations may have occurred in determining the proportion of female members. The gender identification has sometimes been challenging. During instances where determining an individual's gender has been difficult, further investigations have been carried out, for example by using sources such as Google. However, errors may still exist in our data set due to the manual data collection.

8. Conclusion

The purpose of this thesis was to examine the potential relationship between female representation in the boardroom and the financial performance of firms listed on the Nasdaq Nordic Main market. The aim was to answer the research question regarding whether gender diversification of Nordic company boards affects financial performance. With the investigation established, no relationship between the two can be established.

The regression models showed that no significant result could be deduced from the proportion of women and the profitability measures ROA and Tobin's Q. The regression analyses for the critical mass of the proportion of female board members did not present significant relationships with the profitability measures either. Thus, none of the null hypotheses could be rejected. Based on the results of the study, it cannot be concluded with statistical certainty that the proportion of female directors affects firm financial performance. Although the results are not conclusive, they do enable indications of how the market responds to gender-balanced boards.

As regards suggestions for future research, the involvement of different financial performance metrics may lead to other results. In addition to Tobin’s Q and ROA, one could explore the relationship between female presence and other metrics such as Return on Investment (ROI). Furthermore, it would be interesting to incorporate additional characteristics of the board members, such as age, educational level, and ethnicity to broaden the scope of the investigation. Although this study used a quantitative methodology, one suggestion is to complement the quantitative analysis with a qualitative research method, such as interviews. This would provide a deeper comprehension of the mechanisms behind gender diversity and its effects on financial performance.

In conclusion, our research adds to the body of knowledge on the relationship between gender diversity in the boardroom and financial performance. More specifically, as the Nordics have not been investigated as a region before, this study provides new information to the field. From an ethical- and societal perspective, this study provides important insights to the board- and business management and adds to the critical conversation of a gender-balanced labour market.

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Appendix

Below are the results from the conducted tests that have been made on the data and models are presented. In addition to this, the companies included in the study can be observed.

Appendix 1: Hausman Test

```
Test of H0: Difference in coefficients not systematic

   chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
           =  16.07
Prob > chi2 = 0.1347
```

This specific Hausman test reports the results of Tobin's Q and female percentage. It should be noted that the other tests reported the same result, indicating that the random effect model should be used.

Appendix 2: PARM – Test

Tobin's Q & Critical mass	Tobins & Female percentage
(1) dsector1 = 0	(1) dsector1 = 0
(2) dsector2 = 0	(2) dsector2 = 0
(3) dsector3 = 0	(3) dsector3 = 0
(4) dsector4 = 0	(4) dsector4 = 0
(5) dsector5 = 0	(5) dsector5 = 0
(6) dsector6 = 0	(6) dsector6 = 0
(7) dsector7 = 0	(7) dsector7 = 0
(8) 19.year = 0	(8) 19.year = 0
(9) 20.year = 0	(9) 20.year = 0
(10) 21.year = 0	(10) 21.year = 0
F-Statistic = 54.36	F-Statistic = 58.55
Prob > F = 0.0000	Prob > F = 0.0000

ROA & Female percentage	ROA & Critical mass
(1) dsector1 = 0	(1) dsector1 = 0
(2) dsector2 = 0	(2) dsector2 = 0
(3) dsector3 = 0	(3) dsector3 = 0
(4) dsector4 = 0	(4) dsector4 = 0
(5) dsector5 = 0	(5) dsector5 = 0
(6) dsector6 = 0	(6) dsector6 = 0
(7) dsector7 = 0	(7) dsector7 = 0
(8) 19.year = 0	(8) 18.year = 0
(9) 20.year = 0	(9) 20.year = 0
(10) 21.year = 0	(10) 21.year = 0
F-Statistic = 34.89	F-Statistic = 31.56
Prob > F = 0.0001	Prob > F = 0.0002

Appendix 3: Wooldridge Test

Wooldridge Test

H0: no first-order autocorrelation

Dependent variable	F-statistics	Prob >F
ROA	11.151	0.0009
Tobin´s Q	7.712	0.0058

Appendix 4: Breusch- Pagan Test

Breusch- Pagan Test

H0: Constant variance

Dependent variable	Chi-Square Statistic	Prob > Chi-Square
ROA	50.78	0.0000
Tobin´s Q	85.61	0.0000
ROA	50.53	0.0000
Tobin's Q	85.32	0.0000

The first to tests with ROA and Tobin's Q uses female percentage as the independent variable while the remaining two uses critical mass of the proportion of female board members.

Appendix 5: VIF Test

Variable	VIF	1/VIF
Boardsize	1,52	0,656149
Total assets	1,5	0,667993
Firm age	1,08	0,922143
Ind_ Members	1,08	0,922327
Leverage	1,08	0,923688
Female %	1,04	0,965673

This specific VIF test reports the results of Tobin's Q and female percentage. However, the remaining tests made with other independent and dependent variables reported similar values around 1 and 2.

Firms included:

A.P. MÖller -Maersk A/S	Boozt AB	FLSmidth & Co. A/S	K- Fast Holding AB	Novo Nordisk A/S	Sinch AB
AAK AB	Bravida Holding AB	Fabege AB	K2A Knaust & Andersson AB	Novozymes A/S	Skanska AB
ABB Ltd	Brdr. A&O Johansen	Fagerhult AB	KABE Group AB	Nyfosa AB	SkiStar AB
AFRY AB	Brdr. Hartmann A/S	Fast. Balder. AB	Kamux Oyj	OEM International AB	Solar A/S
ALK Abell— A/S	Bufab AB	Fastator AB	Karnov Group AB	Olvi Oyj	Stillfront Group AB
AQ Group AB	Bulten AB	Fastighets AB Trianon	Kemira Oyj	Oriola Oyj	Stockmann Oyj Abp
AcadeMedia AB	Byggmax Group AB	Fastpartner AB	Kesko Oyj	Orion Oyj	Stora Enso Oyj
AddLife AB	CBRAIN A/S	Fenix Outdoor AB	Kindred Group	Orrön Energy AB	Suominen Oyj
AddNode Group AB	CTT Systems AB	Ferronordic AB	Knowit AB	Outokumpu Oyj	Sweco AB
Addtech AB	Calliditas Therapeutics AB	Fingerprint Cards AB	Kone Oyj	Pandora A/S	Swedish Orphan Biovitrum AB
Alfa Laval AB	Camurus AB	Finnair Oyj	Konecranes Oyj	Pandox AB	SynAct Pharma AB
Alimak Group AB	Cargotec Oyj	Fiskars Oyj	Københavns Lufthavne A/S	Peab AB	Systemair AB
Alma Media Oyj	Carlsberg A/S	Flugger Group A/S	Lagercrantz Group AB	Per Aarsleff Holding A/S	TCM Group A/S
Ambea AB	Castellum AB	Fortum Oyj	Lassila & Tikanoja Oyj	Pihlajalinna Oyj	TORM A/S
Ambu A/S	Catena AB	G5 Entertainment AB	LeoVegas AB	Platzer Fastigheter Holding AB	Talenom Oyj
Arise AB	Caverion Oyj	GN Store Nord A/S	Lifco AB	Ponsse Oyj	Tele2 AB
Arjo AB	CellaVision AB	Gabriel Holding A/S	Lime Technologies AB	Pricer AB	Telia Company AB
Aspo Oyj	ChemoMetec A/S	Garo AB	Lindab International AB	Proact IT Group AB	Terveystalo Oyj
Assa Abloy AB	Chr. Hansen Holding A/S	Genmab A/S	Logistea AB	Probi AB	Tethys Oil AB
AstraZeneca PLC	Citycon Oyj	Getinge AB	Loomis AB	Q-Linea AB	Thule Group AB
Atlas Copco AB	Clas Ohlson AB	Gränges AB	MIPS AB	QT Group Oyj	TietoEVRY Oyj
Atria Oyj	Cloetta AB	Gyldendal A/S	MT Højgaard Holding A/S	RTX	Tivoli A/S
Atrium Ljungberg AB	Coloplast A/S	H+H International A/S	Marimekko Oyj	Raisio Oyj	Tobii AB
Attendo AB	Columbus A/S	H. Lundbeck A/S	Matas A/S	Rapala VMC Oyj	Tokmanni Group Oyj
Autoliv Inc. SDB	Concentric AB	HEBA Fastighets AB	MedCap AB	RaySearch Laboratories AB	Trelleborg AB
Axfood AB	Coor Service MGMT Holding A	HEXPOL AB	Medicover AB	Rejlers AB	Troax Group AB
BHG Group AB	Corem Property Group AB	HKScan Oyj	Meko AB	Remedy Enterntainment Oyj	UPM-Kymmene Oyj
BTS Group AB	D/S Norden A/S	HMS Networks AB	Metsä Board Oyj	Revenio Group Oyj	Uponor Oyj
Bactiguard Holding AB	DFDS A/S	Hansa Biopharma AB	Modern Times Group MTG AB	Rockwool A/S	VBG Group AB
Bakkafrost P/F	DSV A/S	Harvia Oyj	Munters Group AB	Rottneros AB	Vaisala Oyj
Balco Group AB	Demant A/S	Hennes & Mauritz AB. H&M	Mycronic AB	Rovio Entertainment Oyj	Valmet Corp.
Bang& Olufsen A/S	Digia Oyj	Hexagon AB	NCC AB	Royal Unibrew A/S	Verkkokauppa.com Oyj
Bavarian Nordic A/S	Diös Fasigheter AB	Hexatronic Group AB	NIBE Industrier AB	SAAB AB	Vestas Wind Systems A/S
Beijer Alma AB	Dometic Group AB	Holmen AB	NKT Holding A/S	SAS AB	Viking Line Abp
Beijer Electronics Group AB	Duni AB	Hufvudstaden AB	NNIT A/S	SCA. Svenska Cellulosa AB	Vitec Software Group AB
Beijer Ref AB	Dustin Group AB	HuhtamŠki Oyj	NP3 Fasigheter AB	SKF AB	Vitrolife AB
Bergman & Beving AB	Eastnine AB	Humana AB	NTG Nordic transport Group A/	SP Group A/S	Volati AB
Besqab AB	Elanders AB	Husqvarna AB	Nederman Holding AB	SSAB AB	Volvo AB
Betsson AB	Electrolux AB	I.A.R Systems Group AB	Neste Oyj	Sagax AB	Wallenstam AB
Better Collective A/S	Elekta AB	IRLAB Therapeutics AB	Net Insight AB	Sandvik AB	Wihlborgs Fastigheter AB
Bilia AB	Elisa Oyj	ISS A/S	Netcompany Group A/S	Sanoma Oyj	WithSecure Oyj
BillerudKorsnäs AB	Elos Medtech AB	ITAB Shop Concept AB	New Wave Group AB	Scandi Standard AB	Wärtsilä Oyj Abp
BioArctic AB	Eltel AB	Immunovia AB	Nilfisk Holding A/S	Scandic Hotels Group AB	XANO Industri AB
BioGaia AB	Enea AB	Incap Oyj	NoHo Partners Oyj	Scandinavian Tobacco Group A/S	Xbrane Biopharma AB
BioInvent International AB	Epiroc AB	Indutrade AB	Nobia AB	Scanfil Oyj	Xvivo Perfusion AB
Biotage AB	Ericsson Telefonab LM	Instalco AB	Nokia Oyj	Schouw & Co. A/S	YIT Oyj
Bittium Oyj	Essity AB	Invisio AB	Nokian Tyres Plc	Sdiptech AB	Zealand Pharma A/S
Boliden AB	Etteplan Oyj	Inwido AB	Nolato AB	Sectra AB	Örsted A/S
Bonava AB	Evolution AB	JM AB	North Media A/S	Securitas AB	
Bonesupport Holding AB	Ework Group AB	Jeudan A/S	Note AB	SimCorp A/S	