Radboud University

Board diversity and firm performance

Master Thesis Economics – Accountancy & Control

Final Version

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Abstract

The European Commission strives for more women in the board of directors, because they could diversify the board of directors which positively influences firm performance. Their idea is to establish a binding gender quota to encourage the presence of women in the board of directors. In this research the relation between board diversity, based on the age, ethnicity, and educational level of women in the board of directors, and firm performance (e.g. return on assets) is examined. Besides that, the possible moderation effect of gender quotas on the relationship between board diversity and firm performance is examined. The sample consists of 468 firms from 12 European companies, operating in the trade and service industry, with at least one woman in the board of directors. The results show a positive relationship between women in the board of directors and firm performance. When looking at specific characteristics of these women, the results show that there is no positive relationship between board diversity, based on the age, ethnicity, and educational level of women in the board of directors, and firm performance. The results also show no moderation effect of gender quotas on the expected relationships between women in the board of directors, board diversity, and firm performance. The critical mass theory of Kanter (1987) could give possible explanations for not finding the expected relationships. This research contributes to the literature through a better understanding of the relationship between women in the board of directors, board diversity and firm performance, and by investigating the unexamined moderation effect of gender quotas.

Contents

1 Introduction

Lord Davies (2015) states that "Britain's biggest companies need to get their house in order by appointing more women to executive positions" (Western Daily Press, para. 1). The key reason for more women at the top is the impact women can have in business terms. The more diverse the group is at the top, the better the firm performance. For this reason, Lord Davies argues that British companies have to appoint more women at the top.

Women should have a positive effect on firm performance (e.g. return on assets), because of the increase in board diversity. Therefore, the European Commission (2016) also strives for more women at the top. The commission is convinced there are more women who are able to perform a top function in the board of directors. The idea is to establish a binding quota. The quota encourages in reaching the goal of forty percent representation of women in the board of publicly listed companies. In this way, the commission strives to promote the equality between men and women in decision-making, which increases the board diversity and firm performance (European Commission, 2016).

To better understand the relationship between women in the board of directors and firm performance (e.g. return on assets), the effect of board diversity on firm performance have to be investigated. In this research, board diversity refers to specific characteristics and expertise of women in the board that diversifies the board of directors. Some factors that influence the board diversity are the educational level, age and ethnicity (Arena et al., 2015; Walt & Ingley, 2003; Singh et al.; Campbell & Minguez-Vera, 2008). A better understanding of the relationship between board diversity and firm performance is important. Because a deeper understanding of the relationship may affect the decision to establish a binding quota about the presence women in the board. Norway has already introduced a binding quota to promote the diversity in the board and thus, increasing firm performance (Bøhren & Staubo, 2014). Studies show the quota of forty percent of women in the Norwegian boardrooms has a negative effect on the firm performance (Bøhren & Staubo, 2014; Ahern & Dittmar, 2012).

Many countries strive for more women at the top of firms in their country to increase board diversity and increase firm performance. Studies based on Norway show a negative relationship between women in the board of directors and firm performance (Bøhren & Staubo, 2014; Ahern & Dittmar, 2012). This negative relationship could be the result of the binding quota regulation in Norway. A study based on Germany, which had a soft quota regulation until December 2015, shows a positive relationship between women in the board of directors and firm performance (Joecks et al., 2012). The difference between binding quotas

and soft quotas is that binding quotas are included in the legislation and soft quotas are not included. The possible influence of a binding quota or a soft quota on the relationship between board diversity and firm performance is yet unknown.

This research is about the relationship between board diversity and firm performance. Besides that, the influence of binding quota regulations and soft quota regulations on this relationship will also be investigated. The research question is: *"What is the effect of board diversity, based on the age, ethnicity, and educational level of women in the board of directors, on firm performance, and the influence of gender quotas on this effect?"*

This research contributes to the literature in a few ways. First, following the call for a better understanding of the relationship between women and firm performance, the effect of board diversity on firm performance is investigated (Arena et al., 2015). A second contribution is filling in the research gap about a possible influence of a gender quota on the relationship between board diversity and firm performance.

This research is useful for policymakers and regulators. The European Commission prefers a binding quota to reach the goal of more women in the board of directors (European Commission, 2016). Thus, it is important for the commission to know the effect of women on firm performance. Besides that, the possible influence of a binding quota or a soft quota is also important. When binding quotas and soft quotas differs in their effect on the relationship between board diversity and firm performance, policymakers and regulators should chose for the most positive effect.

This research uses the quantitative method and makes an analysis of European countries. Data is collected from European publicly listed firms in the trade and service industry[1], with at least one woman in the board of directors. The level of board diversity of each company is determined and will be entered in Stata. Stata performs a regression to define the relationship between board diversity and firm performance, and the possible influence of gender quotas on this relationship.

The paper is structured as follows. The following chapter gives an overview of the prior literature. The trigger for this research will be elaborated and hypothesis are formed based on the existing literature. Chapter three describes the usage of the methodology. This chapter

1 Based on the two digit SIC code.

describes the way in which an answer to the research question is obtained. The results are presented in chapter four. The results will be presented by use of tables. The last chapter of this paper contains the conclusion. The research question will be answered in this chapter. The limitations of this study and recommendations for future research are also presented in this chapter. Finally, references and appendices are given.

2 Literature review

This chapter provides an overview of the existing literature. First, literature about firm performance is discussed. After that, the influence of board diversity on firm performance is explained. The resource dependency theory and human capital theory are discussed to understand the link between board diversity and firm performance. Then women are included, because of their influence on board diversity and firm performance. They have different characteristics and expertise in comparison with their male board members, which increases board diversity. Therefore, specific characteristics and expertise of women in the board of directors and their influence on firm performance also is discussed. Finally, this chapter contains literature about gender quotas. The aim and different types of gender quotas, and the use of gender quotas in European countries are discussed. The reason for discussing gender quotas is the possible influence of gender quotas on the relationship between women in the board of directors, board diversity, and firm performance.

2.1 Firm performance

The objective of the firm is to build and sustain superior performance, this means performance which is higher than the average performance of firms in the same industry (Arend, 2004). But, the definition of performance can vary widely between firms, and also between researchers. A lot of research is done using firm performance as dependent variable. These studies used 56 different indicators for firm performance (Combs et al., 2005). Financial performance, by using accounting measures of profitability is the most common firm performance indicator used. But Combs et al. (2005) identifies, in addition to financial performance, four other indicators of firm performance. These other indicators are customer satisfaction, employee satisfaction, social performance, and environmental performance.

Since financial performance is the most common indicator of firm performance, measuring firm performance refers mainly to profitability measures (Combs et al., 2005). This includes indicators as return on assets, return on equity, return on investments, net income, economic value added, and earnings before interest, taxes, depreciation and amortization (Combs et al., 2005).

2.2 Board diversity and firm performance

The resource dependency theory and the human capital theory are common used frameworks to understand the link between board diversity and firm performance, therefore these theories are discussed in this paragraph. After discussing these theories, literature about board diversity will be discussed. This literature is followed by literature about women in the board of directors and their influence on board diversity and firm performance. Last, characteristics and expertise of women and their influence on board diversity will be explained.

2.2.1 Resource dependency theory

The key role of the board of directors is to control and monitor the managers, and providing resources. The research dependency theory suggest that firms are dependent on their environment (Pfeffer, 1972). Firms have to secure resources from the environment, this reduces uncertainty and enhances firm performance (Pfeffer, 1972; Taljaard et al., 2015). Board diversity, created by diverse board capital, supports the ability to secure resources from the environment, which reduces uncertainty and increases firm performance (Hillman & Dalziel, 2003; Pfeffer, 1972). A diverse board is better in securing resources from the environment than less diverse boards, because diverse boards have better access to information and networks (Bryant & Davis, 2012; Taljaard et al., 2015).

2.2.2 Human Capital Theory

Knowledge and skills of board members influences the effectiveness of the execution of the monitoring and resources provision roles (Hillman & Dalziel, 2003). The knowledge and skills of board members are also referred to human capital of the board members. Human capital is defined as: “The knowledge, skills, competences and other attributes embodied in individuals that are relevant to economic activity” (OECD, 1998, p.9). Becker (1964) considers schooling and on-the-job training as the main forms of human capital. Education and experience of board members are examples of human capital. Members of the board bring unique human capital to the board of directors, because they have different levels of education and other experiences (Kesner, 1988). Unique human capital diversifies the board of directors. Decision making will be enhanced due to unique new perspectives and knowledge (Fagan et al., 2012). Therefore, the human capital theory argues that firm performance is affected by board diversity as a result of unique human capital in the board of directors (Carter et al., 2010).

The compatibility of the resource dependency theory and the human capital theory is based on the assumption that board diversity improves firm performance. Both theories argue that unique human capital provides board diversity. Thereafter, board diversity positively influences firm performance.

Several studies are in accordance with the resource dependency theory and the human capital theory. These studies find a positive relation between the level of board diversity and firm performance (Carter et al., 2003; Kim et al., 2013. Because board diversity encourages a better understanding of the market, increases creativity and innovation, and increases effectiveness of the board of directors by taking a broader view (Carter et al., 2003; Kim et al., 2013).

But there is still a minority of studies that show a negative association between board diversity. They claim that board diversity determines conflicts that negatively affect firm performance (Arena et al., 2015; Smith et al., 2006). These conflicts are the results of more diverse opinions and more critical questions, which increases the time that is needed to make a decision. Firms operating in a competitive industry have to react quickly to market shocks, therefore diverse boards could negatively affect firm performance (Smith et al., 2006).

2.2.3 Women in the board of directors, board diversity and firm performance

Women in the board of directors diversify the board. Study shows that women in German boardrooms have a positive effect ton firm performance (Joecks et al., 2012). Mahadeo et al. (2012) also find a positive relationship between women in the board of directors and firm performance in an emerging economy. The research of Carter et al. (2003) and Erhardt et al. (2003) based on U.S. firms both show a positive association between the percentage of women in the board of directors and firm performance.

Other studies show a negative relationship between women and firm performance (Ahern & Dittmar, 2012; Bøhern & Staubo, 2014). These two studies are based on Norwegian firms. A study based on U.S. firms also shows a negative relationship (Adams & Ferreira, 2009). The research of Shrader et al. (1997) which is also based on U.S. firms has the same result.

Later research of Carter et al. (2010) did not find a relationship between women in the board of directors and firm performance. This research is based on U.S. firms. This result also applies to research of Miller & del Carmen Triana (2009) based on U.S. firms and research of Randöy et al. (2006) based on Danish, Norwegian, and Swedish firms.

The mixed research results show that the relationship between women in the board and firm performance remains unclear. Some studies find a positive relationship between women in the board of directors and firm performance, other studies find a negative relationship. However, a few studies did not find a relationship of any kind. All studies are based on one specific country, so the general effect of women in the board of directors on firm performance is not investigated.

The research gap on the effect of women in the board of directors on firm performance is filled by the research of Arena et al. (2015). This research makes a cross-country analysis to study the general effect of women in the board of directors on firm performance in the masculine industries. The results show that women in the board of directors do not positively affect firm performance. Women may create relationship conflicts and have no contribution to the value creation. When the critical mass is taken into account, women in the board of directors have a positive effect on firm performance.

The effect of the presence of women in the board on firm performance in European firms, operating in the trade and service industry, has not been investigated at the moment. Therefore the first hypothesis is as following:

H1a: The presence of women in the board of directors is positively related to firm performance.

To better understand the relationship between women in the board of directors and firm performance, the specific characteristics and expertise of women have to be investigated. Arena et al. (2015) investigated the educational level of women in the board of directors. Women diversify the board of directors through their educational level, because they have relatively a higher educational level than their male board members (Arena et al., 2015). Therefore, the educational level is a factor that influences board diversity. Other board diversity factors and their influence on firm performance has not been investigated at the moment.

Board diversity refers to differences between board members and has been categorized between demographic dimensions and cognitive dimensions (Erhardt, 2003; Mahadeo et al., 2012). Demographic dimensions are for example age and ethnicity. An example of a cognitive dimension is the educational level.

Women have different characteristics and expertise than men, for example their educational level. Because women have in comparison with their male members in the board of directors

a relatively higher educational level (Arena et al., 2015). In addition, women in the board of directors have relatively a lower age than their male board members. Women have also less board experience than their male board members (Ahern & Dittmar, 2012). Therefore, the presence of women in the board of directors diversifies the board through their differences in characteristics and expertise in comparison with their male board members.

This research investigates a number of factors that influence the board diversity. These factors are characteristics and expertise of women in the board of directors. The factors are discussed below and are based on several studies which suggest that these factors determine the board diversity (Walt & Ingley, 2003; Singh et al., 2008; Campbell & Minguez-Vera, 2008).

Age

Research shows that women directors are on average younger than their male counterparts (Walt & Ingley, 2003) (Singh et al., 2008). New and retained women directors are on average 6.5 years younger than their male associates in the board of directors (Ahern & Dittmar, 2012). When there are more women in the board of directors, the age of the board members will be more diverse. This has a positive effect on board diversity.

Mahadeo et al. (2012) show that age-diversity, as the result of young women in the board of directors, has a positive influence on firm performance. Taljaard et al. (2015) also find a positive relationship. They stated in their research that younger boards through the presence of women may lead companies towards being more competitive and higher firm performance.

Educational level

Some studies do not report unanimous findings about which type of gender is better educated. They show women are just as well educated as men (Carter et al., 2010; Singh et al., 2008). Machold et al. (2013) also show women are just as well educated as men by arguing that half of the graduates from universities are women. Therefore, Machold et al. (2013) claim that companies are less competitive when they do not appoint members from this pool of talent.

Other studies state that women in the board are on average higher educated than their male members (Ahern & Dittmar; Fagan et al., 2012). Fagan et al. (2012) suggest in their paper that the type of education, for example law or business management, is not different between women and men in the board of directors.

So, the literature shows that women are, in terms of educational level, certainly not less educated than their male members in the board. Women are sometimes even better educated

than their male members and this diversifies the board. A higher educational level has a positive effect on firm performance. Because the educational level provides relevant human capital for an effective execution of the tasks of board members (Arena et al., 2015).

On the other side, Arena at al. (2015) argue that women with a higher educational level than their male members would cause emotional conflicts in the board. This is the case when women in the board of directors do not feel inferior to their male members (Arena et al. 2015). These conflicts have a negative influence on the firm performance.

Ethnicity

Several studies define ethnicity as the number of minorities in the board of directors. Minorities include African, Asian, Hispanic, Native Americans and Mixed Race people (Erhardt et al., 2003; Ntim, 2015). Because these races are non-whites. The ethnicity in the board of directors is low for both woman (4.2%) and men (1.4%) (Singh et al, 2008). Therefore, ethnic minorities in the board increases the board diversity.

Erhardt et al. (2003) discovered a positive association between the presence of ethnic minorities on board and firm performance. Biggins (1999) stated that corporations increasingly find that the presence of ethnic minorities in the board positively influence firm performance, because ethnic diversity in the board enhances a better understanding and serving of their customers and clients. Carter et al. (2003) also show a positive relationship between ethnicity and firm performance. However, later research of Carter et al. (2010) did not find evidence that ethnic minorities will improve the financial performance of the firm, but they find also no evidence that ethnic minorities have a negative effect on firm performance.

The age, educational level and ethnicity of women in the board of directors determines together the level of board diversity in this research. Literature about the relation between board diversity and firm performance show that the level of board diversity is positively related to firm performance. Therefore, the second hypothesis is as following:

H1b: Board diversity, based on the age, ethnicity, and educational level of women in the board of directors, is positively related to firm performance.

2.3 Gender quotas

The aim of gender quotas is to promote the presence of women in the board of directors. These quotas could influence the relationship between women and firm performance, and the relationship between board diversity and firm performance which is just discussed in the previous paragraph.

2.3.1 The aim of gender quotas and the different types

The aim of gender quotas is more women at the top, because the problem to be addressed is the underrepresentation of women in the board of directors. The underrepresentation is a phenomenon which deserves attention because women usually constitute circa fifty percent of the population in almost all countries (IDEA & Stockholm University). Therefore gender quotas promote the presence of women in decision-making and thus, more women in the board of directors.

Gender quotas could be established by the use of a quota-instrument. According to the European commission's Network (2011), the definition of a quota instrument is:

> The quota-instrument is a positive measure that establishes a fixed percentage or number for the representation of a specific category of persons. Quotas can be included in legislation (in electoral, equality, labour, and constitutional law) or applied on a voluntary basis (like voluntary political party quotas, soft targets). (p.3)

According to the definition of European commission's network, two types of gender quotas can be described. The first type of gender quota is the binding quota regulation. The binding quotas are included in the legislation and firms have to comply with these law. These rules are passed by a government body of elected officials (Catalyst, 2014). When firms do not comply with the law, sanctions will be imposed.

The second type of gender quota is the soft quota regulation. These soft quotas are included in the guidelines on good corporate governance for example. The rules are passed by an administrative body that oversees recommended conduct for companies (Catalyst, 2014). Sanctions are not imposed when a firm does not comply with the soft quota. Other examples of these types of quotas are prizes and awards for companies promoting gender equality, companies signing a charter about the focus on women at the top, and rankings focused on companies with women in the board of directors (Catalyst, 2014; European Commission's Network, 2011).

2.3.2 Quotas for women at the top in European countries

The European Commission (2016) strives for more women at the top. Because the board of directors of European firms contains on average less than twelve percent women, while the European labor force consists of forty-five percent women (Pande & Ford, 2011). The European Commission wants to promote the presence of women in decision making by establishing a binding quota. A quota could be established by the use of a quota-instrument.

The European Commission desires to reach the objective of forty percent representation of women directors in the board of directors of publicly listed companies by the use of a quota-instrument (European Commission, 2016). Most European countries utilize soft quotas to increase the presence of women in decision-making, for example Denmark, Finland, Ireland, Luxembourg, and the United Kingdom (European Commission's Network, 2011). Some European countries employ binding quotas, like Norway, Belgium, France, Iceland, Italy, Netherlands, and Spain (European Commission's Network, 2011). An overview of European countries mentioned in this paragraph, their type of quota, and the introduction date of the quota is given in table 1 in Appendix A.

2.3.3 The effect of gender quotas

Most studies about the effect of gender quotas are based on one single country. The country uses a soft or binding quota and the effect of this gender quota on firm performance in the country is studied. Some results of these studies are divided by type of quota and are shown on the next page.

Binding quota regulation

A lot of research done about the effect of binding quotas is based on Norway. As already stated, Norway has introduced a binding quota in 2003. The forty percent quota applies to public limited sate-owned and inter-municipality companies (Pande & Ford, 2011). The quota have to be reached in 2008. Studies show the binding quota regulation of forty percent women in the Norwegian boardrooms has a negative effect on firm performance, because of appointing unsuitable women (Ahren & Dittmar, 2012; Bøhern & Staubo, 2014; Matsa & Miller, 2013).

Soft quota regulation

Research based on the United States, where a soft quota is used, show a positive relationship between gender diversity in the boardroom and firm performance (Carter et al., 2003). The same relationship applies for a study based on Germany, which had a voluntary quota until December 2015 (Joecks et al., 2012). Kotiranta et al. (2007) based their study on Finnish

listed companies, where a soft quota is applied. This study shows a positive relationship between women in the board of directors and firm performance. They show that firms with women in the board outperform other companies. Although, there are also studies that do not find evidence for a relationship between gender diversity and firm performance (Miller et al., 2009; Rose, 2007)

A few studies examine the effect of gender quotas for different countries, these studies are not based on one specific country. Labelle et al. (2015) have investigated the effect of gender quotas on the relation between gender diversity and performance. They find a positive relationship between gender diversity and performance in countries which use a soft quota, while the relationship is negative in countries which use a binding quota. Labelle et al. (2015) argue that an accelerated increase in the demand for more women in the board of directors creates a shortage of suitable women for the board. This forces firms to appoint less suitable women for the board of directors. Firms in countries which use soft quotas can select their board members optimally and this encourages firm performance, in contrast to firms in countries which use binding quotas that cannot select their board members optimally, due to the pressure of external authorities (Labelle et al., 2015).

Research of Casey et al. (2011) compares the use of soft and binding quotas in Norway and New Zealand. The authors conclude the same as Labelle et al. (2015), introducing a binding quota leads to the appointment of unsuitable women. Casey et al. (2011) show that countries using a binding quota, see women as quota-filling members. These women are not appointed based on merit and competence. Countries which are using soft quotas appoint less women, because of the lack of competence which negatively influences firm performance.

The effect of gender quotas can be combined with the relationship between women and firm performance, and the relationship between board diversity and firm performance. In this way, gender quotas could moderate the relationships. The last hypotheses are based on this moderation effect:

H2a: The positive relationship between the presence of women in the board of directors and firm performance, is stronger for soft quotas than for binding quotas.

H2b: The positive relationship between board diversity, based on the age, ethnicity, and educational level of women in the board of directors, and firm performance, is stronger for soft quotas than for binding quotas.

3 Research method

This chapter is about the research method that is used. First, the research strategy and the process of data collection is discussed. After that, the different types of variables are discussed. Then, the conceptual models are displayed and the corresponding regression equations to test the expected relationships. Last, the performed robustness checks are discussed.

3.1 Research strategy

This study uses the quantitative method. The research does not analyze one specific country, more countries are used in this research. The analysis is a cross-country analysis of Europe. A few countries in Europe have binding quota regulations to improve the gender balance on boards, for example Norway, France, the Netherlands, Italy and Belgium (European Commission's Network, 2011). It is interesting to investigate whether there is a difference in influence of women in the board of directors on firm performance between countries with binding or soft quotas.

3.2 Data

Data is collected from European publicly listed firms from twelve countries[2], for the last available year in Orbis, operating in the trade and service industry, and with a minimum of one women in the board of directors (Arena et al., 2015). First, this research is focused on listed firms because prior research has found a relation between women in the board of directors and firm performance of listed firms (Arena et al., 2015; Campbell & Minguez Vera, 2009). Second, the twelve countries are selected because they apply different types of gender quotas in their country, see Appendix A. In Norway and the Netherlands, the gender quota only applies to companies with more than 250 employees. For this reason, Norwegian and Dutch firms with less than 250 employees are removed from the sample. Third, only firms in the trade and service industry are used, because these are the biggest industries. Using a sample with firms only in a specific industry increases the validity of this research, by mitigating exogenous effects. The first two digits of the US standard industrial classification (SIC) code is used to select the firms. Therefore, firms with the following SIC codes are selected: 50-51 (wholesale trade), 52-59 (retail trade), and 70-89 (services). Last, only firms with women in their board of directors are selected, because this study is about characteristics and expertise of women in the board of directors.

[2] Based on Catalyst (2014): Current index of formal approaches.

The data which is described above, is collected by the use of Orbis (Arena et al., 2015). This database contains information about directors and their biographies of listed companies (Bureau van Dijk, 2015). Financial information needed for measuring firm performance is also available in Orbis. The database Thomson One is used to complement the data collected from Orbis (Drobetz et al., 2014; Joecks et al., 2012). After deleting the firms which have many missing values, there are 468 firms that meet the selection criteria for this research. See Appendix B for an overview.

Eight percent of the data for the board diversity factor ethnicity is manually collected. The databases Orbis and Thomson One are sometimes not specific enough about the ethnicity of women in the board of directors. For example, the databases show that a board member is born in the United States. It is unclear if this person is a Native American, and thus an ethnic minority. To find out if these people are ethnic minorities, pictures are manually collected from annual reports, firm's websites, or news reports about the board member. Because only eight percent of the data for the variable educational level, this shall not affect the credibility of the research. To test this, a robustness test is performed with a sample that does not contain the manually collected data.

3.3 Dependent variable

The dependent variable is firm performance. Firm performance can be measured in various ways. As already mentioned, financial performance is the most used indicator for firm performance (Combs et al., 2005).

The majority of studies which measured firm performance can be divided into two groups. The first group use Tobin's Q to measure firm performance (Ahern & Dittmar, 2012; Campbell & Minguez-Vera, 2008; Carter et al., 2003; Drobetz et al., 2014; Ntim, 2015). The other group use return on assets to measure firm performance (Arena et al., 2015; Erhardt et al., 2003; Mahadeo et al., 2012; Randöy et al., 2006; Storvik & Teigen, 2010). Tobin's Q is a more market based measure, while return on assets is an accounting based measure (Arena et al., 2015).

In this research the return on assets is used as a proxy for firm performance. Return on assets (ROA) is a common used accounting-based indicator for firm performance (Arena et al., 2015;). The ROA is a good indicator because this proxy is widely used as an overall profitability measure (Arena et al., 2015). Return on assets is based on past performance, which is appropriate for this research. ROA is calculated as following: net income before tax divided by the book value of total assets (Carter et al., 2010).

3.4 Independent variables

The first independent variable used in this research is the presence of women in the board of directors (WOM). This variable is measured as the percentage of women in the board of directors. The second independent variable used is the average age of women in the board of directors (AGE). The third independent variable used is the percentage of women in the board, who are ethnic minorities (ETH). The last independent variable used is educational level of women in the board of directors (EDU).

The independent variables are measured as following:

Table 3 – Description of independent variables

Board diversity factors	**Measurement**
Age	The average age of women in a specific board.
Ethnicity	The percentage of women in a specific board who are African, Asian, Hispanic, Native Americans or Mixed Race people (colored people).
Educational Level	The average of the educational level of women in a specific board.

The variable educational level has many missing values (74 percent), so this variable is not taken into account in the regression of board diversity using the complete sample. Therefore, the board diversity factors age and ethnicity are separately used in a regression by using the whole sample. The three factors of board diversity are used together in another regression where twenty-six percent of the whole sample is used. The reason for this is that the educational level of women is available for only twenty-six percent of the sample. This regression analysis requires a more detailed explanation, which is given in paragraph 3.7.

3.5 Moderation variables

A dummy is added for the difference in soft and binding quotas between companies. In this way, the effect of the different type of quotas on the relationship between women in the board of directors, board diversity and firm performance can be tested (WOMQUO and BDIVQUO). The expectation is that the presence of a soft quota in a country have a more positive influence on the relationships between women, board diversity, and firm performance, than the presence of a binding quota in a country. Therefore, the presence of a binding quota in the country in which the firm operates, results in a dummy variable with a

value of zero. If the country in which the firm operates does not apply a binding quota, but a soft quota, the dummy variable has a value of one.

3.6 Control variables

Control variables are included in the regression model to ensure there is no bias in the research. The control variables used in this study are board size (BSIZE), leverage (LEV), and firm size (FSIZE). These three variables are common used control variables in prior research and often have a significant effect on firm performance (Arena et al., 2015; Campbell & Minguez-Vera, 2008; Carter et al., 2003; Dalton et al., 1998; Mahadeo et al, 2011; Ntim, 2015). The measurement of the control variables is given in table 4.

Table 4 – Description of control variables

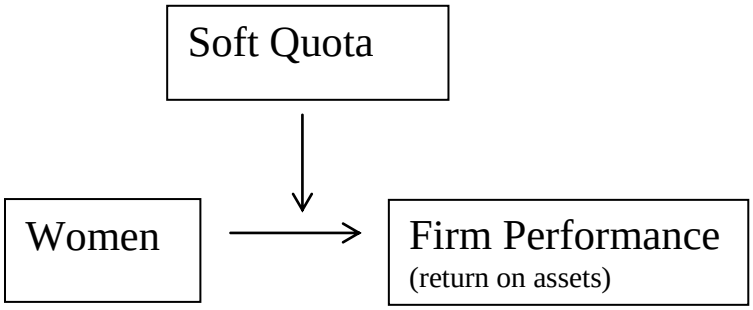
Control variables	Measurement
Board size	Total number of directors on the board.
Leverage	The ratio of total debt to total equity.
Firm size	Total assets of the firm in dollars.

3.7 Conceptual models

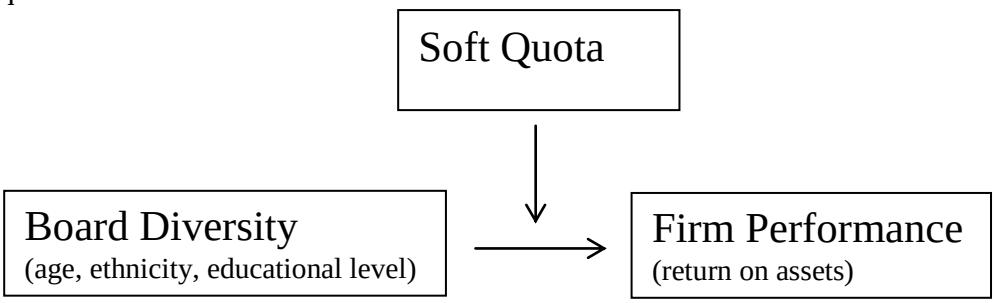
The relationship between the presence of women in the board of directors and firm performance is tested. Besides that the relation between board diversity factors and firm performance is tested. The board diversity factor education has many missing values (74 percent), therefore first the board diversity factors age and ethnicity are separately tested in a regression. The used sample for this regression is the whole sample. After that, the three board diversity factors (age, ethnicity, and educational level) are tested together in one single regression. The used sample for this regression is twenty-six percent of the whole sample, because the factor educational level is available for only twenty-six percent of the whole sample. In this way, the effect of the three board diversity factors together on firm performance can be tested.

Specific gender quotas in countries could influence the relationship between women in the board of directors and firm performance, and the relation between board diversity factors and firm performance. The conceptual models for the regressions are shown on the following page.

The effect of presence of women in the board of directors on firm performance, and the moderation effect of a soft quota:



The effect of board diversity factors on firm performance, and the moderation effect of a soft quota:



To test the hypotheses, regression analyses will be performed. First, the relation between women in the board of directors and firm performance, and the moderation effect of a soft quota is tested. This regression can answer hypothesis 1a and hypothesis 2a. The regression function is as following:

$$ROA = \alpha + \beta_1 WOM + \beta_2 QUO + \beta_3 WOM * QUO + \beta_4 BSIZE + \beta_5 LEV + \beta_6 FSIZE + \varepsilon$$

Where,

ROA = Return on assets
WOM = Presence of women in the board of directors
QUO = Application of a soft or binding quota
BSIZE = Board size
LEV = Leverage
FSIZE = Firm size

Second, the relation between board diversity factors and firm performance, and the moderation effect of a soft quota is tested. Three regressions are performed, because of the limited availability of the board diversity factor educational level. The first regression test the relation between board diversity factor age and firm performance, and the moderation effect

of a soft quota. This regression can partly answer hypothesis 1b and hypothesis 2b. The function is shown on the following page.

$$ROA = \alpha + \beta_1 AGE + \beta_2 QUO + \beta_3 AGE * QUO + \beta_4 BSIZE + \beta_5 LEV + \beta_6 FSIZE + \varepsilon,$$

where

ROA = Return on assets
AGE = Average age of women in the board of directors
QUO = Application of a soft or binding quota
BSIZE = Board size
LEV = Leverage
FSIZE = Firm size

The second regression test the relation between board diversity factor ethnicity and firm performance, and the moderation effect of a soft quota. This regression can partly answer hypothesis 1b and hypothesis 2b. The regression function is:

$$ROA = \alpha + \beta_1 ETH + \beta_2 QUO + \beta_3 ETH * QUO + \beta_4 BSIZE + \beta_5 LEV + \beta_6 FSIZE + \varepsilon,$$

where

ROA = Return on assets
ETH = Percentage of female ethnic minorities in the board
QUO = Application of a soft or binding quota
BSIZE = Board size
LEV = Leverage
FSIZE = Firm size

The last regression includes all the board diversity factors used in this research: age, ethnicity, and educational level. This regression test the relation between board diversity and firm performance and use twenty-six percent of the whole sample. A more detailed explanation is needed for this regression, this explanation is given below.

To test the effect of the level of board diversity on firm performance, the level of board diversity have to be determined. The level of board diversity is determined by three factors: age, ethnicity, and educational level. All the averages of board diversity factors of each board of directors are organized by board diversity factor. The list that is created for each board diversity factor will be divided into two groups, on the basis of the standard deviation. Therefore, each factor of board diversity has a group which located near by the average of the

board diversity factor, and a group which is located farther away from the average. In other words, a small group and a large group. The group which lays a small amount of standard deviations from the mean, contributes less to board diversity than the group which lays a larger number of standard deviations from the mean. Because the more standard deviations of the mean, the more unique the board. Therefore, the group which contributes more to board diversity scores a one, and the group which contributes less to board diversity scores a zero. Table 5 shows the scores.

Table 5 – Scores of variables

Board diversity factors	Score of small group	Score of large group
Age	0	1
Educational level	0	1
Ethnicity	0	1

In the end, each of the three factors of board diversity contains two groups, one group with score one and one group with score zero. Then, for each company, the scores of the three factors of board diversity will be added. The final score indicates the level of board diversity, and this score is between zero and three. The final scores are used in the regression analysis.

Another way to divide the list of a board diversity factor into two groups, is on the basis of the median. In this manner the following argumentations can be tested: (1) younger women in the board of directors have a greater positive influence on firm performance in comparison with older women in the board of directors, (2) women in the board of directors, who are ethnic minorities, have a greater positive influence on firm performance in comparison with non-ethnic minorities, and (3) higher educated women in the board of directors have a greater positive influence on firm performance than women who have a lower educational level. Each factor of board diversity has a group under the median and a group above the median, in other words the low group and the high group. The group with a greater positive effect on firm performance scores a one, the other group scores a zero. As already mentioned, younger women, women who are ethnic minorities, and higher educated women have a greater positive influence on firm performance than relative older women, non-ethnic minorities and lower educated women. So, the low group of board diversity factor age scores a one. The same applies to the high group of board diversity factor ethnicity and educational level. Because these groups have a greater positive influence on firm performance than the other groups. Table 6 shows the scores. In the end, the scores of the board diversity factors will be

added for each firm. The final score indicates the level of board diversity, and this score is between zero and three.

Table 6 – Scores of variables

Board diversity factors	Score of low group	Score of high group
Age	1	0
Educational level	0	1
Ethnicity	0	1

For the reason that the independent variables can be divided into groups in two different ways (standard deviation and median), these factors have different names in the regression equations. When a separation is created on the basis of standard deviation, the independent variable is called BDIV1. When a separation is created on the basis of the median, the independent variable is called BDIV2.

Based on the explanation which is given above, a regression function is performed. This regression function tests the relation between the level of board diversity and firm performance, and the moderation effect of a soft quota. This regression can answer hypothesis 1b and hypothesis 2b. The regression function is:

$$ROA = \alpha + \beta_1 BDIV + \beta_2 QUO + \beta_3 BDIV * QUO + \beta_4 BSIZE + \beta_5 LEV + \beta_6 FSIZE + \varepsilon,$$

where

ROA = Return on assets
BDIV = Level of board diversity based on standard deviation (BDIV1) or based on median (BDIV2)
QUO = Application of a soft or binding quota
BSIZE = Board size
LEV = Leverage
FSIZE = Firm size

3.8 Robustness checks

As a robustness check, Return on Equity (ROE) is used as an alternative accounting based indicator for firm performance (Joecks et al., 2012; Richard, 2000). ROE is calculated as the net income before tax, divided by the shareholder's equity. Another robustness check that is performed is without the manually collected data. The last robustness check is performed with

alternative board diversity scores. As already explained in the previous paragraph, firms have different levels of board diversity based on scores. These scores are between zero and three, so there are four different scores. This robustness check is bringing back the four different scores to two different scores. Firms who normally have a level of board diversity of zero or one, get a score of zero. The firms who normally have a level of board diversity of two or three, get a score of one. The scores on the level of board diversity is now between zero and one.

4 Results

This chapter is about the results of the research. The hypotheses are answered by the use of regression analyses in Stata. First, the descriptive statistics of the variables are shown. After that, the correlation between the variables are discussed. Then, the results of the multiple regressions are shown. At the end, the robustness check is discussed and a short summary of the results is given.

4.1 Descriptive statistics

The whole sample is used to test hypothesis 1a and 2a, and partly hypothesis 1b and 2b. Hypothesis 1b and 2b can only be tested for board diversity factors age and ethnicity in separate regressions. This sample has a total of 468 observations. Table 7 show a statistical description of the variables.

Table 7 – Statistical description of variables of complete sample

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
ROA	468	0,553	19,057	- 98,99	53,26
ROE	449	6,680	53,040	- 300,89	442,63
QUO	468	0,660	0,474	0	1
WOM	468	0,238	0,110	0,048	1
WOMQUO	468	0,142	0,123	0	0,5
AGE	468	52,523	7,732	28	84
AGEQUO	468	34,690	25,662	0	84
ETH	468	3,154	16,037	0	100
ETHQUO	468	1,865	12,282	0	100
BSIZE	468	8,417	3,337	1	30
LEV	443	72,093	100,912	0	780,88
FSIZE	468	1.799.304	5.937.219	0	68.217.795

Twenty-six percent of the sample is used to test partly hypothesis 1b and 2b. These hypothesis can only be tested for all the board diversity factors in one single regression. The reason for using a smaller sample, is that board diversity factor educational level is included in this hypotheses, and this factor is available for only twenty-six percent of the sample. This sample has a total of 122 observations. Table 8 show a statistical description of the variables. This table is shown on the following page.

Table 8 – Statistical description of variables of 26% sample					
Variable	**Observations**	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
ROA	122	- 0,688	22,347	- 98,99	37,46
ROE	118	6,215	60,533	- 229,52	442,63
QUO	122	0,631	0,484	0	1
BDIV1	122	1,008	0,766	0	3
BDIV2	122	0,910	0,680	0	3
BDIV1QUO	122	0,615	0,787	0	3
BDIV2QUO	122	0,592	0,682	0	3
BSIZE	122	9,262	3,483	1	30
LEV	117	87,825	127,277	0	780,88
FSIZE	122	1.616.739	2.986.642	5.509	18.300.000

The variables have to be met classical assumptions in order for ordinary least squares estimators to be the best available (Studenmund, 2014). These assumptions are discussed below and on the following page.

The variables are tested for normality. The complete sample contains variables that are not normal distributed, namely: leverage, firm size and ethnicity. Therefore, these variables are transformed by the use of their natural logarithm (Field, 2009). After the transformation, all the variables of the complete sample are normally distributed, only ethnicity is not normally distributed. The complete sample contains many observations (468), so the lack of normality for the variable ethnicity will not influence the validity of the research (Field, 2009). The twenty-six percent sample also contains variables that are not normally distributed: leverage and firm size. After transformation, these variables are normally distributed.

Then the variables are tested for homoscedasticity. When there is homoscedasticity, the variances of the error terms are constant (Studenmund, 2014). Both the complete sample and the 26% sample have some error terms which do not have a constant variance. Therefore, the assumption of homoscedasticity cannot be met, because of the presence of heteroscedasticity. This leads to results whose validity can be questioned (Studenmund, 2014). To increase the validity of the results, reverse regressions are performed. When the results of the reverse regressions remain the same as the results of the normal regressions, it can be stated with a greater degree of assurance that the results are valid (Barth et al., 2007; Christensen, 2010). The performed reverse regression shows the same results, therefore, it can be stated with a greater degree of assurance that the results are valid.

Linearity of the relationship between the dependent and independent variables is another assumption of the ordinary least squares regression (Studenmund, 2014). This assumption holds for this research. Scatterplots of the residuals are made and these plots all show a linear relationship (Field, 2009).

4.2 Correlation

The variables are also tested for autocorrelation, the results are shown in table 9 and 10 on the following page. A variable is perfectly correlated with another variable if the value is 1 or – 1 (Studenmund, 2014). The closer the value to zero, the less the variables correlate with each other. Table 9 shows there is less correlation between the variables, because most of the values varying from – 0.15 to 0.39. There is one value which indicates a high correlation, namely the correlation between ROA and ROE (0.76). This high correlation is not important for this research, because ROE is only used in a robustness check as an alternative measure for firm performance. Therefore, they are never used in the same regression.

Table 10 also shows little correlation between the variables. Values in this table vary from – 0.28 to 0.41. ROA and ROA show also a high correlation (0.75), but as already mentioned, this high correlation is not important for this research. BDIV1 and BDIV2 also show a moderate correlation (0.33). This moderate correlation is also not important, because the two variables are never used in the same regression. Last, the control variables board size and firm size have a modest level of correlation (0.67). This correlation is not very important because the correlation is between control variables and not between the independent variables (Braster, 2016). A variance inflation test (VIF) for the independent variables is also performed to test the correlation of the variables (Field, 2009). The results show all VIF values below 10, which means that there is no correlation between the variables (Field, 2009). Therefore, the results of the VIF test corresponds with the other test for correlation.

Table 9 – Correlation of variables of complete sample								
	ROA	**ROE**	**WOM**	**AGE**	**ETH**	**BSIZE**	**LEV**	**FSIZE**
ROA	1,000							
ROE	0,762	1,000						
WOM	0,102	0,135	1,000					
AGE	0,089	0,090	- 0,036	1,000				
ETH	0,038	0,025	0,024	- 0,063	1,000			
BSIZE	0,130	0,113	- 0,153	0,086	0,041	1,000		
LEV	0,072	0,161	0,053	0,033	- 0,037	0,223	1,000	
FSIZE	0,035	0,006	0,104	0,087	0,041	0,386	0,193	1,000

Table 10 – Correlation of variables of 26% sample							
	ROA	**ROE**	**BDIV1**	**BDIV2**	**BSIZE**	**LEV**	**FSIZE**
ROA	1,000						
ROE	0,747	1,000					
BDIV1	- 0,147	0,068	1,000				
BDIV2	- 0,060	0,124	0,331	1,000			
BSIZE	0,242	0,195	0,121	0,086	1,000		
LEV	0,184	0,411	0,195	0,117	0,232	1,000	
FSIZE	0,214	0,192	0,093	0,138	0,674	0,209	1,000

4.3 Multiple Regressions

Multiple regressions are performed to test the hypotheses of this research. The relation between women in the board of directors and firm performance, and the moderation effect of a soft quota, can be investigated by testing hypotheses 1a and 2a. These hypotheses can be tested using the following regression equation:

$$ROA = \alpha + \beta_1 WOM + \beta_2 QUO + \beta_3 WOM * QUO + \beta_4 BSIZE + \beta_5 LEV + \beta_6 FSIZE + \varepsilon$$

The results are shown in table 11 on the following page. The results indicate that the presence of women in the board of directors (WOM) has a significant impact on return on assets (ROA) ($t = 2{,}59$; $p < 0{,}05$). The coefficient of variable WOM (28,305) indicates a positive relation. So, hypothesis 1a holds for this performed regression, namely: The presence of women in the board is positively related to firm performance. The results also show that dummy variable gender quota (QUO) has a significant p-value. This variable is only added to generate a moderation variable, therefore the focus is on the value of the moderation variable

(WOMQUO). To test the possible moderation effect of gender quotas, the moderation variable is added in the model (Royston & Sauerbrei, 2012). This variable also show no significance (P>t = 0,081). So, it can be concluded that this model does not support hypothesis 2a. This hypothesis suggests that the positive effect of the presence of women in the board of directors on firm performance is stronger for soft quotas than for binding quotas. The explanatory power of this model is low, namely 0,1172 (Studenmund, 2014). Correcting this value for the number of predictors, gives an explanatory power value of 0,1044. This value means that 10.44% of the variance in the dependent variable ROA can be explained by variances in the independent variables (Studenmund, 2014).

Table 11 - Multiple regression with variable women in the board of directors

Variables	**Coefficient**	**t statistic**	**P > t**
WOM	28,305	2,59	0,010*
QUO	12,382	3,19	0,002**
WOMQUO	- 24,375	- 1,75	0,081
BSIZE	- 0,210	- 0,71	0,475
FSIZE	2,180	4,46	0,000**
LEV	- 0,685	- 1,36	0,175

R-squared 0,1172
Δ R-squared 0,1044
F Statistic 9,14
** = significant at 0,01 level
* = significant at 0,05 level
(two-sided)
Tested model: ROA = $\alpha + \beta_1 WOM + \beta_2 QUO + \beta_3 WOM * QUO + \beta_4 BSIZE + \beta_5 LEV + \beta_6 FSIZE + \varepsilon$
ROA = Return on assets, WOM = Presence of women in board of directors, QUO = Gender quota, BSIZE = Board size, FSIZE = Firm size, LEV = Leverage

After testing hypothesis 1a and 2a, hypotheses 1b and 2b are tested. These hypotheses are about the relation between board diversity factors and firm performance, and the moderation effect of a soft quota. Four regressions are performed to test the hypotheses, because of the limited availability of the board diversity factor educational level. Therefore, the first regression is only about board diversity factor age, the second regression is only about board diversity factor ethnicity. Then, board diversity factor educational level is added and the board diversity factors are all included as one variable "level of board diversity" in one single regression. The level of board diversity can be determined based on standard deviation of the board diversity factors, or based on the median of the board diversity factors. Therefore, the third regression is for the level of board diversity based on standard deviation, and the fourth regression is for the level of board diversity based on the median.

The first regression performed, test hypotheses 1b and 2b for board diversity factor age. The regression function is:

$$ROA = \alpha + \beta_1 AGE + \beta_2 QUO + \beta_3 AGE * QUO + \beta_4 BSIZE + \beta_5 LEV + \beta_6 FSIZE + \varepsilon,$$

Table 12 show the results of this performed regression, which can be found in Appendix C. The results indicate that board diversity factor age (AGE) is not a significant predictor (P>t = 0,331) of the return on assets (ROA). Thence, hypothesis 1b can be rejected when the focus is on board diversity factor age. The moderation variable (AGEQUO) has a p-value of 0,953, which is not significant. Therefore, hypothesis 2b can also be rejected when the focus is on board diversity factor age. Focusing on board diversity factor age results in the rejection of both hypothesis 1b and 2b. But, these hypotheses can still hold when the focus is on board diversity factor ethnicity or when the focus is on board diversity factors all together. The explanatory power of this model does not exceed the explanatory power of the previous regression model. The variance in return on assets can be explained for 9.49% by variances in the independent variables (Studenmund, 2014).

The second regression that is used to test hypothesis 1b and 2b is for board diversity factor ethnicity. The regression function is:

$$ROA = \alpha + \beta_1 ETH + \beta_2 QUO + \beta_3 ETH * QUO + \beta_4 BSIZE + \beta_5 LEV + \beta_6 FSIZE + \varepsilon,$$

The results are shown in table 13, which can be found in Appendix C. The results indicate that board diversity factor ethnicity (ETH) is not a significant predictor (P>t = 0,921) of the return on assets (ROA). Therefore, hypothesis 1b can also be rejected when the focus is on board diversity factor ethnicity. The last opportunity that this hypothesis can still hold is when the focus is on board diversity factors all together. The results also show that dummy variable gender quota (QUO) has a significant p-value. This variable is only added to generate a moderation variable, therefore the focus is on the value of the moderation variable (ETHQUO). The moderation variable (ETHQUO) is, like the other moderation variable AGEQUO, not significant. Because, this variable has a p-value of 0,521. Hypothesis 2b can also be rejected when the focus is on board diversity factor age. But, there is still one opportunity that this hypothesis can hold. Namely, when the focus is on board diversity factors all together. The explanatory power of this model is about the same as the previous

performed regression models. The variance in return on assets can be explained for 9.24% by variances in the independent variables (Studenmund, 2014).

After testing hypotheses 1a and 2a and testing hypotheses 1b and 2b for board diversity factor age and ethnicity, hypotheses 1b and 2b are tested for the level of board diversity. These hypothesis can be tested by adding all board diversity factors in one single regression. As already mentioned, the educational level of women in the board of directors is only available for twenty-six percent of the sample. Therefore, performing a regression with all the board diversity factors is only possible when twenty-six percent of the sample is used.
The regression equation is as following:

$$ROA = \alpha + \beta_1 BDIV + \beta_2 QUO + \beta_3 BDIV * QUO + \beta_4 BSIZE + \beta_5 LEV + \beta_6 FSIZE + \varepsilon$$

When the determination of the level of board diversity is based on standard deviation, the variable board diversity is called BDIV1. When the determination of the level of board diversity is based on the median, the variable is called BDIV2.

The results of the regression with variable BDIV1 are shown in table 14 on the following page. The results indicate that the variable board diversity based on standard deviation (BDIV1) is not a significant predictor of return on assets (ROA). Because the p-value (0,406) of variable BDIV1 is not significant. Therefore, hypothesis 1b can be rejected if the level of board diversity is based on standard deviation. The negative coefficient of variable BDIV1 is remarkable, because a positive coefficient was expected. The negative coefficient is in accordance with results of studies who suggest a negative relationship between board diversity and firm performance, for example the research of Smith et al. (2006). A high level of board diversity leads to more diverse opinions, which leads to time-consuming decision making. Time consuming decision making has a negative influence on firm performance in competitive industries (Smith et al., 2006). The moderation variable (BDIV1QUO) also has a p-value (0,443) which is not significant. Therefore, hypothesis 2b can also be rejected if the level of board diversity is based on standard deviation. The explanatory power of this model (0,3540) is considerably higher in comparison with the performed regressions where the whole sample is included. The variance in return on assets can be explained for 35.40% by variances in the independent variables (Studenmund, 2014).

Table 14 - Multiple regression with all board diversity factors in one single regression (level of board diversity based on standard deviation)

Variables	Coefficient	t statistic	P > t
BDIV1	- 7,179	- 0,84	0,406
QUO	- 0,554	- 0,11	0,915
BDIV1QUO	8,594	0,77	0,443
BSIZE	- 1,899	- 2,62	0,011*
FSIZE	8,224	5,51	0,000**
LEV	1,781	1,17	0,246

R-squared 0,4007
Δ R-squared 0,3540
F Statistic 8,58
** = significant at 0,01 level
* = significant at 0,05 level
(two-sided)
Tested model: ROA = $\alpha + \beta_1 BDIV1 + \beta_2 QUO + \beta_3 BDIV1 * QUO + \beta_4 BSIZE + \beta_5 LEV + \beta_6 FSIZE + \varepsilon$
ROA = Return on assets, BDIV1 = Board diversity, QUO = Gender quota, BSIZE = Board size, FSIZE = Firm size, LEV = Leverage

Another regression is performed where the level of board diversity is based on the median of the board diversity factors (BDIV2). The results of this regression are shown in table 15 on the following page. The results indicate that the variable BDIV2 is not a significant predictor of the dependent variable ROA. The p-value (0,758) is not significant. Therefore, hypothesis 1b can be rejected for both situations, board diversity based on standard deviation and board diversity based on median. The variable BDIV2 also has a negative coefficient, which is unexpected. As already mentioned, board diversity could lead to time-consuming decision making, which negatively influences firm performance (Smith et al., 2006). The moderation variable BDIV2QUO is included to test the possible moderation effect (Royston & Sauerbrei, 2012). The results suggest no moderation effect (P>t = 0,637). So, hypothesis 2b can also be rejected in both situations, board diversity based on standard deviation and board diversity based on median. The explanatory power of this model (0,2501) is somewhat lower than the previous regression, but it is still much higher than the performed regressions where the whole sample is included.

Table 15 - Multiple regression with all board diversity factors in one single regression (level of board diversity based on median)

Variables	Coefficient	t statistic	P > t
BDIV2	- 1,205	- 0,31	0,758
QUO	3,599	0,59	0.556
BDIV2QUO	2,375	0,47	0,637
BSIZE	- 1,196	- 1,86	0,065
FSIZE	6,114	4,79	0,000**
LEV	- 1,406	- 0,33	0,744

R-squared 0,2907
Δ R-squared 0,2501
F Statistic 7,17
** = significant at 0,01 level
* = significant at 0,05 level
(two-sided)
Tested model: ROA = $\alpha + \beta_1 BDIV2 + \beta_2 QUO + \beta_3 BDIV2 * QUO + \beta_4 BSIZE + \beta_5 LEV + \beta_6 FSIZE + \varepsilon$
ROA = Return on assets, BDIV2 = Board diversity, QUO = Gender quota, BSIZE = Board size, FSIZE = Firm size, LEV = Leverage

In summary, the results of the performed regressions are as following. First, the positive relationship between women in the board of directors and firm performance (H1a). The results show a significant positive relationship between women in the board of directors and firm performance, therefore hypothesis 1a holds in this research. After that, the moderation effect of gender quotas on the relationship between women in the board of directors and firm performance (H2a). The results do not show a moderation effect, therefore hypothesis 2a can be rejected in this research. A possible explanation for not finding a moderation effect is given later in this chapter.

Then, the positive relationship between board diversity, based on the age, ethnicity, and educational level of women in the board of directors, and firm performance (H1b). Four regressions are performed to test this relationship. One regression with focus on board diversity factor age, one regression with focus on board diversity factor ethnicity, and two regressions with focus on all board diversity factors together. The results of all regressions does not show a significant positive relation between board diversity and firm performance. Therefore, hypothesis 1b can be rejected in this research. A possible explanation for not finding a positive relationship could be found in the critical mass theory of Kanter (1987). Kanter argues that the presence of at least three women, rather than one single woman, has a significant influence on the overall outcome. So, when the certain threshold of three women is reached, women are able to influence decisions in the board of directors (Arena et al., 2015). When the certain threshold is not reached, women in the board of directors are not able to

influence decisions. Applied to this research, which uses a sample that contains many firms with only one woman in the board of directors. When the critical mass is taken into account, it could be that hypothesis 1b holds for this research. Because the board diversity factors of women are now in a position to influence decisions, and thus influencing firm performance. The critical mass theory could also strengthen the significant positive relation between women in the board of directors and firm performance (H1a). Because women are able to influence the decisions in the board of directors. Last, the possible moderation effect of gender quotas on the relationship between board diversity (based on the age, ethnicity, and educational level of women in the board of directors) and firm performance (H2b). The results do not show a moderation effect, therefore hypothesis 2b can also be rejected in this research. A possible explanation for not finding moderation effects in this research could be found in the critical mass theory. The reason for the appointment of women in the board of directors is unknown. Women could be appointed because of their capabilities and experience, or because of a gender quota which is introduced in the country. But, when the certain threshold of at least three women in the board of directors is reached, the probability of appointing women on the grounds of the gender quota is higher than the probability of appointing women on the grounds of their capabilities and experience. The reason for this, is that studies have empirical evidence that men are more often appointed in the board of directors than women, because of their experience (Bøhren & Staubo, 2014). Sixty-nine percent of the retained male directors had board experience, compared to thirty-one percent of the entering women. Briefly, when the critical mass is taken into account, the moderation effect of gender quotas could be significant.

4.4 Robustness checks

The objective of robustness checks is increasing the validity and reliability of the research (Lu & White, 2014). In this research are several robustness checks performed. The checks relate to adding one additional variable, exclusion of manually collected data, and using an alternative dependent variable.

4.4.1 Alternative board diversity scores

The scores of the firms on the level of board diversity have been reduced from four different scores to two different scores. Using an alternative method to determine board diversity scores, decreases the probability that the results of this research are based on coincidence of choosing a specific method. The results of this robustness check are in accordance with the results of the performed regressions in the previous paragraph. Therefore, the chosen method

to determine the score of board diversity level does not have influence on the results of this research.

4.4.2 Without manually collected data

The available data about the ethnicity of women in the board of directors is sometimes not always as detailed. For this reason, six percent of the sample is manually collected for the variable ethnicity. To increase the validity of this research, the same regressions are performed using a dataset where the manually collected data is excluded. In this way, differences in results caused by manually collected results can be detected (McClave & Sincich, 2011).

The results show no differences in comparison with the results of regressions who use the whole dataset. Therefore, the manually collected data does not influence the results, which increases the validity of this research.

4.4.3 Alternative dependent variable: return on equity

An alternative proxy for firm performance is used to increase the reliability of this research (Lu & White, 2014; Joecks et al., 2012). Return on assets is used as a measure for firm performance, and the return on equity is used as an alternative measure for firm performance (Erhardt et al., 2003). Using an alternative proxy for firm performance decreases the probability that the results of this research are based on coincidence of choosing a specific proxy (Joecks et al., 2012). The results of regressions with return on equity as dependent variable, show the same results as regressions where the dependent variable return on assets is used. Table 16 shows the results, which can be found in Appendix D.

5 Conclusion

After presenting the results of this research, the conclusions can be drawn. The research question of this paper is: *"What is the effect of board diversity, based on the age, ethnicity, and educational level of women in the board of directors, on firm performance, and the influence of gender quotas on this effect?*. Women should have a positive effect on firm performance, because of the increase in board diversity. Therefore, the European Commission (2016) strives for more women at the top by introducing a binding gender quota. Twelve European listed countries in the trade and service industry are used in this research.

The research question can be answered by the use of hypotheses, which formulation is based on the literature review.

H1a: The presence of women in the board of directors is positively related to firm performance.

H1b: Board diversity, based on the age, ethnicity, and educational level of women in the board of directors, is positively related to firm performance.

H2a: The positive relationship between the presence women in the board of directors and firm performance, is stronger for soft quotas than for binding quotas.

H2b: The positive relation between board diversity, based on the age, ethnicity, and educational level of women in the board of directors, and firm performance, is stronger for soft quotas than for binding quotas.

This research concludes that there is no significant evidence for the relation between board diversity, based on the age, ethnicity, and educational level of women in the board of directors, and firm performance (H1b). There is also no significant evidence for the moderation effect by gender quotas (H2a/H2b). But women in general are, in contrast to that, significantly positive related to firm performance (H1a). The explanatory power of the regression model that has tested this relationship is about ten percent, which is quite low (Studenmund, 2016).

The implications of this research are not in accordance with the proponents of board diversity. They state that a more diverse board has a better understanding of the market, increases creativity and innovation, and increases the effectiveness of the board by taking a broader view (Carter et al., 2003). The negative coefficient of board diversity indicates a negative effect of board diversity on firm performance, which is in accordance with the opponents of board diversity. They claim that board diversity determines conflicts that negatively affect firm performance (Petrovic, 2008; Smith et al., 2006). These conflicts are

the results of more diverse opinions and more critical questions, which lead to more time-consuming decision making (Smith et al., 2006).

This research has a scientific contribution to a better understanding of the relationship between women in the board of directors and firm performance. Because this research fills the research gap about specific characteristics and expertise of women. The second scientific contribution is filling the research gap about a possible influence of a gender quota on the relationship between board diversity and firm performance. The practical and societal contribution of this research is the usefulness for policymakers and regulators. It is important for them to know the effect of women in the board of directors on firm performance, and the influence of different types of gender quotas on this effect. This could help them in establishing regulations.

This research also has some limitations. First, this research used a sample of 468 listed firms in twelve European countries. But, these 468 firms are unequally distributed across these twelve countries. For example, 258 firms are located in the United Kingdom. Therefore, it is difficult to generalize the results of this research to other European countries (Studenmund, 2014). The distribution of firms across countries is included in Appendix B.
Second, many factors influence the level of board diversity. It is difficult to include all these factors in one model. When more factors are included, the explanatory power of the regression models is also higher. This means that a higher percentage of the variance in the dependent variable return on assets can be explained by variances in the independent variables (Studenmund, 2014). The third limitation of this research is the problem of heteroscedasticity. This issue is discussed at the beginning of chapter four and it could lead to results whose validity can be questioned (Studenmund, 2014). This limitation is partly corrected by performing reverse regressions, which increases the degree of assurance that the results are valid (Barth et al., 2007; Christensen, 2010). The last limitation is the limited availability of data for board diversity factor educational level. For this reason, a few regressions are performed with only twenty-six percent of the sample. This small sample only has 122 observations, which means that the results are difficult to generalize (Studenmund, 2014).

A recommendation for further research is the use of the critical mass theory (Kanter, 1987). As already mentioned in chapter four, taking into account the critical mass theory could lead to finding more significant relationships (Kanter, 1987). For example a significant relationship between board diversity and firm performance, and a significant moderation effect of gender quotas. Another recommendation for further research is incorporating additional factors that influences board diversity, such as board experience and industry

experience. This research has not added these factors, because these factors contain many missing values. When these factors have fewer missing values in other studies, they could be included in this research. The third recommendation is the use of an alternative proxy for firm performance. This research uses the proxy return on assets, which is an accounting based measure. Accounting based measures are focused on past performance (Arena et al., 2015). A more market based proxy is needed to focus more on future firm performance (Arena et al., 2015). Therefore, Tobin's Q could be a good proxy for firm performance.

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Appendix A

Table 1 – Type of gender quotas per European Publicly Listed Country in 2014[3]

European country	Type of quota regulation	Percentage women required in the board	Type of regulation	Years introduced	Compliance date
Belgium	Binding	33	-	January 2011	2017-2019
Denmark	Soft*	Determined by company	-	December 2012	April 2013
Finland	Soft	-	Corporate Governance Code	January 2010	-
France	Binding	20 & 40	-	January 2011	20% January 2014 40% January 2017
Iceland	Binding	40	-	March 2010	September 2013
Ireland	Soft	-	Corporate Governance Code	June 2010	-
Italy	Binding	20 & 33	-	June 2011	20% August 2012 33% January 2015
Luxembourg	Soft	-	Corporate Governance Code	May 2009	-
Netherlands	Binding*	30	-	June 2011	January 2016
Norway	Binding	40	-	December 2003	January 2008
Spain	Binding*	40	-	March 2007	March 2015
United Kingdom	Soft	25	Corporate Governance Code	CGC October 2012 25% February 2011	January 2015

* = only applies to publicly listed companies with more than 250 employees.

[3] Information collected from Catalyst (2014) and Smith & IZA (2014).

Appendix B

Table 2 - Sample

Sample Selection

Steps		**Number of firms**
Listed companies in 12 EU countries in 2014		7237
	-	6145
Trade and service firms		1092
	-	445
Presence of women in the board of directors		647
Missing values	-	179
		468

Sample per country

Country	**Number of firms**
Belgium	9
Denmark	6
Finland	32
France	85
Iceland	3
Ireland	11
Italy	33
Luxembourg	2
Netherlands	2
Norway	21
Spain	6
United Kingdom	258

Sample per type of gender quota

Type of gender quota	Number of firms
Binding quota	159
Soft quota	309

Appendix C

Table 12 - Multiple regression with board diversity factor age

Variables	Coefficient	t statistic	P > t
AGE	0,159	0,97	0,331
QUO	5,807	0,53	0.595
AGEQUO	- 0,012	- 0,06	0,953
BSIZE	- 0,384	- 1,34	0,180
FSIZE	2,359	4,92	0,000**
LEV	- 0,818	- 1,62	0,106

R-squared 0,1079
Δ R-squared 0,0949
F Statistic 8,32
** = significant at 0,01 level
* = significant at 0,05 level
(two-sided)
Tested model: ROA = $\alpha + \beta_1 AGE + \beta_2 QUO + \beta_3 AGE * QUO + \beta_4 BSIZE + \beta_5 LEV + \beta_6 FSIZE + \varepsilon$
ROA = Return on assets, AGE = Age of women in board of directors, QUO = Gender quota,
BSIZE = Board size, FSIZE = Firm size, LEV = Leverage

Table 13 - Multiple regression with board diversity factor ethnicity

Variables	Coefficient	t statistic	P > t
ETH	0,008	0,10	0,921
QUO	4,992	3,03	0,003**
ETHQUO	0,067	0,64	0,521
BSIZE	- 0,416	- 1,46	0,146
FSIZE	2,432	5,11	0,000**
LEV	- 0,774	- 1,53	0,127

R-squared 0,1054
Δ R-squared 0,0924
F Statistic 8,11
** = significant at 0,01 level
* = significant at 0,05 level
(two-sided)
Tested model: ROA = $\alpha + \beta_1 ETH + \beta_2 QUO + \beta_3 ETH * QUO + \beta_4 BSIZE + \beta_5 LEV + \beta_6 FSIZE + \varepsilon$
ROA = Return on assets, ETH = Female ethnic minorities in the board of directors, QUO = Gender quota,
BSIZE = Board size, FSIZE = Firm size, LEV = Leverage

Appendix D

Table 16 – Robustness check with alternative dependent variable: return on equity

Variables	Coefficient Model 1	t statistic Model 1	P > t Model 1	Coefficient Model 2	t statistic Model 2	P > t Model 2
WOM	76,996	2,32	0,021*			
AGE				0,608	1,22	0,223
QUO	21,809	1,85	0,065	27,390	0,83	0,410
WOMQUO	- 14,035	- 0,33	0,740			
AGEQUO				- 0,272	- 0,44	0,663
BSIZE	- 0,139	- 0,16	0,876	- 0,833	- 0,96	0,338
FSIZE	4,081	2,75	0,006**	5,032	3,45	0,001**
LEV	0,126	0,08	0,934	- 0,248	- 0,16	0,872
Variables	**Coefficient Model 3**	**t statistic Model 3**	**P > t Model 3**	**Coefficient Model 4 (5)**	**t statistic Model 4 (5)**	**P > t Model 4 (5)**
ETH	0,007	0,03	0,976			
BDIV1				2,488	0,08	0,935
(BDIV2)				(7,767)	(0,61)	(0,543)
QUO	12,636	2,52	0,012*	0,061	0,00	0,997
				(7,629)	(0,38)	(0,703)
ETHQUO	0,156	0,49	0,623			
BDIV1QUO				46,626	1,19	0,237
(BDIV2QUO)				(10,260)	(0,63)	(0,532)
BSIZE	- 0,879	- 1,01	0,313	- 4,400	- 1,73	0,088
				(- 2,327)	(- 1,11)	(0,270)
FSIZE	5,191	3,58	0,000**	15,640	2,98	0,004**
				(11,783)	(2,82)	(0,006)**
LEV	- 0,165	- 0,11	0,915	8,210	1,53	0,129
				(1,693)	(0,42)	(0,677)

** = significant at 0,01 level

* = significant at 0,05 level

(2-sided)

Tested models:

1. ROE = $\alpha + \beta_1 WOM + \beta_2 QUO + \beta_3 WOM * QUO + \beta_4 BSIZE + \beta_5 LEV + \beta_6 FSIZE + \varepsilon$
   R-squared: 0,0809 Δ R-squared: 0,0676 F Statistic: 6,06
2. ROE = $\alpha + \beta_1 AGE + \beta_2 QUO + \beta_3 AGE * QUO + \beta_4 BSIZE + \beta_5 LEV + \beta_6 FSIZE + \varepsilon$
   R-squared: 0,0670 Δ R-squared: 0,0534 F Statistic: 4,94
3. ROE = $\alpha + \beta_1 ETH + \beta_2 QUO + \beta_3 ETH * QUO + \beta_4 BSIZE + \beta_5 LEV + \beta_6 FSIZE + \varepsilon$
   R-squared: 0,0632 Δ R-squared: 0,0496 F Statistic: 4,65
4. ROE = $\alpha + \beta_1 BDIV1 + \beta_2 QUO + \beta_3 BDIV1 * QUO + \beta_4 BSIZE + \beta_5 LEV + \beta_6 FSIZE + \varepsilon$
   R-squared: 0,2435 Δ R-squared: 0,1846 F Statistic: 4,13
5. ROE = $\alpha + \beta_1 BDIV2 + \beta_2 QUO + \beta_3 BDIV2 * QUO + \beta_4 BSIZE + \beta_5 LEV + \beta_6 FSIZE + \varepsilon$
   R-squared: 0,182 Δ R-squared: 0,1350 F Statistic: 3,89

ROE = Return on equity, WOM = Presence of women in board of directors, AGE = Age of women in board of directors, ETH = Female ethnic minorities in the board of directors, BDIV1 = Board diversity 1, BDIV2 = Board diversity 2, QUO = Gender quota, BSIZE = Board Size, LEV = Leverage, FSIZE = Firm Size