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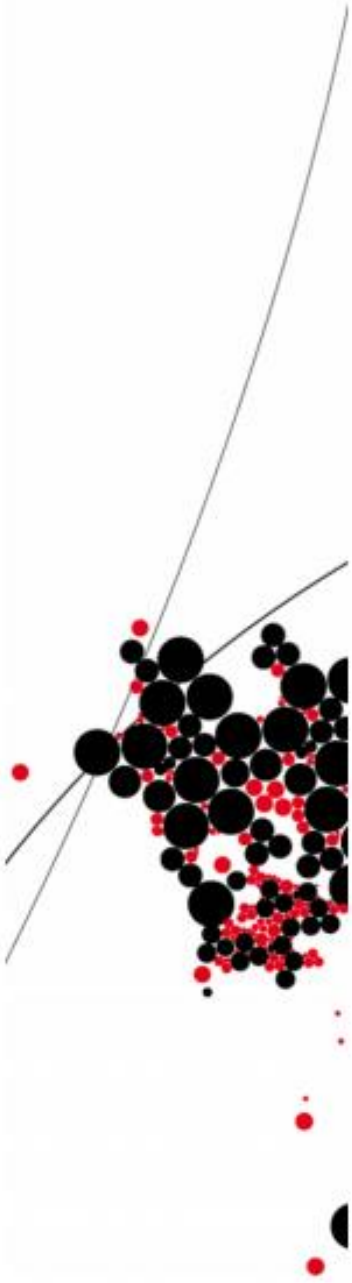
The effect of board gender diversity on firm performance in the Netherlands.



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Preface

This thesis is the final part of the Master in Business Administration, track financial management at the University of Twente. The thesis is written in the period between November 2019 and August 2020. In this preface I would like to thank the people who helped me and guided me during the process.

First, I would like to thank Dr. X. Huang as my first supervisor for the feedback and guidance during the writing of my thesis. Next, I would like to thank Prof. Dr. R. Kabir, which was my second supervisor. His feedback and help was also very important for me to finish my thesis. Lastly, I would love to thank everyone who stimulated me during this process, for instance my family and fellow students.

Galaf Mutlu

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Abstract

This study examines the effect of board gender diversity on firm performance of Dutch firms listed on the Euronext Amsterdam in the period between 2010 and 2019. In this paper a positive relationship between board gender diversity and the accounting-based indicators of firm performance, as measured through the return on assets, return on equity and the return on sales, is documented. Moreover, it is documented that having a critical mass of female directors is positively related to the accounting-based indicators of firm performance. In the meanwhile, a negative relationship has been found between board gender diversity and the market-based indicators of firm performance, as measured through Tobin's Q. This study offers useful insights into the current global debate on gender diversity and its implications for firms and contributes to the limited Dutch gender diversity literature.

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1. Introduction

Increasing the gender diversity in the top executive positions of firms and in the boardroom have been an important issue for European governments. Women are outnumbered by men in leadership positions in the corporate sector in the European Union (European Commission, 2016). The European commission found that in 2016 on average 23.3 % of the board members of the largest publicly listed companies in the European Union are women. So, the percentage of women in the board of directors of companies is lower than that of men and several studies suggest that not using the skills of highly qualified women is a waste of talent and bad for the economic growth potential of a firm. Therefore, different European governments are binding quotas, eventually with sanctions, to increase the number of women in the board of directors. According to the European Commission (2016) binding quotas with sanctions are implemented in for example France (40%) and Germany (30%). And results show that the percentages of women in the board of directors in these countries are on average higher than in countries without quotas. To increase the number of women in all European board of directors, the European Union has set a quantitative objective of a 40% presence of women in the board of directors of companies listed on stock exchanges by 2020. It is interesting to see that the suggestion that more women in the board of directors or at executive positions leads to better organizational and financial performance (European Commission, 2016). So, more women in the top positions of companies should result in increased firm productivity and profitability.

The assumption is that women in corporate top positions lead to better firm performance. One of the most well-known studies supporting this assumption according to Marinova, Plantenga, and Remery (2016) is that of Catalyst (2004). 'This study ranked the fortune 500 companies in terms of highest representation of women on their top management teams and compared the financial performance of companies in the top quartile to companies in the lowest quartile' (Marinova et al., 2016). Results show that companies in the top quartile, with more women in their top management, achieve significantly better financial results than those in the lowest quartile. Several field evidences in different countries or regions have been made afterwards. Kilic and Kuzey (2016) investigated the relationship between board gender diversity and firm performance in Turkey. Their study shows 'that the inclusion of female directors is positively related to the financial performance of firms, as measured through the return on assets, return on equity and the return on sales'. Furthermore Lückerath-Rovers (2013) states that firms with female directors perform better than those without women on their boards. In the meanwhile, Marinova et al. (2016) found no relation between board gender diversity and firm performance among Dutch and Danish boardrooms. A more recent investigation is Oremus (2020), which documents a positive and significant relationship between board gender diversity and firm financial performance in the UK. Furthermore Carter, D'Souza, Simkins, and Simpson (2010) did not find a significant relationship between the gender diversity of the board and firm performance using a sample of US major

corporations. So, there are different conclusions made already about the relationship between board gender diversity and firm performance in different countries. In addition, there are also theories that will be used to explain the relationship between gender board diversity and firm performance in this paper. The theories will be used to determine the hypotheses. The agency theory for example states that gender diversity in boards can increase the board independence and the ability to align the interest of management and stakeholders. Another theory is the resource dependence theory, which contains the idea that every board member has different beneficial resources that will be provided to the firm. Farrell and Hersch (2005) agree by adding that woman bring different value and resources to a firm by offering different perspectives compared to men.

This thesis investigates the relationship between board gender diversity and firm performance in the Netherlands. As mentioned, there are several studies about the relationship between board gender diversity and firm performance. However, there is not much research completed in The Netherlands and especially not after the financial crisis of 2007 till 2008. The financial crisis had a huge impact on the organizations, and it is possible that firms diversified their boards afterwards to gain more and different resources to improve their firm performance and to prevent a new financial crisis. Reguera-Alvarado, Fuentes, and Laffarga (2015) and Adams and Funk (2012) state that after the crisis there has been a growing concern about improving the effectiveness of boardrooms through the inclusion of diversity in boards. This is supported by Nelson (2012), who stated that speculation arose after the crisis whether woman leaders would have prevented the financial crisis. Examples of studies with samples before 2009 are Lückerath-Rovers (2013), which used a sample of listed Dutch companies in 2008 and Marinova et al. (2016), which used firms listed in 2007. In addition, in the decade after the financial crisis several countries and the European Union have been implementing target quotas to increase the number of female directors. Next to the quota of 40% implemented by the European Union, the Dutch government implemented a target objective of 30% women in Dutch boardrooms based on a ´comply or explain´ mechanism, without sanctions. Through the implementation of the quotas and the attention for female directors the share of Dutch female directors increased from 10.4% in 2012 to 21% in 2019 (Luckerath-Rovers, 2019). In this thesis the focus will be on listed Dutch companies in the period between 2010 and 2019. The academic relevance that will be added in addition to prior research is that the research will be done in the period after the financial economic crisis and in a time that the European Union and the Dutch government set quantitative objectives as mentioned earlier. There are not many researches that investigate the effect of gender board diversity on firm performance in the Netherlands in this period.

Dutch companies use a two-tier board model, which contains of the executive board and the supervisory board as two separately functioning boards. This is interesting because firms must reach quotas in two different tiers, which means that woman will be appointed as executives and supervisors (Luckerath – Rovers, 2019). However internationally the one-tier model is more usual and, in this paper, Luckerath-

Rovers (2013) will be followed. That study adopted the international terminology to avoid confusion and refers to executive boards and supervisory boards together as the board. Marinova et al. (2016) agreed by referring to board in their study as 'the combined number of all directors, i.e. management (executive) directors plus supervisory (non-executive) directors'.

This thesis expects an increase of female directors after the financial crisis compared to before the crisis. An important reason are the implemented quotas as mentioned, moreover the resource dependence theory states that women can deliver different resources and increase the resources and knowledge of the board of directors. Firms will have this in mind in order to cope with the effects of new financial crisis's or other difficult circumstances. So, they will probably diverse their board of directors to gain more resources to be able to make the right decisions. Furthermore, one of the central values defended as 'Dutch' is gender equality according to Roggeband and Verloo (2007). It is interesting to study whether a country with gender equality as a central value, can increase gender diversity in boardrooms. Lastly there is a lack of empirical evidence about the relationship of board gender diversity and especially Dutch boardrooms. This thesis will include study of several years in the last decade, namely 2010 till 2019. The long period will show the development and increase of woman in the board of directors during the years and their influence on the firm performance. The results will give the opportunity to reflect and compare with previous studies and to eventually find differences between the number of women in the board of directors before and after the crisis and the implementation of quotas.

To discover the effect of board gender diversity on firm performance the following research question will be used: *What is the effect of board gender diversity on firm performance of listed firms in The Netherlands?* In the following sections about the literature review and the methodology I determine in which way this question will be answered. First a literature review will be made and subsequently the hypotheses will be formulated. Hence the research method will be explained and the way to collect the data. After the collection of the data, the results and conclusions of this investigation are presented.

2. Literature Review

This literature review contains several definitions and gives the explanation of terms based on academic articles. Theories will be explained and based on these theories; the hypotheses of this study will be formulated in this chapter.

2.1 Board and Board Features

Corporations are owned by shareholders, which own a number of shares issued by the corporation. The total number of shares denotes how much ownership a shareholder has in a corporation. Shareholders make a financial investment in a specific corporation and with this investment they gain voting shares to elect the directors of a corporation. Shareholders are normally not directly involved in the management of a corporation, but indirectly by electing the board of directors. So, the board of directors are elected by the shareholders and their role is to manage and supervise the organization. The shareholders grant the right to remove the directors in case they are not satisfied with their performances. The board directors are elected based on the board structure laws of the domestic country of the corporation. Millet-Reyes and Zhao (2010) explain that there are two types of board structure. The first in the unitary board of directors as used in common law countries, and the second is the two-tier board structure, which is used in several code law countries. Jungmann (2006) agrees by stating that it is a well-known phenomenon that there are two main sets of legal rules on the supervision of corporate management: One-tier boards and two-tier boards.

According to Aluchna (2013) the one-tier board is a model in which the board of directors functions as a collectively corporate body. All directors who are elected by the shareholders work together to remain a long-term sustainable value of the company. The one-tier board includes the top management, whose role is to manage the company on a daily basis. Furthermore, it includes non-executive directors, whose role is to fulfill the oversight and monitoring functions. The one-tier board is mainly used in common law countries like the USA, UK, Sweden, and Italy. In contrast to the one-tier board, the two-tier board is a model of corporate control and monitoring in which two boards with distinctive tasks function (Aluncha, 2013). The two-tier model includes separated boards, namely the supervisory board and the management board. The mandates of these boards are kept separately and therefore the members of the supervisory board cannot be members of the management board at the same time. To make clear, the executive functions and the functions of monitoring and control are completely separated into two different boards. The supervisory board takes place between the shareholders and the executive board. Both boards consist of directors who are elected to work together and to remain the sustainability of the value of the firm. The management board includes executive directors who are responsible for the daily operations of the company. In the meanwhile, the supervisory includes nonexecutive directors, whose role is to control the work of the management board. Companies in countries like Germany, Denmark

and The Netherlands use two-tier boards. The main goal of this paper is to investigate the relationship between gender board diversity in Dutch boardrooms and firm performance. As mentioned, the board structure in the Netherlands is based on a two-tier board. However internationally the one-tier model is more usual. Several studies with samples which include countries with two-tier boards use the international terminology to avoid confusion and refer to the executive board and the supervisory board together as the board. For example, Luckerath-Rovers (2013) did this and Marinova et al. (2016) agreed by referring to board in their study as 'the combined number of all directors, i.e. management (executive) directors plus supervisory (non-executive) directors'. This will also be done in this study. I will combine the supervisory and executive boards of different firms, which grants the ability to compare and generalize results with for example the investigations mentioned before. Moreover, the combining of the boards grants the option to compare the results in the Netherlands with the results of countries with one-tier boards as well.

The board of a company, including the management board and the supervisory board, is responsible for the daily decision making and the monitoring of these decisions. Carter et al. (2003) state that diversity in the board through different gender, ethnicity or cultural background leads to a board that understands particular market conditions better. This brings more creativity and quality to decision making and produces more effective problem-solving. Therefore, different researchers around the world started investigations to the relationship between gender board diversity and firm performance.

2.2 Theoretical Approaches

In prior research, several theories explained the relationship between board gender diversity and firm performance. To develop a research based on theory, this paragraph explains three important theories. The agency theory, human capital theory and the resource dependency theory will be explained basically and furthermore their explanations about the relationship between board gender diversity and firm performance.

2.2.1 Agency Theory

The first important theory when investigating the effect of board gender diversity is the agency theory. According to the agency theory, independent corporate boards are crucial in aligning the interest of management and shareholders, in providing information for monitoring and counseling, and in ensuring effective decision-making (Becht, Bolton, and Röell, 2003). Taking the agency theory as viewpoint, gender diversity is one of the most important corporate governance mechanisms for companies (Kilic and Kuzey, 2016). Gender diversity in boards can increase the board independence and the ability to align the interest of management and stakeholders. Because more board independence leads to different questions and thoughts, not just in the case of gender diversity, but also in the case of ethnicity and age for example (Carter, Simkins, and Simpson, 2003). In addition, diverse boards may understand market

conditions better due to different backgrounds and may bring more creativity and quality and will be able to make better decisions and to solve problems easier. Moreover, the interest of the management and shareholders could be for example the improvement of the public image of the firm. Smith, Smit, and Verner (2006) state that a more diverse board could lead to a better public image of the company and they assume that this will increase firm performance.

However, it is also stated that management diversity will lead to more costs for the firm. The coordination of diverse top management teams may be more difficult and costly, and conflicts may occur more easily (Smith et al., 2006). It is not possible according to the agency theory to state that the increase in firm performance will outweigh the increase in costs. Hence there is the probability that a diverse board will face more difficulty in reaching consensus. This will slow down the decision-making of the firm and lead to a less efficient decision-making board. Carter et al. (2003) describe that however board diversity could result in a more activist board, there is no guarantee that monitoring is more effective because diverse board members may be marginalized. So, there is no clear prediction about how the agency theory supports the relationship between board gender diversity and firm performance. However, there are several considerations which state that board diversity is beneficial for firm performance. These could be used as basis for more empirical research on the relationship between board gender diversity and firm performance.

2.2.2 Resource Dependence Theory

The predominant theory in the research on the board of directors is the agency theory, however prior reviews on the board of directors literature conclude that the resource dependence theory is the most supported one. According to the resource-based theory, a company consists of many resources namely all assets, capabilities, organizational processes, firm attributes, information, and knowledge, which can be used to effectively implement value-creating strategies (Barney, 1991). The resource dependence theory could be used by managers to reduce environmental uncertainty and dependence according to Hillman, Withers and Collings (2009). The resource dependence theory contains the idea that environments deliver resources and organizations depend on these limited resources for survival. Hillman et al. (2009) state that every board member has different characteristics which will provide different beneficial resources to the firm. Pfeffer and Salancik (1978) suggest that directors bring four benefits to organizations: a) information in the form of advice and counsel, b) access to channels of information between the firm and environmental contingencies, c) preferential access to resources, and d) legitimacy. Legitimacy could be defined as ‘the presumption of propriety stemming from conformity to social guidelines’ according to Drees and Heugens (2013). Furthermore, resource dependence scholars describe legitimacy in terms of pragmatic and instrumental ways, whereby organizations try to increase their legitimacy by answering the demands of their key constituents. The board of directors, and their legitimization, of large corporations are highly visible to societal actors who grant legitimacy

and who are influenced by the prestige of the directors, which indicates that directors are able to legitimize a firm (Hillman et al., 2007). So, directors will bring resources into the firm, with the goal to remain the sustainability of the firm.

Female directors will bring different resources into the firm. Women experiences are different compared to men and they also contain different knowledge and expertise. Farrell and Hersch (2005) agree with this by stating that women will add value to a firm based on the resource dependence theory by offering different perspectives. Hillman et al. (2007) add that female directors can provide a valuable form of legitimacy in the eyes of employees. Institutional investors for example increasingly inspected boardrooms and found that the reputation and credibility of a firm in labor markets may improve by the inclusion of women on the board. So, based on the resource dependence theory electing female directors results in more valuable resources. Women on the board leads to more diverse teams with a greater range of perspectives. This could result in better decision-making and hence the better decision-making could lead to better firm performance. The resource dependence theory suggests that the board's provision of resources is directly related to firm performance (Hillman and Dalziel, 2003). It is likely that board gender diversity improves firm performance according to the resource dependence theory.

2.2.3 Human Capital Theory

In addition to the resource dependence theory, the human capital theory will be added to this paper. Barney (1991) stated that human capital of a company's employees, management and especially board members are the key resources to achieve competitive advantage. This indicates that the human capital theory complements the resource dependence theory. Board capital is positively associated with the provision of resources by the board, which, in turn, is positively associated with firm performance (Hillman and Dalziel, 2003). Board human capital contains the knowledge and skills 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). Hence Barney (1991) mentions that human capital of board members includes training, judgment, experience, and individual knowledge, which are components that could not be copied easily by competitors and could lead to advantage. Moreover, it is stated that directors have unique human capital (Terjesen, Sealy, and Singh, 2009). Every board member delivers different resources through their educations and experiences. Human capital is unique and adding women to the board will provide different experiences, knowledge, educations, and skills. Therefore, the human capital theory argues that board gender diversity will affect firm performance because of the increasing unique human capital (Carter et al., 2010).

In summarization the agency theory does not provide strong support for the relationship between board gender diversity and firm performance, however it provides the opportunity for research. In the meanwhile, the resource dependence theory and de the human capital theory are highly suggestive about

a positive relationship between board gender diversity and firm performance according to Carter et al. (2010).

2.3 Diversity

Before the explanation of for example gender diversity and the formulation of the hypotheses, it is first necessary to explain the other characteristics and features of diversity. Van der Walt and Ingley (2003) describe diversity in the board as the combination of the different qualities, characteristics, and expertise of the individual members in relation to decision-making and other processes within the board. Therefore, gender is one of the characteristics of the board and genders relationship with firm performance will be focused on in this thesis. Other examples of diversity characteristics in the board are age, ethnicity, nationality, and educational background. According to Erhardt, Werbel, and Shrader (2003) diversity can be categorized into two different groups, namely demographic and cognitive. Demographic diversity includes for example gender, age, and ethnicity. In the meanwhile, cognitive diversity contains knowledge, education, and values. High failure rates of firms and financial scandals, and with that the financial crisis in 2008, led to concerns about the effectiveness of boards (Kilic and Kuzey, 2016). Hence companies started forming boards based on diversity and countries changes their laws to support the diversification of boardrooms. A diverse board with different backgrounds, experiences, gender, or educations will bring more resources and different human capital, which eventually will improve the firm performance.

2.4 Gender Diversity

Diversity as explained in the previous section is separated in demographic and cognitive diversity. One of the demographic forms of diversity is gender diversity, and this paper will focus on this type of board diversity. To investigate the effect of board gender diversity on firm performance, it is necessary to define and explain gender diversity. Gender diversity in boards is basically the diversity of gender in the board and in most cases a term used to increase the amount of woman in the board of directors. Perrault (2015) describes it as the presence of proportion of women on the board. So, a gender diverse board includes an number of female directors.

Gender diversity is the most debated type of board diversity in the literature. Adams and Funk (2012) speak about a barrier for women to join the top ranks of organizations. Despite it may expected this barrier to be broke with the increasing number of women joining the labor force in the last years, only a little change has occurred in the top of companies. It has caught attention of media, companies, and politics. As mentioned earlier several countries set up binding quotas as guideline for the minimum number of women in the board of directors. Several empirical studies about the effect of board gender diversity on firm performance found a positive relationship (Lückerath-Rovers, 2013; Erhardt et al., 2003; Kilic and Kuzey, 2016). These studies suggest that women directors bring for example different

resources, skills, and experiences into the boardroom, which resulted in better decision-making of the boards and resulted in better firm performance. In the meanwhile, other studies found a negative relationship between the independent and the dependent (Marinova et al., 2016; Darmadi, 2011). The most important argument to this is that women are more diligent to monitoring, which could result in tough boards, which are over monitoring in firms, which could result in higher costs and poorer financial firm performance. Furthermore, in line with the agency theory the coordination of diverse top management teams may be more difficult and costly, and conflicts may occur more easily (Smith et al., 2006). So, there are positive and negative relationships examined between board gender diversity and firm performance.

2.5 Firm Performance

When investigating the effect of board gender diversity on firm performance it is necessary to describe and to clarify the term firm performance. Firm performance could be described as a 'subset of organizational effectiveness that covers operational and financial outcomes' according to Santos and Brito (2012). So, in their description, they separate two types of firm performance, namely operational and financial. Santos and Brito (2012) describe that operational firm performance can be indicated as non-financial competitive facets, in contrast financial firm performance include financial competitive facets. Examples of facets of operational firm performance are quality, customer satisfaction, employee satisfaction and innovation.

However, the approach as a stakeholder to firm performance is mostly the profit, market value and growth of a firm (Santos and Brito, 2012). Cho and Puck (2005) explain that profitability measures a firm's past and current generated returns. In the meanwhile, growth measures a firm's increase in size, which returns in more profitability. Furthermore, market value represents the external assessments and expectations of firm's future performance. The focus of several studies like Luckerath-rovers (2013) and Marinova et al. (2016) is the influence of women directors on firm financial performance. In addition, Combs, Crook, and Shook (2005) investigated which performance measurement have been used in several empirical studies between 1980 and 2004. Their results show that financial firm performance have been measured most frequently (82%), in contrast to operational firm performance (18%). So firm financial performance is used most frequently and is also used by comparable studies, which are mentioned frequently in this paper. In this study the firm performance is used as the dependent variable and the focus is on financial firm performance. This to determine whether gender board diversity leads to more profitability and productivity and to be able to compare to prior studies. More about the measurement of financial firm performance is explained the methodology of this thesis.

2.6 Corporate Decisions

Despite the focus of this thesis is on the effect of board gender diversity on firm performance, it is also interesting to review the literature on the effect of board gender diversity on different types of corporate decisions. This is important because corporate decisions could influence the firm performance of a firm. The influence of gender in the board on different corporate decisions is an intermediate step because it indirectly influences the financial firm performance. The board of directors of a firm must take various decisions and decisions can be risky. Marinova et al. (2016) describe in their study that women are more risk-averse and focus more on long-term perspective. This is also supported by Jianakoplos and Bernasek (1998) which found that women are more risk averse than man. Risk averse people are tended to focus more on risk management. In general men are less risk-averse and are taking more risky decisions, while women are more cautious due to their risk averseness. As described by Marinova et al. (2016) this could prevent a firm from financial problems during a financial crisis.

In the meanwhile, Levi, Li and Zhang (2014) found that the presence of female directors on a corporate board is negatively related with the firms' acquisitiveness, which indicates that women appear to be less motivated by empire building. Firms that increase their firm performance during mergers and acquisitions will probably not benefit by hiring women according to Levi et al. (2014). However, in contrast, Ahern and Dittmar (2012) used Norwegian firms in their sample, Norway implemented a mandatory quota in 2006, which indicates that 40% of the directors in Norway are required by law to be female. Their study shows that the quota led firms to increase in size, which resulted in more leverage and the undertaking of more acquisitions.

Another example of corporate decision taking is the decision to innovate as firm. Simpson, Carter, and D'Souza (2010) state that women can enhance innovation and creativeness due to their ability to change dynamics, interaction, and decision-making. Galia and Zenou (2013) discovered the impact of gender board diversity on the decision to innovate. They found a negative relationship with product innovation, however in contrast they found that gender board diversity is positively related with marketing innovation. Moreover, Miller and Carmen Triana (2009) found that gender diversity is positively related to a firm's innovation.

2.7 Firm Risk

In the previous paragraph I mentioned the impact of women on different corporate decisions. Women tend to be more risk averse and focus more on risk management, which could prevent a firm from financial problems. Several studies examined the effect of gender board diversity on firm riskiness. Firm riskiness is quantified in several studies as the variability of stock return, a decrease of the variability means a decrease of firm riskiness. Lenard, Yu, and York (2014) found that 'more gender diversity on the board of directors impacts firm risk by contributing to lower variability of stock market return. Ahern

and Dittmar (2012) agree by documenting a significant decrease in stock price reaction when firms add at least one female director to their board. Another method of measurement that is used by prior papers to quantify firm riskiness is the Return on Assets (ROA). Faccio, Marchica, and Mura (2016) state that the volatility of returns is a standard proxy for risk in the financial economics literature. They found that the volatility of the ROA decreases when a female becomes CEO of a firm. In the meanwhile, Sila, Gonzales, and Hagendorf (2016) did not show a significant relationship between gender board diversity and firm riskiness. So, several studies show that adding female directors decreases the volatility of the stock return and the ROA, which indicates that women decrease the firm riskiness, however there are also studies that did not find a significant relationship.

2.8 Institutional Background

In the previous paragraphs of this literature review the theories have been explained and the terms like gender diversity and firm performance have been clarified based on literature. Hence it is important to discover what existing literature tells about the institutional background related to this topic. Why should a firm increase the gender diversity in their board of directors? In addition, to the goal to increase firm performance there are more reasons according to different empirical investigations to increase the gender diversity in boardrooms.

Different countries set up mandatory gender quotas for the board of directors of firms. Institutions have to diverse their board of directors to fulfill these quotas. More about the quotas will be explained in the following paragraph about quotas. Discovering other reasons for firms to diverse their boards gives the possibility to link back to the theories stated earlier in this paper.

Firms tend to strive for a good corporate governance policy. Board gender diversity is according to Kilic and Kuzey (2016) one of the most important governance issues and is considered as an integral part of good corporate governance. Campbell and Minguez-Vera (2008) state that discussions regarding the gender diversity in boards have mainly focused on two aspects, namely economic and ethical concerns. Based on the ethical perspective, firms want to diverse their boards, because the underrepresentation of females in boardrooms could be seen as discrimination. Hence economic arguments propose that discrimination is sub-optimal rather than immoral (Kilic and Kuzey, 2016). However, it is important that good corporate governance should result in improved performance, otherwise the question of who sits in the board of directors has no practical value.

Firms use gender board diversity to fulfill quotas and for ethical and economical reason, but the main goal is to improve firm performance. The firm performance could be increased by adding unique characteristics, abilities, and talents. This is in line with the resource dependence theory, which states that every character contains different unique resources, which could help the board in the decision making. The increase of firm performance due to unique characteristics, abilities and talents is also

supported by the human capital theory as mentioned earlier. Furthermore, gender diversity in boards increases the quality of decision making. Women generally expend more effort on their tasks as compared to men according to Kilic and Kuzey (2016), which created a beneficial and more exhaustive decision-making process. In addition, boards with female members have a better attendance rate according to Adams and Ferreira (2004) and are more effective. Moreover, female directors are also better in connecting their corporations to female laborers, customers, and females in different parts of the work field, because of their different experiences and characteristics compared to male directors. This is also supported by the resource dependence theory and the human capital theory, because of the importance of the different resources and human capital of male and female directors. Moreover, the agency theory states that different backgrounds in the board lead to better decision making. The agency theory supports the different benefits of gender board diversity, however there are doubts about the increase in costs and the profitability.

2.8.1 Quotas

An already mentioned reason to diverse the gender in the board of directors are the mandatory quotas, which are introduced by different countries in the world. Several European governments made the goal to increase gender diversity in the board of directors an important item on the agenda. The percentage of women in the board of directors in the European Union in 2010 was only 11.4% according to the European Commission. However, the European Commission found that in 2016 on average 23.3 % of the board members of the largest publicly listed companies in the European Union were women. The percentage of women in the board of directors of companies increased in the last years, however it is still lower than the percentage of male directors.

To increase the number of women in the top positions of firms, affirmative actions are under discussion or already operational in several countries (Marinova et al., 2016). A well-known example in this is Norway, which implemented a mandatory quota in 2006. According to Huse (2013) 40% of the directors in Norway are required by law to be female. Marinova et al. (2016) stated that in 2012 the number of female directors in Norway was 42%. Moreover, this could be seen as an example of the results of the implementation of a mandatory quota. Other examples of European countries with quotas are Italy, Germany, and France. The European Commission started to encourage the increase of the number of women in the board of directors in 2010. Hence in 2011 they called for self-regulation by firms to increase the number of women in their boards and to ensure the gender balance (Jourova, 2016). The regulations did not result in a significant improvement of the number of women, which is why in 2012 the European Commission implemented a legislative proposal to accelerate the process to increase the gender diversity in boardrooms. Until 2010 the share increase of woman in boardrooms was 0.5% per year according to Jourova (2016). Hence after the proposal the average increase in European boardrooms have been 2.1% per year. To keep increasing the gender diversity in boardrooms, the proposal of the

European Commission contains a quantitative objective of a 40% presence of the under-represented sex among non-executive directors of listed companies in 2020. Firms that do not meet the target, are required to justify in their annual report. Moreover, they have to make appointments during the qualification of new candidates, which means that if two candidates are equally qualified, priority shall be given to the candidate of the under-represented sex.

The quotas set by the European Commission are also mandatory for Dutch boardrooms logically. However, the Dutch government also implemented a target of 30% women in Dutch boardrooms based on a ´comply or explain´ mechanism, without sanctions. Reason for the Dutch government to implement the target is their assumption that more diversity leads to more innovation and creativity, which lead to growth and better firm performance. The target resulted in a share of women on boards in The Netherlands of 21% in 2019, which is higher than a share of 10.4% of female directors in 2012. Other examples of countries with a 'comply or explain' mechanism are Finland, Turkey, and the United Kingdom. So interesting is the given that the European Commission, with high support of the European Parliament, and governments of several countries are betting highly on mandatory quotas for gender diversity in boardrooms. The European Commission states that not taking advantage of the skills of women constitutes in a waste of talent and a loss of economic growth potential. It is interesting to discover whether the increase and especially the presence of female directors results in better firm performance. Especially in The Netherlands, in which the number of women in boardrooms between 2012 and 2019 increased significantly as mentioned earlier.

2.9 Hypotheses

Based on the literature review and other empirical researches about this topic, two hypotheses will be set up in this section. These hypotheses will be used to test the relationship between board gender diversity in Dutch boardrooms and firm performance in The Netherlands.

The hypotheses will be developed based on the theories mentioned earlier in this paper. The agency theory is about the independence of the board and the possibility and quality to make the best decisions and specially to align the interest of the management and stakeholders. The theory states that the independence increases by increasing the gender diversity in boardrooms, however it is not sure whether it increases firm performance due to a possible increase in costs as explained earlier. Hence the hypotheses are also based on the resource dependence theory, in which different characteristics and in this case, gender will bring different resources. The hypotheses will be formulated in order to determine whether the different resources will increase the firm performance in Dutch boardrooms. Furthermore, the human capital theory will be mentioned because female directors will bring unique skills and knowledge to the board as stated by the theory. It is interesting to investigate whether this effects the

firm performance. The benefits of woman in the board of directors are mentioned several times in the literature review and will not be explained again in the hypotheses development.

To determine whether board gender diversity affects firm performance in the Netherlands it is important to first investigate the presence of female directors on the different boards. According to Luckerath-Rovers (2013) the presence of female in the board may result in a greater range of perspective and therefore lead to better decision-making, which is in line with the agency theory. Other studies that showed that female directors on the board positively affect firm performance are for example Erhardt et al. (2003) and Kilic and Kuzey (2016). Furthermore, in line with the resource dependence theory and the human capital theory the presence of female will bring different resources and unique skills and experiences. Especially skills and resources that are not equipped by male directors. The first hypothesis is determined in line with the theories and the studies mentioned in this paper, which describe positive influences of gender diverse boards on firm performance. The following hypothesis will be used in order to determine whether female directors on the board positively affects firm performance.

H1: Female directors on a board positively affects firm performance

Subsequently the effect of the proportion of female directors on firm performance will be investigated. Francoeur, Labelle and Sinclaire-Desgagné (2008) found in their paper using a sample of Canadian firms a positive relationship between the proportion of female in the board and firm performance. In addition, Mahadeo, Soobaroyen and Hanuman (2012) also found a positive significant relationship between the proportion of female in the board and the financial firm performance. In contrast Adams and Ferreira (2009) found a negative relationship between the proportion of female on the board and firm performance. Linking back to the theories it is important to consider the increase in costs based on the agency theory. A high proportion of female directors could for example result in high costs and with that more a negative effect on the firm performance. In the meanwhile, a high proportion of female could lead to more resources and a higher number of unique skills.

The effect of the proportion of female directors is furthermore determined in several other theories. First the token status theory, also known as tokenism, describes according to Zimmer (1988) women's occupational experiences and their behavioral responses to those experiences in terms of their numerical proportion, which suggests that barriers to women's occupational equality could be lowered by hiring more women in highly-skewed male boardrooms. The theory states that a single woman in a board, or another minority, could be seen as a token and be considered as less competent. Being less competent and having low status, means probably that they do not have a significant influence on corporate decisions and firm performance.

Furthermore, it is interesting to consider the critical mass theory, which indicates that women do not always represent women in the board, but only as the number of women in the board increases (Sarah

and Mona, 2008). According to Kramer, Konrad, Erkut, and Hooper (2006) one woman in the board feels the spotlight and is highly visible, which results in cautiousness and carefulness, which implies that the woman will not show all resources she got. Two women on the board is better, however a lot of female directors still feel stereotyped, ignored, and excluded, which results again in carefulness. However, having three or more women in the boardroom seems to result in a definite shift and removes gender from being a concern in boardrooms according to Kramer et al. (2016). Three or more women in the board of directors could be explained as the critical mass and the moment of normalization and full use of the resources of women. However as mentioned by Dahlerup (2006) and Oremus (2020) it is more appropriate to use a percentage of 30% women directors instead of three women directors as critical mass, to take the size of the board into account. So according to the critical mass theory, a minimum proportion of 30% women directors on the board positively affects firm financial performance. There are studies that already tested the relationship between having a critical mass for women directors on boards and firm performance. Liu, Wei, and Xie (2014) and Low, Roberts, and Whiting (2015) are two examples of studies that found a positive relationship. In contrast, I did not find any papers that documented a negative relationship between a critical mass for women directors and firm performance.

In conclusion, I expect based on theory and prior empirical studies that having a critical mass (30%) of women directors on boards will positively influence firm performance. This will show that the proportion of women directors is important in order to determine the influence of women directors. With the theories in mind, the second hypothesis is formulated as follows:

H2: A critical mass of female directors on a board positively affects firm performance

In conclusion the hypotheses will be used to investigate whether the presence and proportion, based on the critical mass theory, of female directors effects the firm performance significantly and positively.

3. Methodology

In this chapter I discuss the methodology that I use to test the hypotheses and answer the research question as mentioned in the previous chapters. The effect of board gender diversity on firm performance in Dutch boardrooms will be tested through the use of regression analyses. Several types of regression analyses will be discussed in this chapter and the method used in this thesis will be determined. Furthermore, the variables will be determined and explained in this chapter.

3.1 Quantitative Analysis

Quantitative research will be conducted to investigate the relationship between board gender diversity and firm performance in Dutch boardrooms. The hypotheses will be empirically tested using the statistical tool SPSS. An overview of the conceptual model of this study will be given in figure 1 and explained in this chapter.

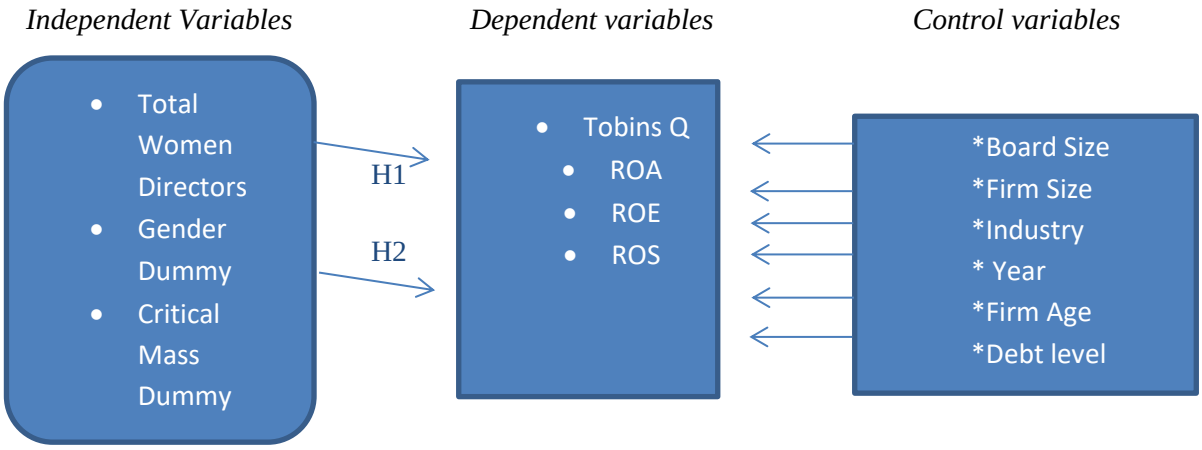

Figure 1: Conceptual model

3.1.1 Methods Used in Prior Research

The different papers and studies, in general, use Pearson's correlation matrix to test for multicollinearity. Hence these studies use regression analysis to examine the relationship between board gender diversity and firm performance. Examples are Marinova et al. (2016), Luckerath-Rovers (2013) and Kilic and Kuzey (2016). More recent examples of studies that used regression analysis are Oremus (2020) and Ten Dam (2018). However, there are differences in the research methods of the observed studies. The studies used different types of regression analysis, which in their way all examine the influence of the independent variables on the dependent variables. In this section different methods of regression analysis used in prior research will be discussed.

OLS Regression

The regression analysis method that is used most commonly by prior researches to investigate the effect of board diversity on firm performance is the Ordinary Least Square (OLS) regression analysis. The OLS regression is a statistical method of analysis that estimates the relationship between the independent variables and the dependent variables. The OLS method estimates the relationship by minimizing the sum of the squares in the differences between the observed and predicted values of the dependent variable configured as a straight line. The OLS method is used by Luckerath-Rovers (2013), which is a comparable study, because the author used Dutch boardrooms as well. Furthermore Oremus (2020) used it as well in a recent comparable study. Moreover Liu et al. (2014) mention the OLS regression method as a commonly used method in board diversity literature.

However as mentioned by Marinova et al. (2016) a complication by studying the relationship between board gender diversity and firm performance is that a correlation is not implying causality always. They state that the direction of causality can go in different ways. There is a probability that gender diversity leads to higher performance, but in the meanwhile it could also be that high-performing companies tend to employ a more gender diverse workforce. This implies joint endogeneity of variables of board gender diversity and firm performance according to Marinova et al. (2016) and Adams and Fereira (2009). In the case of endogeneity, the coefficients of the OLS regression are biased and cannot be interpreted as causal relations. Low et al. (2015) mentioned in their paper that insignificant results from the OLS regression may be due to the fact that gender diversity could be endogenous in their model. However not all studies that focus on gender diversity suffer from the problem of endogeneity, but it will be taken into account if the OLS regression method is going to be used in this paper.

Furthermore, as also mentioned by Oremus (2020) most gender diversity studies include year and industry fixed effects in their OLS regressions in order to control for yearly fluctuations of firm performance and industrial influence. This is supported by different papers like Adams and Ferreira (2009) and Liu et al. (2014). Outcomes of firm performance can be a result of the variability in industry

or year instead of the variation of gender in boards. So, if I use this method, variables for industry and year variation will be included to cope with this problem.

2SLS Regression

Prior studies that had to deal with endogeneity between the variables like Marinova et al. (2016) and Kilic and Kuzey (2016) used the two-stage least square (2SLS) regression method. This regression method is an extension of the earlier explained OLS method and is used when the dependent variable's error terms are correlated with the independent variables. The problem of endogeneity can be solved by adding instrumental variables. Oremus (2020) describes that 'instrumental variables are variables that are uncorrelated with the error term and the dependent variable but correlated with the independent variable'. Instrumental variables could be used to determine the true correct correlation between the dependent and independent variable.

Woolridge (2001) explains that the 2SLS regression method works in two stages, as mentioned in the name. In the first stage a new instrumental variable for board gender diversity must be created. The regression with the instrumental variable is based on OLS regression. Subsequently in the second stage a GGM regression will be applied. The GGM regression is used to mitigate the endogeneity concerns between variables. Oremus (2020) states that with the GGM regression, the relation between women directors on the board and firm performance can be estimated in weighted levels. Woolridge (2001) explains that the method requires a certain number of moment conditions, which are specified for the model. With these two stages the goal of the 2SLS method is to concern for endogeneity between board gender diversity and firm performance.

Endogeneity is sometimes a problem, when investigating the relationship between board gender diversity and firm performance. The 2SLS method could be a solution, however there are arguments against the use of this method in this thesis. Woolridge (2001) states that even if endogeneity exists between variables, it often has only a minor impact on estimates of coefficients and statistical significance. Moreover, he states that the GGM regression method is very complicated and when used wrong it can generate invalid estimates quickly. Hence Adams and Ferreira (2009) describe that 'it is usually difficult to come up with valid instruments, because the factors that are arguably most correlated with the endogenous variable are other governance characteristics that are already (or should be) included in performance regressions, such as board size and independence'. Furthermore, it is also difficult to exactly determine the number of instrumental variables needed according to Oremus (2020). Lastly Woolridge (2001) states that 2SLS is most ideal for the analysis of cross-sectional data. As mentioned in this paper I will use data from 2010 till 2019. Using 2SLS for the analysis of time series, could result in spurious results according to Oremus (2020), because it will not be able to ensure co-integration.

Fixed Effects Regression

Furthermore, Ujunwa and Okoyeuzu (2012) used in their paper in which they investigated the effect of corporate board diversity on firm performance a fixed effect regression. The fixed effect regression allows the researcher to examine variations among cross-sectional units simultaneously with variation within individuals over time according to Gaur and Gaur (2006). A fixed effect regression can determine the relationship between the predictor and outcome variables within entities like countries and firms. Baltagi (2005) states that each entity has its own characteristics that may influence the predictor variables. The fixed effect regression is used to analyze panel data, which are data involving measurements over time. The fixed effect regression method removes the effect of time-invariant characteristics, which results in the ability to assess the relationship between the predictor and the outcome variables (Adams and Ferreira, 2009). Other prior studies that used fixed effect regression to analyze panel data are Liu et al. (2014) and Rose (2007).

To investigate the relationship between board gender diversity and firm performance, I use panel data. As mentioned, the Fixed effect regression method is suitable to analyze panel data, however Shehata, Salhin, and El-Helaly (2017) mentions that a fixed effect regression is not able to estimate time-invariant variables. This is supported by Oremus (2020), which describes that a side effect of the fixed effects regression method is that it cannot be used to examine time variant causes of the dependent variable. Kohler and Kreuter (2005) state that time invariant characteristics are technically perfectly collinear with the entity dummies and fixed effect models are created to study the cause of changes within an entity. This cannot be done by a time-invariant variable, which is constant for each entity. In the case of this study, gender is a time-invariant predictor of firm performance. Because of this the fixed effect regression analysis is not suitable, which is also mentioned by Oremus (2020) and Ten Dam (2018).

Hierarchical Regression

The last regression method that I discuss is hierarchical regression. Erhardt, Werber, and Shrader (2003) used in their study a hierarchical regression analysis to demonstrate specific effects of the independent variable on the dependent variable. Researchers are often interested in testing theoretical assumptions and examining the influence of several predictor variables in a sequential way, which means that the relative importance of a predictor may be judged on the basis of how much it adds to the predication of a criterion and hierarchical regression has been developed for this (Petrocelli, 2003). Moreover De Jong (1999) states that ‘in hierarchical regression the independent variables are entered into the regression equation in a specified order and that the extra amount of variance accounted for in a dependent variable by a specific independent variable is the main focus of interest’. Furthermore, this type of regression analysis determines to what extent regression coefficients vary across different subpopulations. However, this research does not contain several demographic subpopulations, because the focus is on Dutch boardrooms only. Nevertheless, the study contains a long sequential period, 2010 till 2019, which

is another form of different subpopulations. In conclusion, hierarchical regression analysis could be used eventually to determine the effect of gender board diversity on firm performance in the Netherlands in the years after the economic crisis.

3.1.2 Method in This Study

As already mentioned, the data of this paper consists out of Dutch listed firms in the period between 2010 and 2019. So different variables will be structured over a certain period, and this type of data is also known as panel data according to Brooks (2014). Panel data is used by several comparable studies before, like Luckerath-Rovers (2013), Low et al. (2005) and Liu et al. (2014). Low et al. (2015) states that panel data results in more reliable analysis than cross-sectional data, moreover it is more precise and powerful in controlling for unobservable heterogeneity and omitted variable biases. Furthermore Baltagi (2005) states that panel data increases the degrees of freedom, reduces the collinearity among explanatory variables and improves the efficiency of econometric estimates. Panel data also increases the data, which is important in this paper because the number of firms is not very high, however observing many years increases the data and minimizes bias. As mentioned by Park (2011) a short panel has many entities and a short period, in contrast a long panel has a long period with less entities.

Two of the methods of regression analysis explained in the previous section could be used in this thesis. The OLS regression method and the hierarchical regression. A study that is very comparable to this study is as mentioned earlier the study of Luckerath-Rovers (2013). Luckerath-Rovers (2013) used the OLS regression method to examine the effect of board gender diversity on firm performance. Furthermore, the OLS method is also used by Oremus (2020), which is also a comparable and very recent study. To ensure more comparability between studies, it is good to use the most commonly used method in the board and performance literature, which is the OLS method. Moreover, in line with previous studies like Liu et al. (2014) and Oremus (2020) fixed effects for industry and year will be included to control for yearly fluctuations of firm performance and industrial influence.

3.1.3 Model

As mentioned, the data is analyzed trough an OLS regression. The model is created based on the model of Liu et al. (2014), which used an OLS regression including fixed effects for industry and year dummies. The OLS regression model including fixed effects for industry and year is written as follows:

$$\textbf{PERFORMANCE}_{it} = \beta 0 + \beta 1(\textbf{BOARD GENDER DIVERSITY})_{it} + \beta 2(\textbf{CONTROL VARIABLES})_{it} + \lambda_t + \alpha_i + \varepsilon_{it}$$

Where:

$PERFORMANCE_{it}$ = Measures of Firm Performance.

$\beta 0$ = The intercept or constant.

$\beta 1(BOARD\ GENDER\ DIVERSITY)_{it}$ = Measures of board gender diversity.

$\beta 2(CONTROL\ VARIABLES)_{it}$ = Firm specific control variables are included.

λ_t = Year fixed effects to control for yearly economy-wide fluctuations.

α_i = Industry fixed effects to control for industry specific influences.

ε_{it} = The error term.

3.2 Variables

In order to investigate the effect of gender diversity on firm performance in Dutch boardrooms through a regression analysis, variables have to be determined. This section explains the different independent and dependent variables. Furthermore, the control variables are determined and explained as well. Hence a table is created of all variables, their label and the measurement or definition that fits a specific variable.

3.2.1 Independent Variables

In this section the measurement of the independent variables will be determined. Gender board diversity is the independent variable in this thesis, however it has to be separated in three variables in order to answer the hypotheses as developed in this thesis. To investigate whether female directors on a board affect firm performance in line with Adams and Ferreira (2009) and Marinova et al. (2016) the percentage of women on the board, management board plus supervisory board, is used as independent variable. In addition to this Kilic and Kuzey (2016) also used the percentage of women on the board, calculated as total females on board divided by the total number of directors on the board. Furthermore, a dummy is created based on Marinova et al. (2016) and Kilic and Kuzey (2016), which equals 1 if the board of directors include at least one female and 0 otherwise. So, the first hypothesis is measured by investigating the effect of the percentage of women on the board on firm performance and through a dummy for the presence of women on the board.

Hence, in the second hypothesis the effect of the proportion of woman in Dutch boardrooms on firm performance will be investigated. More specific I investigate whether a critical mass of female directors on the board positively affects firm performance. Earlier in this paper I introduced the critical mass theory in order to determine whether having 3 or more woman on the board will be the tipping point and the moment of impact of the female board members. However as mentioned by Dahlerup (2006) it is more appropriate to use a percentage of 30% women directors instead of three women directors as critical mass, to take the size of the board into account. To test hypothesis 2 a dummy variable is used, which equals 1 if the percentage of women in boardroom is 30% or more and otherwise 0. So, to investigate the second hypothesis I use a dummy variable, which is also used by Dahlerup (2006) and Low et al. (2015).

3.2.2 Dependent Variables

This thesis investigates the relationship between the independent variables as mentioned and the firm performance in the Netherlands. The measurement of firm performance will also be done based on other academic papers. Marinova et al. (2016) and Kilic and Kuzey (2016) agree with each other that the two main types of performance indicators are market-based ones and financial statement ratios, which are accounting-based. In this thesis the same indicators of firm performance will be used. The market-based one is Tobin's Q, which is the ratio of the market value of a firm to the replacement cost of its assets according to Marinova et al. (2016). More specifically Tobin's Q will be measured as the market value of equity plus book value of debt, divided by book value of debt plus book value of equity (Marinova et al., 2016). Furthermore, financial statement ratios will be used to determine firm performance, like the Return on equity (ROE), Return on Assets (ROA) and the Return on Sales (ROS). So, in this paper the firm performance will be measured based on the investigations of Marinova et al. (2016) and Kilic and Kuzey (2016) through the ROA, ROE, ROS, and Tobin's Q.

3.2.3 Control Variables

Different idiosyncratic factors may influence the variables and with that the investigated relationship. To protect the investigation from biases, firm specific control variables will be included in this investigation. A control variable is an element that is not changed throughout an experiment and remains constant, because of its unchanging state, it allows the relationship between the other variables being tested to be better understood. It controls whether the relationship between the independent and dependent variables remains the same when other factors are included.

The control variables that will be used in this thesis are based on prior studies. Logarithms are used for some control variables to reduce their standard deviations, make the values more normal distributed, and to make them easier to read due to the large values they contain. These variables are indicated with 'L' in front of their codes. The descriptive statistics will not contain the natural logarithm of the

variables. Marinova et al. (2016) used different control variables in their study and some of these will be used to control the relationship between the independent and dependent variables in this thesis. One of the control variables used by Marinova et al. (2016) is board size. Board size (L_BSIZE) is an interesting control variable because adding female directors could also mean that a firm decides to increase their board size. In that case it is important to find whether firm performance is affected by an addition of female directors, even when the board size increases as well. Hermalin and Weisbach (2003) documented in their paper a negative association between board size and firm performance. Moreover Carter et al. (2003) found a positive association between board size and Tobin's Q. Furthermore, firm size, as in number of employees (L_EMP), and firm age (L_FAGE) will be included as control variables based on Marinova et al. (2016) and Oremus (2020). Koch and McGrath (1996) describe that firm size is expected to affect the labor productivity in a firm due to a larger scale of operations and settings. Therefore, it is expected that firm size has a positive effect on firm performance. (L_EMP) will be added as firm specific control variable to ensure that the relationship between board gender diversity and firm performance remains even if the labor productivity of a firm increases. Firm age (L_FAGE) will also be included as a control variable. Older firms tend to be more stable and experienced and this should not bias the relationship between the independent and dependent variables. Another control variable that will be included, in line with prior studies, in this study is the debt level of firms (DEBT). Dezso and Ross (2012) used the debt level, book value of debt divided by total assets, as a control variable. Firms increase their debt level in order to increase their profit opportunities, and therefore the debt level can bias the relationship between gender board diversity and firm performance.

Lastly, as mentioned fixed effects are included for industry and year. To control for time-varying economic influence on firm performance a dummy variable is created for several years between 2010 and 2019. Furthermore, in line with Luckerath-Rovers (2013) this study will include a dummy variable for companies operating in the financial sector, because these companies are on average large companies, but also have on average more female directors than other companies. However, to control for industry specific influences more dummies are created as fixed effects for the bigger industries. A dummy is created for the manufacturing industry, one for the wholesale, retail and trade sector, and lastly a dummy for the information and communication sector. In conclusion, the control variables in this study will be the board size, firm size measured in number of employees, firm age, and debt level. Furthermore, fixed effects dummies for year and the different industries are included.

Variables	Code	Definitions or measurement
INDEPENDENT VARIABLES		
Total Women Directors	TWD	Total number of women directors / total number of directors on the board.
Dummy Gender	G_D	Dummy variable = 1 if there is at least 1 woman on the board of directors; otherwise = 0
Critical Mass Dummy	CM_D	Dummy variable = 1 if 30% or more of the board members are women; otherwise = 0
DEPENDENT VARIABLES		
Tobin's Q	TQ	(Market value equity + book value total debt) / (book value equity + book value total debt)
Return On Assets	ROA	EBIT / total assets.
Return On Equity	ROE	Net income / total equity.
Return On Sales	ROS	EBIT / net sales.
CONTROL VARIABLES AND FIXED EFFECTS		
Board Size	L_BSIZE	Log of total number of directors on the board.
Employees	L_EMP	Natural logarithm of the number of employees.
Firm Age	L_FAGE	Log of total number of years the firm exists.
Debt-level	Debt	Long-term debt / total assets.
Year	Year	Dummy variable for every year between 2010 and 2019 to control for time-varying effects
Financial Sector	IND_1	Dummy variable = 1 if firm is operating in the financial sector; otherwise = 0
Manufacturing	IND_2	Dummy variable = 1 if firm is operating in the manufacturing industry; otherwise = 0
Wholesale, Retail & Trade	IND_3	Dummy variable = 1 if firm is operating in the wholesale, retail or trade industry; otherwise = 0
Information & Communication	IND_4	Dummy variable = 1 if firm is operating in the information or communication industry; otherwise = 0

Table 1: Variables definitions

4. Data

This chapter describes the data which will be used to investigate the effect of board gender diversity on firm performance.

4.1 Research Sample

The research sample will be used to investigate the effect of board gender diversity on firm performance in the Netherlands. The research sample will be created based on criteria, because it has to be representative and data biases have to be precluded. The sample data for this research consists out of listed Dutch firms on the Euronext Amsterdam per 1 May 2020. This is in line with previous studies like Marinova et al. (2016) and Lückerath-Rovers (2013). Also, in line with other studies only companies with a statuary domicile in the Netherlands will be included, because there are differences in diversity between countries and this will affect the results (Lückerath-Rovers, 2013). The effect of listed banks, insurance or investment firms, which have on average as mentioned earlier a higher number of female directors will be controlled through the control variable 'financial sector dummy' (Luckerath-Rovers, 2013). Firms that lack information about the number of women in the board or do not give enough information to fill the dependent variables, are excluded in this study. Firms with sufficient information in at least one year between 2010 and 2019 will be included in the sample. So, there are firms with data in all years, however there are also firms, which are for example listed in 2018 and just provide enough data in 2 years. Table 2 presents the data sample in general, hence, in table 3 the number of firms providing enough information for research per year are presented. Moreover appendix 1 contains an overview of the firms used in this study.

The final sample is as follows:

Data sample	
Listed firms 2020	122
Known value between 2010-2019 (operating revenue)	116
Statutory domicile in the Netherlands	102
Providing enough information for research	85

Table 2: Data Sample

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Firms	45	49	55	64	67	74	77	82	83	43

Table 3: Firms providing enough information for research per year

4.2 Data Collection and Sources

The collection of the data for this research will be done through a quantitative way of data collection. There will be no interviews or surveys, but the data needed for the independent and dependent variables will be gathered from the Orbis database of the University of Twente. Orbis contains information about companies worldwide, with an emphasis on private company information. Orbis combines information from regulatory and other sources and delivers company information with added value. Data can be found easily through Orbis because there are many filters, which give the possibility to find the required data. The Orbis database gives the required data to measure the firm performance through the measurement methods mentioned in the research method. It gives required data to fill the dependent and control variables, however annual reports will be used sometimes to complete the data. In the meanwhile, Orbis does not provide enough information about the amount of woman on the board. To complete the required data and to gather the data required for the independent variables, I will use the annual reports of the companies. So, the presence and the proportion of female directors per firm in different years will be gathered using annual reports.

4.3 Outliers

After the collection of the data, I check whether there are outliers with extreme values which could lead to biases in the relationship between the dependent and the independent variables. The outliers will be detected using scatterplots and the explore functions in SPSS. Outliers will be detected based on big varied differences on the dependent variables compared to the mean. To deal with the outliers the data is adjusted from them. First, I show a table of the descriptive statistics of the data including the outliers. Afterwards I use the winsorization technique as found by Charles Winsor, to transform extreme values in statistical data to deal with the effect of possible outliers. The highest and lowest values are replaced by the adjacent highest and lowest values. Because of this as stated by Dixon (1980) data have not to be deleted and the analysis does not lose power. To keep 95% of the original values of the study and to be able to mitigate the effect of outliers, winsorization has been performed on the top and bottom 2.5% of the sample. With this the effect of the outliers is minimized and a significant amount of the original values is used.

5. Results

In this chapter the results of this study are presented. In the first paragraph the descriptive statistics are discussed before and after the winsorization of outliers. Furthermore, the final version of descriptive statistics is discussed and compared to prior studies. Subsequently in the following paragraph the multicollinearity will be discussed using two methods: Pearson's correlation matrix and the Variance Inflation Factor. In the third paragraph the hypotheses will be tested using regression analysis as mentioned in the methodology. Lastly the robustness of the results will be checked in this chapter.

5.1 Descriptive Statistics

The descriptive statistics of the collected data including the outliers are presented in appendix 2. The table shows the independent, dependent and control variables with their number of observations, means, standard deviations, medians, minimum and maximum values. However, the table in appendix 2 contains outliers as mentioned and there are some extreme low and high values. For example, one of the performance measurements, the return on equity (ROE), shows a mean of 0.053, in the meanwhile the minimum is -5.319 and the maximum 5.432, so there are some extreme high and low values. Another example of a performance measurement with extreme values is Tobin's Q (TQ). It shows a maximum value of 13.962, while the mean is 0.947 and the median not higher than 0.741. Furthermore, the leverage mean (DEBT) is 0.192, while it has an extreme maximum with 0.88. These extreme values indicate that the data is very dispersed, which could present a biased version of the real situation. To deal with the outliers and to create a better picture of the situation the data have been winsorized as mentioned in the methodology. The purpose of winsorization is to mitigate the effect of outliers that can be present in the data. Examples of recent studies that winsorized their data are Shehata et al. (2017) and Liu et al. (2014). The data of this study contains a high number of outliers, so it is not possible to winsorize all outliers if the aim is to keep a big amount of the original values. To keep 95% of the original values of the study and to be able to mitigate the effect of outliers, winsorization has been performed on the top and bottom 2.5% of the sample. With this the effect of the outliers is minimized and a significant amount of the original values is used.

The winsorization of the data changed the descriptive statistics significantly. Table 4 presents the descriptive statistics with the adjusted values. The table shows that the mean of the ROE is 7.7%, which is higher than a ROE of 3.53% reported by Kilic and Kuzey (2016) using a Turkish sample during 2008-2012. Moreover, Bennouri, Chtioui, Nagati, and Nekhili (2018) with a ROE of 5.05% also show lower results using a French sample. Another ratio that is used to measure the firm performance is the return on assets (ROA). With a mean of 3% it is lower but comparable to results of studies like Adams and Ferreira (2009), which used a sample of US firms in 2003, and showed a ROA of 3.19% and Kilic and Kuzey (2016) with 3.66%. Furthermore, the table shows the statistics of the variable ROS, which

indicates a mean of 8.3% in this study. The statistic is way higher than Kilic and Kuzey (2016), which reported a ROS mean of 5% and a mean of 4.8% reported by Liu et al. (2014) for a sample of Chinese listed firms between 1999 and 2011. However, both prior studies used the net income instead of the EBIT to measure the return on sales, which probably causes the difference in ROS between this study and some other studies. The last dependent variable displayed in the descriptive statistics table is the Tobin's Q (TQ). The mean value of TQ is 0.892, lower than a TQ mean of 2.299 presented by Marinova et al. (2016) for a Dutch/Danish sample in 2007 and a mean of 1.352 reported by Rose (2007) using a Danish sample in 2001. Other examples of studies that used TQ as performance measurement are Dezso and Ross (2012) and Bennouri et al. (2018), which show a lower but still higher TQ value compared to this study with 1.039 and 1.04, respectively. It could be concluded that the TQ of this study is low compared to prior studies.

Moreover, the table presents the descriptive statistics regarding the independent variables, which measure the gender diversity in Dutch boardrooms. The table shows a mean of 13.5% for the variable TWD, which indicates that on average 13.5% of the board members of the chosen sample between 2010 and 2019 were women. In comparison Ten Dam (2018) found that 11.3% of Dutch directors were women between 2015 and 2018 and Marinova et al. (2016) reported an average of 5.4% in 2007. So, this study shows a higher mean than other studies that used a Dutch sample, which is probably caused by their usage of a less recent sample. The number of women directors in the Netherlands increased in the last years, so using more recent years in a study results in a higher number of women directors on average. In addition, figure 2 shows the development of the percentage of women in boardrooms in this research. I chose to use a sub-sample with 53 firms that provided enough information for research in at least 9 years between 2010 and 2019. This to show the development using consistently the same firms. In 2010, only 6.36% of the board members were women. However especially after the implementation of different quotas, which are explained earlier, the percentage of women in boardrooms of this Dutch sample increased to 21.39% in 2019. This is comparable to Luckerath-Rovers (2019), which also used a Dutch sample and found that 21.1% of the board members were women in 2019. Furthermore, gender diversity is measured by a dummy for the presence of a female director (G_D). The table reports that 66.2% of the boardrooms include at least 1 woman. Kilic and Kuzey present a lower mean of 50% in a Turkish sample. Furthermore, it is interesting to mention that Van Overveld (2012) reports that in 2012 38% of Dutch boardrooms included at least one female, where Luckerath-Rovers (2019) shows a G_D of 84% in 2019. This is another indication that the number of female directors in The Netherlands experienced growth. Lastly the critical mass dummy (CM_D) reports that 11.6% of the firms in this study have at least 30% women on their boards. This is higher than a mean of 7.5% reported by Liu et al. (2014), in contrast Oremus (2020) reports a higher mean of 20.5% using a sample of UK listed firms during 2015 and 2018.

Lastly, table 4 shows the descriptive statistics for the control variables. The average board size (BSIZE) is 8.44, with a minimum of 3 and a maximum of 16 board members. Several other studies report a mean of approximately 8 board members as well. For example, Marinova et al. (2016) and Oremus (2020) with means of 7.8 and 8.4, respectively. Furthermore, firms in this study are on average 57.56 years old. This is higher than the average age of firms used in the study of Oremus (2020), which reports a mean of 45.13 years. Moreover, Ten Dam (2018) reports a mean of 62.4 years. The average amount of employees is 16355 in this study, lower than a mean of 20,225 employees reported by Oremus (2020). Furthermore, firms in this study have a debt ratio of 18.9% on average. This is way lower than the mean of 54.9% reported by Van Overveld (2012) for a Dutch sample in 2012, but more in line with Ten Dam (2018) which found a mean of 21.6%. In addition, the variable SALES that will be used to check the robustness of the results is added to the descriptive statistics. The variable net sales (SALES) is used as different proxies of firm size (x1000), employees (EMP) is the proxy for firm size that will be used initially during the testing for multicollinearity and the regressions. Lastly the table shows that 9.7% of the firms is operating in the financial sectors, 38.2% in the manufacturing, 8.8% in the wholesale and retail trade industry, and 12.8% in the information and communication industry.

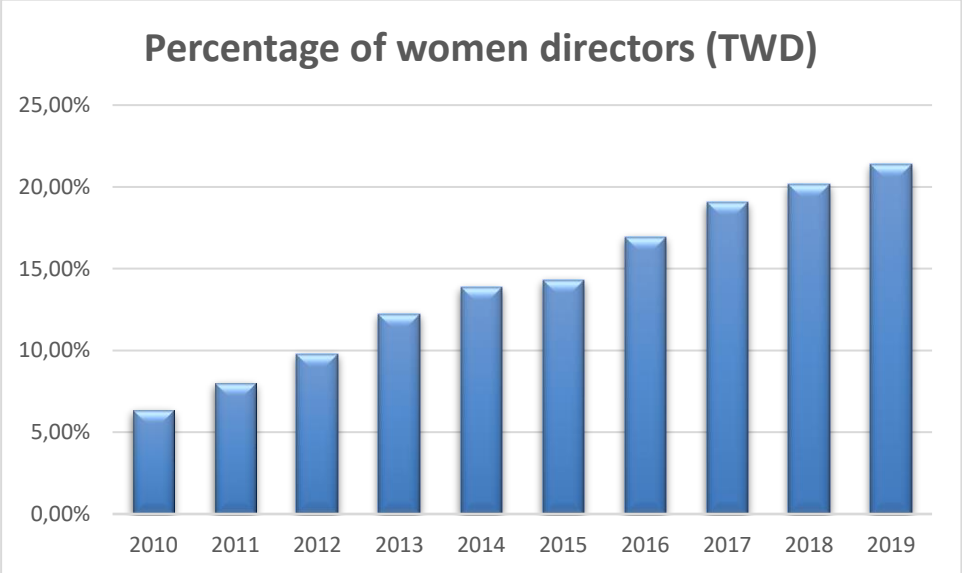

Figure 2: Development of percentage of women directors (TWD), using a sub-sample of 53 firms, which provided enough information for research in at least 9 years between 2010 and 2019.

Variable	N	Mean	St. Dev	Median	Minimum	Maximum
Firm Performance						
ROE	623	0.077	0.193	0.115	-0.460	0.408
ROA	636	0.030	0.086	0.040	-0.238	0.180
ROS	593	0.083	0.146	0.065	-0.276	0.498
TQ	617	0.892	0.751	0.741	0.040	3.740
Gender Diversity						
TWD	639	0.135	0.118	0.143	0	0.5
G_D	639	0.662	0.473	1	0	1
CM_D	639	0.116	0.320	0	0	1
Control variables						
EMP	635	16,355	39,157	2,400	13	218,000
BSIZE	639	8.44	3.182	8	3	16
FAGE	639	57.56	50.53	38	3	182
DEBT	586	0.189	0.152	0.151	0.006	0.587
SALES	615	3,934,136	7,119,253	805,976	4111	27,911,299
IND_1	639	0.097	0.296	0	0	1
IND_2	639	0.382	0.486	0	0	1
IND_3	639	0.088	0.283	0	0	1
IND_4	639	0.128	0.335	0	0	1

Table 4: Descriptive statistics after winsorization. Dependent variables, independent variables and control variables included. Furthermore, dummies for the different industries added. More information about the industry dummies in table 1.

5.2 Multicollinearity

We speak about multicollinearity when two or more explanatory variables are highly linearly related. This could be a problem in a study because multicollinearity erodes the statistical significance of an explanatory variable. To check for multicollinearity, I used Pearson's correlation matrix. Hence the Variance Inflation Factor (VIF) is used to quantify the severity of multicollinearity.

5.2.1 Pearson's Correlation Matrix

In table 5, Pearson's correlation matrix is presented, which shows the correlation coefficient between the variables used in this study. As mentioned by Brooks (2014) variables used in an OLS regression should not be highly correlated to each other. Variables that have a correlation of +1 or -1 are perfectly linear to each other. The closer a correlation value is to 1, the more linearity between two variables. Vithessonthi and Racela (2016) state that correlations below .3 will not create multicollinearity issues, in contrast correlations with values above .3 could be a problem and should be checked separately before adding them to the OLS regression model.

First, the matrix shows high correlations among the dependent variables. ROE and ROA are highly correlated (r=.915) to each other. Furthermore, ROS is also highly and significant correlated to ROE and ROA. Moreover, ROE and ROA are positively and significant correlated to all independent variables, TWD, G_D, and CM_D. This indicates that boards with women directors and boards that have a critical mass for women have higher firm performance based on ROE and ROA. TWD and CM_D are also positively correlated to ROS, in contrast there are no significant correlations between TQ and the measurements for gender diversity. These results show harmony with the theories described earlier, that board gender diversity and a critical mass of women on boards positively affect firm performance based on ROE, ROA, and ROS. Subsequently the correlation matrix shows the relationships between the dependent variables and several control variables. For example, an increase in employees (L_EMP) results in better firm performance based on ROE and ROA, however it is negatively significant related to TQ.

Further, the matrix shows positive significant correlations among the independent variables. TWD, G_D, and CM_D are all positively and significant correlated to each other with r>.3. However, this does not lead to multicollinearity, because the measurements of gender diversity are used alternatively and not simultaneously in the regression models. Furthermore, there are several correlations among the independent and control variables. For instance, older firms (L_FAGE) are hiring more employees (L_EMP), which results in larger boards (L_BSIZE) and increasing the board members results in an increase of women directors (TWD). Additionally, an increase in employees (L_EMP) improves the

chance that a firm has a critical mass of women on the board (CM_D). Lastly, it is remarkable that the variable for board size (L_BSIZE) has several relationships containing r>.3 with independent variables TWD, G_D, and L_EMP, which could undermine the statistical significance of the measurements of gender diversity. The regressions will include a column in which L_BSIZE is excluded, to check the results also without this control variable.

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**
(1) ROE	1										
(2) ROA	.915**	1									
(3) ROS	.483**	.479**	1								
(4) TQ	.183**	.166**	.035	1							
(5) TWD	.143**	.115**	.101*	-.027	1						
(6) G_D	.117**	.108**	.035	-.044	.803**	1					
(7) CM_D	.122**	.102**	.124**	-.017	.640**	.259**	1				
(8) L_EMP	.228**	.216**	-.003	-.085*	.202**	.288**	.078*	1			
(9) DEBT	-.037	-.117**	.140**	-.176**	.132**	.151**	.021	.033	1		
(10)L_FAGE	.124**	.157**	-.048	-.053	.205**	.189**	.149**	.173**	-.249**	1	
(11) L_BSIZE	.143**	.094*	.168**	-.059	.366**	.472**	.191**	.533**	.204**	.072	1

Table 5 presents the Pearson's correlation matrix to measure the correlations among variables. ** and * denote significance at the 1% and 5% levels, respectively.

5.2.2 Variance Inflation Factor (VIF)

In addition to Pearson's correlation matrix, the Variance Inflation Factor (VIF) is used to quantify the severity of multicollinearity in this study. 'VIFs get their name from the fact that they report how much the variance of the estimated coefficient increases is due to collinear independent variables' (Craney and Surles, 2002). If there is no correlation between the independent variables, the VIF score will be equal to 1. In the meanwhile, according to Kutner and Nachtsheim (2005) VIF scores higher than 10 indicate that multicollinearity issues exist between the variables. The VIF values for this study range between 1.106 and 1.995, which means that all are way below 10. In conclusion, based on the VIF scores, there is no multicollinearity among the variables in this study and no variables have to be excluded from this study. However as explained each regression table will include a model in which L_BSIZE is excluded.

5.3 Regression Analysis

This section contains the results of the regression analyses of this study. First the results regarding the first hypothesis will be discussed, in which I investigate whether female directors positively affect firm performance. Hence the results concerning the second hypothesis are discussed, wherein I investigate whether a critical mass of female directors affects firm performance positively. The results of the regression analyses are used to accept or reject the hypotheses, however it is necessary to check the robustness of the results first in the following section.

5.3.1 Female Directors Affect Firm Performance Results

The first hypothesis states in this study that female directors in the board positively affect firm performance. First, I examined whether the percentage of women directors on boards (TWD) affects firm performance significantly. In addition, a dummy variable is used (G_D), to determine whether the presence of a women director on the board affects firm performance positively and significant. Table 6 presents the regression analysis where gender diversity is measured by TWD and firm performance by ROA and ROE. Regression results between TWD and ROS and TQ are also discussed, however the tables are given in appendix 3. Subsequently table 7 presents the regression results where gender diversity is measured by G_D and firm performance by ROA and ROE, furthermore the results between G_D and ROS and TQ are also added to appendix 3.

Table 6 presents 6 different models, in which the first model shows the influence of the control variables on ROA. As indicator of firm size, L_EMP have been added to the models. Koch and McGrath (1996) describe that firm size is expected to affect the labor productivity in a firm due to a larger scale of operations and settings. In model 1, L_EMP shows a positive significant relationship with ROA as expected. Furthermore, DEBT is included as a control variable, which shows a negative significant relationship to ROA, which is in line with Liu et al. (2014). Another control variable is L_FAGE, which shows a positive significant relationship, indicating that the older a firm gets, the higher the return on assets. Lastly, L_BSIZE shows no significant relationship to ROA, which is in line with Liu et al. (2014).

From model 2, the independent variable TWD is included in the models combined with different combinations of control variables. Model 2 shows the combination of DEBT, L_FAGE and L_EMP with TWD. TWD show a positive significant relationship at the 5% level with ROA. Which indicates that a 1% increase in the percentage of female directors, is associated with an on average 0.081% higher return on assets (ROA). As explained earlier, I decided to include L_BSIZE separately in all models, because of the results of Pearson's correlation matrix, which showed high relations between L_BSIZE and the independent variables. The inclusion of L_BSIZE in model 3 as a control variable did not change the relationship between TWD and ROA, which remains positive and significant at the 5% level. Hence in the models 4,5 and 6 of table 6 the relationship between TWD and ROE is analyzed. The OLS

regression on ROE show very comparable results as with ROA, in which model 6 shows that a 1% increase of women is associated with an on average 0.176% higher return on equity. In the meanwhile, DEBT show no significance to ROE in all models, where it was significant related to ROA.

Dependent variables: ROA and ROE

	ROA			ROE		
MODEL	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.065**	-.047**	-.050*	-.176***	-.116**	-.143**
	(-2.287)	(-2.202)	(-1.725)	(-2.803)	(-2.412)	(-2.221)
TWD		.081**	.080**		.192**	.176**
		(2.451)	(2.297)		(2.518)	(2.195)
L_EMP	.016***	.016***	.016***	.035***	.039***	.036***
	(4.026)	(4.588)	(4.062)	(3.882)	(4.751)	(3.973)
DEBT	-.060**	-.065***	-.065***	-.021	-.031	-.037
	(-2.357)	(2.588)	(-2.575)	(-.366)	(-.545)	(-.633)
L_FAGE	.018**	.013	.013	.032*	.022	.022
	(2.008)	(1.444)	(1.437)	(1.669)	(1.096)	(1.079)
L_BSIZE	.025		.004	.089		.043
	(.857)		(.131)	(1.381)		(.634)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
ADJ. R^2	.059	.068	.066	.054	.062	.061
F-Statistic	3.136***	3.476***	3.278***	2.912***	3.196***	3.037***
N	636	636	636	623	623	623

Table 6 presents the OLS regression with fixed effects for year and industry. Gender diversity is measured by the percentage of women directors on boards (TWD). The dependent variables are the return on assets (ROA), column 1,2,3, and the return on equity (ROE), column 4,5,6. *, **, and * denote significance at the 10%, 5%, and 1% levels, respectively.**

In addition, as explained, regression analyses have been done between TWD in combination with the control variables with ROS, and TQ. The results are given in appendix 3. First, TWD shows a positive relationship with ROS, however not significant in the final model. It is remarkable that L_EMP does not show significance with ROS and DEBT shows a positive significant relationship to ROS. TWD is not significant related to ROS in model 3, however in model 2, where L_BSIZE is excluded, a slightly positive relationship at the 10% level is found. All with all, it could be stated that TWD is mostly positive and significant related to the accounting-based indicators of firm performance, ROE, ROA, and ROS. However, there is also a market-based indicator added to this study, namely Tobin's Q (TQ). The results between TWD and TQ are noteworthy, because TWD is negatively and significant related to TQ in the final model which was not expected. Furthermore, the table show a negative significant relationship between L_FAGE and TQ, which is also different from the OLS regressions with accounting-based indicators.

Moreover, a dummy variable for gender (G_D) have been used as explained earlier to be able to accept or reject hypothesis 1. The regression results with ROA and ROE are presented in table 7, in which the models 1 and 4 are the same as in table 6, because the same control variables and dependent variables have been used. Furthermore, the results between G_D and ROA are very comparable to the regression results between TWD and ROA. However, the final model (model 3) shows less significance at the 10% level compared to the 5% level in the case of TWD. Moreover, model 2 shows again positive significance on the 5% level when L_BSIZE is excluded from the model. Table 7 shows that, if the number of firms in this sample with female directors on board increases with 1%, the ROA will increase with 0.016%. So, an increase of the number of firms with at least one female directors, results in a higher return on assets on average. All with all both independent variables, TWD and G_D, are positively and significant related to ROA. Analyzing the regression on ROE, it is remarkable to state that there is no significant relationship in model 6 with G_D. Despite, in model 5, where L_BSIZE is excluded, G_D shows significance on the 10% level with ROE. It could be concluded that the exclusion of L_BSIZE in the models results in more significant relationships between G_D and the dependent variables.

Dependent variables: ROA and ROE

	ROA			ROE		
MODEL	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.065**	-.048**	-.052*	-.176***	-.119**	-.155**
	(-2.287)	(2.250)	(-1.798)	(-2.803)	(-2.470)	(-2.391)
G_D		.016**	.016*		.033*	.027
		(1.963)	(1.774)		(1.767)	(1.377)
L_EMP	.016***	.016***	.016***	.035***	.038***	.035***
	(4.026)	(4.446)	(3.959)	(3.882)	(4.599)	(3.835)
DEBT	-.060**	-.063**	-.064**	-.021	-.024	-.031
	(-2.357)	(-2.523)	(-2.522)	(-.366)	(-.415)	(-.530)
L_FAGE	.018**	.015	.014	.032*	.028	.027
	(2.008)	(1.635)	(1.625)	(1.669)	(1.225)	(1.360)
L_BSIZE	.025		.006	.089		.056
	(.857)		(.197)	(1.381)		(.828)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
ADJ. R^2	.059	.064	.063	.054	.056	.056
F-Statistic	3.136***	3.337***	3.148***	2.912***	2.990***	2.860***
N	636	636	636	623	623	623

Table 7 presents the OLS regression with fixed effects for year and industry. Gender diversity is measured a dummy variable for women on the board (G_D) as explained in the methodology. The dependent variables are the return on assets (ROA), column 1,2,3, and the return on equity (ROE), column 4,5,6. *, **, and * denote significance at the 10%, 5%, and 1% levels, respectively.**

Additionally, in appendix 3 the regression results between G_D and ROS and TQ are given. Where TWD showed some significance with ROS, there is no significance between G_D and ROS at all. Lastly, G_D is also negatively significant related to TQ, which was surprising as mentioned in the case of TWD.

In conclusion, gender diversity seems to have an influence on firm performance. The independent variables TWD and G_D positively affect the accounting-based measures of firm performance, especially in the case of ROA and ROE. Other studies that found positive relationship with these performance indicators are Liu et al. (2014), Kilic and Kuzey (2016) and Erhardt et al. (2013). However, the regression analyses indicate that gender diversity negatively affects the market-based measure TQ of firm performance in this study. This is line with Darmadi (2011), which also found a negative relationship between gender diversity and market-based indicators like TQ. Furthermore Bennouri et al. (2018) also found positive relationships between gender diversity and accounting-based indicators of firm performance, but a negative relationship between gender diversity and market-based indicators like TQ. The robustness of the results will be checked in section 5.4, afterwards a final conclusion could be made and hypothesis 1 could be accepted or rejected.

5.3.2 Critical Mass Results

The results in the previous section already showed that an increase in the proportion of women directors TWD results in an increase of accounting-based indicators of firm performance. In the meanwhile, G_D was less significant with for example ROS and this shows again the importance of hypothesis 2. Because the critical mass theory states that not the presence of a women on the board affects firm performance, but the proportion of women on the board. Having a boardroom, which contains for at least 30% out of women should result in better firm performance according to the critical mass theory. Table 8 reports the regression analysis between the critical mass dummy CM_D and the dependent variables ROA and ROE.

Models 1 and 4 of table 8 show the control variables and their relationship to the dependent variables, without the inclusion of the independent variable. The same control variables are used as in the testing of hypothesis 1. Furthermore, dummies for year and industry have been added again to control for time-varying economic and industry influences on firm performance. This results in equal outcomes of models 1 and 4 during the testing of hypothesis 1 and 2, so the results of these models will not be discussed again in this section.

In table 8, CM_D is positively and significant related to ROA in the models 2 and 3 at the 10% level. The table indicates that a board with a critical mass for women has on average an increase of 0.02% in their return on assets. Furthermore, the final model shows positive significant relationships for L_EMP and L_FAGE and a negative significant relationship for DEBT with ROA. Hence, the table shows that CM_D is positively related to ROE in model 6 at the 10% level. In model 5, where L_BSIZE is excluded from the model, I even found a positive relationship between CM_D and ROE at the 5% level.

Dependent variables: ROA en ROE

	ROA			ROE		
MODEL	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.065**	-.047**	-.057**	-.176***	-.116**	-.156**
	(-2.287)	(-2.194)	(-1.985)	(-2.803)	(2.415)	(-2.455)
CM_D		.021*	.020*		.053**	.047*
		(1.826)	(1.688)		(2.030)	(1.769)
L_EMP	.016***	.017***	.017***	.035***	.041***	.037***
	(4.026)	(4.890)	(4.114)	(3.882)	(5.061	(4.038)
DEBT	-.060**	-.057**	-.059**	-.021	-.009	-.020
	(-2.357)	(-2.288)	(-2.341)	(-.366)	(-.153)	(-.340)
L_FAGE	.018**	.016*	.016*	.032*	.028	.027
	(2.008)	(1.816)	(1.766)	(1.669)	(1.448)	(1.375)
L_BSIZE	.025		.015	.089		.063
	(.857)		(.505)	(1.381)		(.962)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
ADJ. R^2	.059	.063	.062	.054	.058	.058
F-Statistic	3.136***	3.304***	3.130***	2.912***	3.054***	2.935***
N	636	636	636	623	623	623

Table 8 presents the OLS regression with fixed effects for year and industry. The independent variable for having a critical mass of women on the board is (CM_D), which equals 1 if a boardroom exists for 30% out of women as explained in the methodology. The dependent variables are the return on assets (ROA), column 1,2,3, and the return on equity (ROE), column 4,5,6. *, **, and * denote significance at the 10%, 5%, and 1% levels, respectively.**

Moreover, the relationship between CM_D and firm performance, as measured by ROS and TQ is given in appendix 4. The OLS regression on ROS shows a positive significant relationship with CM_D at the 5% level. Again, the control variable L_BSIZE showed a positive significant relationship with ROS, where it was insignificant with ROE and ROA. Moreover, DEBT shows a positive significant relationship with ROS in all models. Furthermore, a negative significant relationship is found with TQ. This is in line with the results of hypothesis 1, which assume that gender diversity in this study positively affects the accounting-based indicators of firm performance, however all relationships to the market-based indicator TQ are negative.

In conclusion, critical mass for women on the board is positively related to accounting-based indicators of firm performance, but negatively related to the market-based indicator TQ in this study. There are several studies, like Liu et al. (2014) and Low et al. (2015) that found a positive relationship between CM_D and the accounting-based indicators. Bennouri et al. (2018) furthermore also found a significant relationship with the accounting-based indicators but is more comparable because of their negative relationship between CM_D and TQ. Before answering hypothesis 2, it is necessary to check the robustness of the results in the following paragraph.

5.4 Robustness Checks

In the regression tests I already checked the robustness partly by using several dependent variables for example. However not all dependent variables showed the same results, because the accounting-based indicators of firm performance showed mostly positive and significant relationships with gender diversity. In the meanwhile, the market-based indicator, Tobin's Q (TQ), showed negative and significant relationships with gender diversity. Because of these surprising results, I chose to use different ways to check the robustness of the results. First the proxies of firm size have been changed, second, I created a subsample for the manufacturing industry, lastly, I chose to lag an independent variable to solve endogeneity issues.

To check the robustness of the results first the proxies for firm size have been changed. L_EMP is used during the regression analysis as the indicator of firm size, however it showed slightly high positive and significant correlations with the independent variables TWD and G_D based on Pearson's R as shown in table 5. So, it is good to use different proxies for firm size, to check whether the results remain mostly the same when using other control variables. I chose to use the logarithm of net sales (L_SALES) as new indicator of firm size based on Marinova et al. (2016). It must be mentioned that L_SALES also showed slightly high relationships with TWD, r=.353, G_D, r=.275 and CM_D with r=.158.

In table 9, the regression results between TWD and the dependent variables ROA and ROE are presented in which L_EMP is replaced by L_SALES. It is remarkable that the results are mostly the same as the results shown in the section with the regressions, however the results of this robustness check show less significance. TWD is positively and significant related in the final model, model 3, to ROA at the 5% level, where the significance with ROE in model 6 is at the 10% level. Furthermore, it is remarkable that L_BSIZE is negatively and significant related to the dependent variables after the inclusion of L_SALES. Moreover, the robustness of the results between TWD with and ROS, and TQ have been checked through the inclusion of L_SALES and the tables are added to appendix 5. Again, I found positive relationships between TWD and ROS, however again they are not significant. Lastly, also with the new proxies for firm size the relationship between TWD and TQ remains negative and significant at the 5% level.

Hence, the robustness of the results between G_D and the indicators of firm performance have been checked. The tables are added to appendix 5, where again L_EMP is replaced by L_SALES. The regression results in section 5.3.1 showed that the ROS is not affected by G_D and with the inclusion of the new control variable the insignificant relationship remains. However, now I also did not find a significant relationship with the dependent variables ROE and ROA. In contrast, again a significant negative relationship is found with TQ in the final model. In conclusion, the first method to check the robustness of the results found in section 5.3.1 show that the results remain mainly the same when the

indicator of firm size is changed. This means that hypothesis 1 is supported partly again, because board gender diversity seems to affect the accounting-based indicators of firm performance, however it is again negatively related to the market-based indicator of firm performance.

Dependent variables: ROA and ROE

	ROA			ROE		
MODEL	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.110***	-.132***	-.098***	-.300***	-.355***	-.275***
	(-3.861)	(1.453)	(-3.384)	(-4.705)	(-5.868)	(4.216)
TWD		.049	.070**		.081	.132*
		(1.453)	(2.045)		(1.046)	(1.686)
L_SALES	.036***	.027***	.036***	.091***	.068***	.090***
	(7.282)	(6.790)	(7.177)	(7.946)	(7.547)	(7.866)
DEBT	-.063***	-.077***	-.068***	-.026	-.060	-.038
	(-2.571)	(-3.125)	(-2.768)	(-.466)	(-1.072)	(-.681)
L_FAGE	.013	.010	.009	.019	.014	.011
	(1.455)	(1.083)	(.981)	(.976)	(.708)	(.558)
L_BSIZE	-.084**		-.098***	-.208***		-.235***
	(-2.533)		(-2.915)	(-2.806)		(-3.104)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
ADJ. R^2	.117	.110	.122	.129	.118	.132
F-Statistic	5.502***	5.210***	5.458***	5.898***	5.433***	5.747***
N	636	636	636	623	623	623

Table 9 presents the robustness check of the results of hypothesis 1. Gender diversity is measured by the percentage of women directors on boards (TWD). The dependent variables are the return on assets (ROA), column 1,2,3, and the return on equity (ROE), column 4,5,6. (L_SALES) have been added as control variable instead of (L_EMP). *, **, and * denote significance at the 10%, 5%, and 1% levels, respectively.**

Thereafter, the robustness of the results of hypothesis 2 have been checked through the same way. Again, high positive and significant results have been found between CM_D and ROS as presented in table 10. Moreover, table 10 shows a weak negative significant relationship between CM_D and TQ, which is in line with the results found earlier. Furthermore, the tests with ROA and ROE are added to appendix 5 and positive relationships have been found with both dependent variables, however not significant. In conclusion, having a critical mass of female on the board affects the firm performance of a firm positively in the case of accounting-based indicators. However, hypothesis 2 is as well just partly supported, because the relationship between (CM_D) and the market-based indicator (TQ) is negative. So, the results are mainly the same as the results shown in section 5.3.2.

Dependent variable: ROS en TQ

	ROS			TQ		
MODEL	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.054	-.040	-.036	1.196***	1.364***	1.130***
	-1.098)	(-.870)	(-.729)	(5.292)	(6.468)	(4.956)
CM_D		.049***	.050***		-.141	-.171*
		(2.610)	(2.618)		(-1.584)	(-1.923)
L_SALES	.016*	.014**	.016*	-.053	.013	-.052
	(1.775)	(2.120)	(1.770)	(-1.349)	(.438)	(-1.315)
DEBT	.105**	.104**	.106**	-.987***	-.905***	-.992***
	(2.405)	(2.439)	(2.443)	(-5.029)	(-4.661)	(-5.061)
L_FAGE	.005	.001	.001	-.177***	-.158**	-.162**
	(.359)	(.048)	(.958)	(-2.580)	(-2.278)	(-2.344)
L_BSIZE	.006		-.014	.627**		.693***
	(.103)		(-.246)	(2.385)		(2.623)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
ADJ. R^2	.028	.040	.038	.168	.163	.172
F-Statistic	1.951**	2.376***	2.244***	7.743***	7.514***	7.555***
N	593	593	593	617	617	617

Table 10 presents the robustness check of the results of hypothesis 2. The independent variable for having a critical mass of women on the board is (CM_D), which equals 1 if a boardroom exists for 30% out of women as explained in the methodology. The dependent variables are the return on sales (ROS), column 1,2,3, and Tobin's Q (TQ) in column 4,5,6. (L_SALES) have been added as control variable instead of (L_EMP). *, **, and * denote significance at the 10%, 5%, and 1% levels, respectively.**

Subsequently, as a second robustness check of the results presented in section 5.3, the sample is modified into a subsample with firms operating in the manufacturing industry. As mentioned earlier the four biggest industries are specified as dummy variables and are used in the regression analyses. Earlier I mentioned that firms operating in the financial industry have more women on the board on average. I tested whether there are differences between the results of the original sample and a sample, where financial firms are excluded. However, no significant differences have been found. Furthermore, in the section containing the descriptive statistics I showed that the manufacturing sector is the biggest sector in this study. The results showed that gender board diversity affects the accounting-based indicators of firm performance positively, however the market-based indicator has a negative relation with female on boards. So, in order to verify the results of the regressions in section 5.3 I decided to estimate OLS regressions using a subsample of firms operating in the manufacturing sectors, because this excludes financial firms, focusses on one type of firms and results in a sample big enough to draw conclusions. The subsample contains 244 observations. The same regression method has been used as explained in the methodology, so with L_EMP as indicator of firm size. However, the subsample is industry specific, so the fixed effects for industry are omitted in this robustness test.

The tables containing the OLS regression results using a subsample for the manufacturing industry in the case of hypothesis 1 are presented in appendix 5. The results correspond to the results presented in

section 5.3, because again a positive relationship have been found between the independent variables for board gender diversity and the accounting-based indicators of firm performance. Besides, gender board diversity shows again negative relationships with the market-based indicator of firm performance. However, it seems that having female directors on the board affects firm performance more when focusing on a subsample which contains the manufacturing industry. The independent variables, TWD and G_D, are both highly positive related to the accounting-based indicators of firm performance ROA, ROE, and ROS at the 1% level. The signs are stronger than in the initial regression analyses. In the meanwhile, as mentioned a negative relationship is found again between TWD and G_D, and TQ, however this relationship loses significance compared to the initial results. So, except of differences in significance between the regressions of the subsample and the initial sample, the results are comparable to each other. This strengthens the previous mentioned conclusion that hypothesis 1 is supported partly.

Furthermore, hypothesis 2 have been tested as well using the subsample. The tables are presented in appendix 5 as well. Positive relationships have been found between CM_D and ROA, ROE, and ROS, however in this case no significance has been found. In the meanwhile, a negative and significant relationship at the 5% level is found in the final model between CM_D and TQ. So, when using these results to verify the results shown in section 5.3.2, it is remarkable that some significance is lost. However, the signs are the same and hypothesis 2 is supported partly again, because of the negative relationship between CM_D and TQ.

Lastly, in order to check the robustness of the results in section 5.3, and to control for endogeneity issues, a one-year lagged version of the independent variable for total women directors (TWD) is used. Carter et al. (2010) states that a one-year lag should be used, because existing theory is not able to predict the time that is needed for effect to take place. Furthermore Liu et al. (2014) state that they use a one-year lagged board gender diversity measure to replace the contemporary ones since female directors need time to influence firm performance. The results in section 5.3 showed that gender board diversity affects the accounting-based indicators of firm performance positively, however a negative relationship is found with the market-based indicators. The previous robustness checks verified the results of the regression analyses. Hence, I will check the robustness a final time in which I focus on the results of hypothesis 1, but the main goal is to verify whether gender board diversity is again positively related to the accounting-based indicators and negatively to the market-based indicator of firm performance. The initial sample is used, in which the independent variable (TWD) is lagged based on (t-1).

Table 11 presents the results of the robustness check in which the independent variable, TWD, is lagged based on (t-1) related to ROA and ROE. Gender diversity is again positively and significant related at the 5% level to ROA. However, the sign is less strong with .077 compared to the sign in the final model of the initial sample (.080). The same is found in the case of the relation with ROE, the positive

relationship between gender diversity and ROE remains, however the sign is less strong when the independent variable is lagged.

Dependent variables: ROA and ROE

	ROA			ROE		
MODEL	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.128***	-.111***	-.108**	-.259**	-.186*	-.214**
	(-2.891)	(-2.717)	(-2.390)	(-2.466)	(-1.898)	(-2.007)
TWD(t-1)		.075**	.077**		.190**	.173**
		(2.192)	(2.137)		(2.408)	(2.079)
L_EMP	.017***	.016***	.017***	.035***	.039***	.036***
	(3.921)	(4.328)	(3.949)	(3.618)	(4.469)	(3.692)
DEBT	-.055**	-.061**	-.061**	-.005	-.015	-.021
	(-2.048)	(-2.316)	(-2.262)	(-.089)	(-.243)	(-.342)
L_FAGE	.018*	.013	.013	.039*	.028	.028
	(1.917)	(1.395)	(1.398)	(1.864)	(1.324)	(1.308)
L_BSIZE	.015		-.005	.094		.048
	(.501)		(-.160)	(1.381)		(.668)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
ADJ. R^2	.062	.071	.069	.051	.059	.058
F-Statistic	3.053***	3.348***	3.157***	2.648***	2.896***	2.757***
N	526	526	526	516	516	516

Table 11 presents the robustness check of the results. Gender diversity is measured by the percentage of women directors on boards (TWD) and lagged one year. The dependent variables are the return on assets (ROA), column 1,2,3, and the return on equity (ROE), column 4,5,6. *, **, and * denote significance at the 10%, 5%, and 1% levels, respectively.**

Subsequently, in appendix 5 the results between TWD (t-1) and the independent variables ROS and TQ are presented. The results verify the initial results presented in section 5.3. A positive and significant relationship is found with ROS and again a negative and significant at the 5% level is found between gender diversity and the market-based indicator of firm performance TQ.

In conclusion, the three different methods used to check the robustness of the regressions results show the same results. The results presented in section 5.3 are verified and it is clear that in this study gender diversity affects the accounting-based indicators of firm performance positively. Furthermore, both hypotheses are supported partly, considering that having female on the board of directors affects the market-based indicator of firm performance negatively in this study.

6. Conclusion and Discussion

This study investigates the effect of gender diversity on firm performance of listed firms in The Netherlands. The effect of the presence and the proportion of female board members is examined. Adams and Funk (2012) state that there is a barrier for women to join the top ranks of organizations. Several countries introduced quotas in the past years to increase the number of women in corporate boardrooms. There are ethical and economic reasons for the increase of women in boardrooms. The resource dependence theory states that every character contains unique resources, which could improve the decision making of a board. Furthermore, in line with the human capital theory female can bring unique skills and talents into a firm. The aim of this paper was to determine whether these different resources of women lead to better firm performance. This paper investigates the effect of gender diversity on firm performance in The Netherlands through a sample of 85 listed firms. Data is gathered for the period between 2010 and 2019.

First, I investigated whether female directors on a board positively affect firm performance. This is investigated through an OLS regression analysis with fixed effects for year and industry. The results show that female directors in Dutch boardrooms positively and significant affect accounting-based indicators of firm performance, like ROA and ROE. However, a negative significant relationship is found with Tobin's Q, which is the market-based indicator of firm performance in this study. This suggests that hypothesis 1 is supported in the case of accounting-based indicators and rejected in the case of market-based indicators of firm performance.

Furthermore, it is hypothesized in the second hypothesis of this study that having a critical mass of female directors on a board positively affects firm performance. As explained in the methodology, we speak about a critical mass if a boardroom exists for at least 30% out of women. This study found that having a critical mass of women on the board results in an increase of the accounting-based indicators of firm performance, especially the ROS. However, in line with the results of hypothesis 1, a negative significant relationship is found with Tobin's Q.

So, both hypotheses in this study are supported partly. Gender diversity seems to affect the accounting-based indicators of firm performance positively. In the meanwhile, negative relationships have been found with the market-based indicator, Tobin's Q. This means that the theories mentioned in this study like the human capital theory and the critical mass theory are also supported partially. Regarding the critical mass theory, it must be mentioned that the first hypothesis already shows that having just female directors already increases the accounting-based indicators of firm performance. So, a critical mass of female directors is eventually not necessary. However, because having a critical mass will not negatively affect the accounting-based indicators of firm performance, it is good to strive for a critical mass of female directors in order to for example meet the target quotas and create gender equality.

The outcome of this study was a bit surprising, given that not many prior studies found differences in the relationship between gender diversity and different indicators of firm performance. Several countries set quotas to increase the number of female directors and so did the Dutch government. However, based on the results of this study it should be more firm specific to give firms the space to determine whether they want to take the risk that there market-based firm performance indicators will decline. For example, during the robustness check of the results, this study showed that in the case of firms in the manufacturing industry a negative relationship between gender board diversity and market-based indicators of firm performance have been found as well, however less significant than the initial results. So, results could be different for different types of firms in this study and in further research of this topic it could be interesting to investigate the effect of gender board diversity on firm performance for different industries. Based on this study it is not possible to state that gender board diversity affects firm performance just positively, so to set obligatory quotas more research is necessary. Extended research could be for example industry specific or even firm specific. For firms that focus on the accounting-based indicators of firm performance, it is good to increase the number of female directors. Given the findings that having a critical mass of female on the board positively affects firm performance, it is good to have a minimum ratio of 70/30 at least. In the meanwhile, in line with the resource dependence theory it is not recommended to have a board of members which conducts of more than 70% women, because this will decrease the resources brought in by male directors.

As mentioned it is interesting for further research to determine for specific firms or industries whether increasing the amount of female on board results in better firm performance. Moreover, in this study I did not make a difference between executive and non-executive board directors. For further study it is interesting to determine whether there is difference between having a female in an executive or a non-executive board position. This, because normally executive board members have more influence on the daily operations of a firm. So, a different sample or focus for further study is interesting and with that it is important to consider that this study is limited to Dutch listed firms. Due to cultural differences the results of this study may not be applicable for different regions. Furthermore, all firms are listed on the Euronext, which means that the sample conducts out of mostly large firms. For further research it is good to diverse the sample by letting it consist out of small, medium, and large firms from different countries. Lastly, as explained earlier endogeneity could be a problem when investigating the relationship between gender board diversity and firm performance. This because people and so also female directors choose a firm earlier as employer when the firm performance is better. The estimation method of this study was an OLS regression, which does not take endogeneity into account. To solve this problem, I used a one-year lag of the independent variable during the robustness check of the results. However, for further research on this topic, it is recommended to use for example the 2SLS regression method to control for endogeneity.

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Appendices

Appendix 1: List of firms in this study

Appendix 2: Descriptive statistics including outliers

Appendix 3: Female directors affect firm performance results

Appendix 4: Critical mass results

Appendix 5: Robustness check results

Appendix 1: List of firms in this study

AALBERTS N.V.	INTERTRUST N.V.
ABN AMRO BANK NV	JUST EAT TAKEAWAY.COM N.V.
ACCELL GROUP NV	KARDAN N.V.
ADYEN N.V	KENDRION N.V.
AEGON NV	KONINKLIJKE AHOLD DELHAIZE N.V.
AFC AJAX NV	KONINKLIJKE BAM GROEP NV
AKZO NOBEL NV	KONINKLIJKE BOSKALIS WESTMINSTER NV
ALFEN N.V.	KONINKLIJKE BRILL NV
ALTICE EUROPE N.V.	KONINKLIJKE DSM N.V.
AMG ADVANCED METALLURGICAL GROUP N.V.	KONINKLIJKE KPN NV
AMSTERDAM COMMODITIES N.V.	KONINKLIJKE PHILIPS N.V.
AND INTERNATIONAL PUBLISHERS NV	KONINKLIJKE VOLKERWESSELS N.V.
ARCADIS NV	KONINKLIJKE VOPAK N.V.
ASML HOLDING N.V.	LUCAS BOLS N.V
ASR NEDERLAND NV	N.V. KONINKLIJKE PORCELEYNE FLES
AVANTIUM N.V.	NEDERLANDSCHE APPARATENFABRIEK 'NEDAP' N.V.
BASIC-FIT N.V.	NEWAYS ELECTRONICS INTERNATIONAL NV
BE SEMICONDUCTOR INDUSTRIES NV	NIBC HOLDING NV
BETER BED HOLDING NV	NN GROUP NV
BEVER HOLDING NV	NOVISOURCE N.V.
BRUNEL INTERNATIONAL NV	NSI N.V.
C/TAC NV	OCI N.V
CORBION N.V.	ORANJEWOUD N.V.
CURETIS N.V.	ORDINA NV
DGB GROUP N.V.	PHARMING GROUP NV
DPA GROUP N.V.	POSTNL N.V.
EASE2PAY N.V.	RANDSTAD NV
ENVIPCO HOLDING N.V.	ROODMICROTEC N.V.
ESPERITE N.V.	SBM OFFSHORE N.V.
EUROCOMMERCIAL PROPERTIES N.V.	SIF HOLDING N.V.
FASTNED B.V.	SIGNIFY N.V.
FLOW TRADERS NV	SLIGRO FOOD GROUP N.V.
FORFARMERS N.V.	SNOWWORLD N.V.
FUGRO NV	STERN GROEP NV
GRANDVISION N.V	TIE KINETIX N.V.
HEIJMANS NV	TKH GROUP N.V.
HEINEKEN NV	TOMTOM NV
HOLLAND COLOURS NV	UNILEVER NV
HYDRATEC INDUSTRIES N.V.	VAN LANSCHOT KEMPEN NV
ICT GROUP N.V.	VASTNED RETAIL N.V.
IEX GROUP N.V.	WERELDHAVE NV
IMCD N.V.	WOLTERS KLUWER NV
ING GROEP NV	

Appendix 2: Descriptive statistics including outliers

Variable	N	Mean	St. Dev	Median	Minimum	Maximum
Firm Performance						
ROE	623	0.053	0.481	0.115	-5.319	5.432
ROA	636	0.028	0.115	0.040	-0.815	0.640
ROS	593	0.077	0.224	0.065	-1.231	1.645
TQ	617	0.947	1.106	0.741	0.001	13.962
Gender Diversity						
TWD	639	0.135	0.118	0.143	0	0.5
G_D	639	0.662	0.473	1	0	1
CM_D	639	0.116	0.320	0	0	1
Control variables						
EMP	635	23387	83103	2400	1	709720
BSIZE	639	8.50	3.450	8	1	23
FAGE	639	61.20	62.76	38	0	336
DEBT	586	0.192	0.162	0.151	0	0.88
SALES	615	4,352,168	9,151,174	805,976	12	75,423,950
IND_1	639	0.097	0.296	0	0	1
IND_2	639	0.382	0.486	0	0	1
IND_3	639	0.088	0.283	0	0	1
IND_4	639	0.128	0.335	0	0	1

This table presents the descriptive statistics including the outliers

Appendix 3: Female directors affect firm performance results

Dependent variables: ROS en TQ

	ROS			TQ		
MODEL	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.031	.036	-.018	1.149***	1.435***	1.041***
	(-.655)	(1.000)	(.367)	(5.226)	(8.417)	(4.633)
TWD		.105*	.079		-.375	-.594**
		(1.862)	(1.35)		(-1.442)	(-2.189)
L_EMP	-.009	-.004	-.009	-.037	-.002	-.038
	(-1.329)	(-.634)	(-1.361)	(-1.196)	(-.055)	(-1.222)
DEBT	.104**	.112***	.098**	-1.021***	-.884***	-.983***
	(2.377)	(2.583)	(2.223)	(-5.100)	(-4.465)	(4.908)
L_FAGE	.011	.008	.006	-.175**	-.129*	-.141
	(.746)	(.518)	(.423)	(-2.534)	(-1.823)	(-2.000)
L_BSIZE	.106**		.088*	.480**		.636***
	(2.143)		(1.715)	(2.109)		(2.677)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
ADJ. R^2	.027	.025	.028	.162	.159	.168
F-Statistic	1.902**	1.833**	1.900**	7.498***	7.328***	7.397***
N	593	593	593	617	617	617

Dependent variables: ROS en TQ

	ROS			TQ		
MODEL	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.031	.033	-.037	1.149***	1.438***	1.056***
	(-.655)	(.920)	(-.775)	(5.226)	(8.432)	(4.685)
G_D		.001	-.009		-.064	-.122*
		(.099)	(-.604)		(-.983)	(-1.769)
L_EMP	-.009	-.002	-.009	-.037	-.002	-.035
	(-1.329)	(-.334)	(-1.295)	(-1.196)	(-.054)	(-1.122)
DEBT	.104**	.124***	.107**	-1.021***	-.892***	-.981***
	(2.377)	(2.852)	(2.429)	(-5.100)	(-4.477)	(-4.875)
L_FAGE	.011	.014	.013	-.175**	-.138**	-.150**
	(.746)	(.962)	(.850)	(-2.534)	(-1.962)	(-2.134)
L_BSIZE	.106**		.116**	.480**		.618***
	(2.143)		(2.223)	(2.109)		(2.573)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
ADJ. R^2	.027	.019	.026	.162	.157	.166
F-Statistic	1.902**	1.619*	1.815**	7.498***	7.248***	7.283***
N	593	593	593	617	617	617

Appendix 4: Critical mass results

Dependent variables: ROS en TQ

	ROS			TQ		
MODEL	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.031	.038	-.013	1.149***	1.432***	1.079***
	(-.655)	(1.042)	(-.284)	(5.226)	(8.399)	(4.857)
CM_D		.054***	.049**		-.131	-.175*
		(2.882)	(2.548)		(-1.484)	(-1.955)
L_EMP	-.009	-.003	-.009	-.037	-.006	-.041
	(-1.329)	(-.484)	(-1.240)	(-1.196)	(-.198)	(-1.303)
DEBT	.104**	.121***	.105**	-1.021***	-.919***	-1.028***
	(2.377)	(2.853)	(2.416)	(-5.100)	(-4.696)	(-5.146)
L_FAGE	.011	.009	.006	-.175**	-.139**	-.158**
	(.746)	(.600)	(.435)	(-2.534)	(-2.008)	(-2.277)
L_BSIZE	.106**		.084*	.480**		.571**
	(2.143)		(1.672)	(2.109)		(2.464)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
ADJ. R^2	.027	.033	.037	.162	.159	.167
F-Statistic	1.902**	2.132***	2.175***	7.498***	7.337***	7.330***
N	593	593	593	617	617	617

Appendix 5: Robustness check results

Robustness checks through new proxy for firm size

Dependent variables: ROS en TQ

	ROS			TQ		
MODEL	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.054	-.043	-.040	1.196***	1.356***	1.097***
	-1.098)	(-.933)	(-.808)	(5.292)	(6.398)	(4.754)
TWD		.072	.074		-.384	-.541**
		(1.266)	(1.271)		(-1.452)	(-2.008)
L_SALES	.016*	.014**	.015*	-.053	.018	-.049
	(1.775)	(2.072)	(1.709)	(-1.349)	(.578)	(-1.228)
DEBT	.105**	.098**	.099**	-.987***	-.873***	-.952***
	(2.405)	(2.267)	(2.264)	(-5.029)	(-4.459)	(-4.840)
L_FAGE	.005	.001	.001	-.177***	-.150**	-.148**
	(.359)	(.074)	(.073)	(-2.580)	(2.122)	(-2.110)
L_BSIZE	.006		-.009	.627**		.740***
	(.103)		(-.162)	(2.385)		(2.760)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
ADJ. R^2	.028	.031	.029	.168	.163	.172
F-Statistic	1.951**	2.051***	1.935**	7.743***	7.485***	7.577***
N	593	593	593	617	617	617

Dependent variables: ROA en ROE

	ROA			ROE		
MODEL	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.110***	-.134***	-.099***	-.300***	-.364***	-.286***
	(-3.861)	(-5.005)	.013	(-4.705)	(-6.015)	(-4.358)
G_D		.007	.013		.001	.016
		(.812)	(1.569)		(.073)	(.838)
L_SALES	.036***	.027***	.036***	.091***	.070***	.091***
	(7.282)	(6.790)	(7.182)	(7.946)	(7.638)	(7.870)
DEBT	-.063***	-.075***	-.067***	-.026	-.051	-.032
	(-2.571)	(-3.041)	(-2.714)	(-.466)	(-.915)	(-.565)
L_FAGE	.013	.011	.010	.019	.018	.016
	(1.455)	(1.255)	(1.140)	(.976)	(.941)	(.801)
L_BSIZE	-.084**		-.098***	-.208***		-.224***
	(-2.533)		(-2.868)	(-2.806)		(-2.927)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
ADJ. R^2	.117	.108	.119	.129	.116	.128
F-Statistic	5.502***	5.111***	5.347***	5.898***	5.358***	5.606***
N	636	636	636	623	623	623

Dependent variables: ROS en TQ

	ROS			TQ		
MODEL	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.054	-.057	-.063	1.196***	1.156***	.905***
	(-1.098)	(-1.230)	(-1.255)	(5.292)	(5.422)	(3.916)
G_D		-.011	-.012		-.064	-.112*
		(-.750)	(-.804)		(-.978)	(-1.657)
L_SALES	.016*	.018**	.016**	-.053	.016	-.049
	(1.775)	(2.556)	(1.819)	(-1.349)	(.495)	(-1.247)
DEBT	.105**	.110**	.108**	-.987***	-.879***	-.951***
	(2.405)	(2.548)	(2.478)	(-5.029)	(-4.467)	(-4.817)
L_FAGE	.005	.007	.008	-.177***	-.158**	-.155**
	(.359)	(.499)	(.503)	(-2.580)	(-2.247)	(-2.221)
L_BSIZE	.006		.018	.627**		.743***
	(.103)		(.310)	(2.385)		(2.736)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
ADJ. R^2	.028	.029	.027	.168	.161	.171
F-Statistic	1.951**	1.986**	1.878**	7.743***	7.402***	7.489***
N	593	593	593	617	617	617

Dependent variables: ROA en ROE

	ROA			ROE		
MODEL	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.110***	-.134***	-.104***	-.300***	-.358***	-.285***
	(-3.861)	(-5.033)	(-3.630)	(-4.705)	(-5.954)	(-4.420)
CM_D		.013	.016		.027	.039
		(1.108)	(1.453)		(1.042)	(1.475)
L_SALES	.036***	.028***	.036***	.091***	.069***	.092***
	(7.282)	(7.140)	(7.257)	(7.946)	(7.856)	(7.964)
DEBT	-.063***	-.073***	-.063***	-.026	-.052	-.026
	(-2.571)	(-2.975)	(-2.565)	(-.466)	(-.935)	(-.459)
L_FAGE	.013	.011	.011	.019	.016	.015
	(1.455)	(1.278)	(1.266)	(.976)	(.812)	(.753)
L_BSIZE	-.084**		-.090***	-.208***		-.224***
	(-2.533)		(2.701)	(-2.806)		(-2.994)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
ADJ. R^2	.117	.109	.119	.129	.118	.131
F-Statistic	5.502***	5.150***	5.324***	5.898***	5.432***	5.703***
N	636	636	636	623	623	623

Robustness checks through subsample of manufacturing industry

Dependent variables: ROA and ROE

	ROA			ROE		
MODEL	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.039	-.057*	-.001	-.058	-.075	.018
	(-.891)	(-1.901)	(-.020)	(-.600)	(-1.115)	(.191)
TWD		.196***	.231***		.438***	.498***
		(3.857)	(4.283)		(3.841)	(4.090)
L_EMP	.024***	.023***	.028***	.037***	.038***	.047***
	(4.028)	(4.434)	(4.811)	(2.765)	(3.268)	(3.543)
DEBT	-.112***	-.116***	-.121***	-.125	-.141	-.151*
	(-2.712)	(-2.896)	(-3.030)	(-1.345)	(-1.570)	(-1.670)
L_FAGE	.019	.001	.000	.025	-.013	-.016
	(1.376)	(.099)	(-.011)	(.820)	(-.422)	(-.507)
L_BSIZE	-.016		-.085*	.007		-.142
	(-.361)		(-1.856)	(.066)		(-1.386)
Year	Yes	Yes	Yes	Yes	Yes	Yes
ADJ. R^2	.095	.150	.160	.014	.075	.079
F-Statistic	2.915***	4.240***	4.226***	1.251	2.468***	2.438***
N	243	243	243	241	241	241

Dependent variables: ROS en TQ

	ROS			TQ		
MODEL	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.105*	-.014	-.065	1.145***	1.691***	1.078**
	(-1.792)	(-.359)	(-1.117)	(2.837)	(5.796)	(2.602)
TWD		.264***	.239***		-.003	-.382
		(3.905)	(3.369)		(-.007)	(-736)
L_EMP	.014	.021**	.016*	-.106*	-.059	-.112**
	(1.636)	(3.005)	(1.965)	(-1.926)	(-1.190)	(-2.010)
DEBT	-.020	-.034	-.030	-.677*	-.712*	-.664*
	(-.358)	(-.641)	(-.558)	(-1.750)	(-1.827)	(-1.712)
L_FAGE	.008	-.014	-.012	-.060	-.046	-.028
	(.431)	(-.756)	(-.648)	(-.478)	(-.344)	(-.208)
L_BSIZE	.138**		.074	.796*		.909**
	(.025)		(.236)	(1.937)		(2.070)
Year	Yes	Yes	Yes	Yes	Yes	Yes
ADJ. R^2	.050	.091	.093	.073	.058	.071
F-Statistic	1.926**	2.777***	2.684***	2.443***	2.119**	2.303***
N	230	230	230	241	241	241

Dependent variables: ROA en ROE

	ROA			ROE		
MODEL	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.039	-.053**	.002	-.058	-.066	.021
	(-.891)	(-1.785)	(.039)	(-.600)	(-.989)	(.221)
G_D		.059***	.066***		.127***	.139***
		(4.644)	(4.998)		(4.440)	(4.633)
L_EMP	.024***	.019***	.023***	.037***	.029**	.036***
	(4.028)	(3.566)	(4.018)	(2.765)	(2.453)	(2.775)
DEBT	-.112***	-.124***	-.130***	-.125	-.161*	-.170*
	(-2.712)	(-3.142)	(-3.289)	(-1.345)	(-1.795)	(-1.898)
L_FAGE	.019	.001	.000	.025	-.013	-.014
	(1.376)	(.066)	(.019)	(.820)	(-.418)	(-.453)
L_BSIZE	-.016		-.081*	.007		-.129
	(-.361)		(-1.827)	(.066)		(-1.302)
Year	Yes	Yes	Yes	Yes	Yes	Yes
ADJ. R^2	.095	.173	.182	.014	.094	.097
F-Statistic	2.915***	4.841***	4.780***	1.251	2.878***	2.802***
N	243	243	243	241	241	241

Dependent variables: ROS en TQ

	ROS			TQ		
MODEL	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.105*	-.012	-.071	1.145***	1.685***	1.171***
	(-1.792)	(-.292)	(-1.215)	(2.837)	(5.788)	(2.844)
G_D		.064***	.058***		.108	.043
		(3.795)	(3.325)		(.873)	(.335)
L_EMP	.014	.017**	.012	-.106*	-.068	-.107*
	(1.636)	(2.384)	(1.434)	(-1.926)	(-1.337)	(-1.936)
DEBT	-.020	-.046	-.040	-.677*	-.742*	-.691*
	(-.358)	(-.860)	(-.746)	(-1.750)	(-1.902)	(-1.773)
L_FAGE	.008	-.009	-.008	-.060	-.078	-.072
	(.431)	(-.533)	(-.449)	(-.478)	(-.598)	(-.551)
L_BSIZE	.138**		.086	.796*		.754*
	(.025)		(1.389)	(1.937)		(1.755)
Year	Yes	Yes	Yes	Yes	Yes	Yes
ADJ. R^2	.050	.088	.092	.073	.061	.070
F-Statistic	1.926**	2.705***	2.661***	2.443***	2.185**	2.268
N	230	230	230	241	241	241

Dependent variables: ROA en ROE

	ROA			ROE		
MODEL	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.039	-.048	-.019	-.058	-.049	-.014
	(-.891)	(-1.538)	(-.427)	(-.600)	(-.710)	(-.140)
CM_D		.021	.027		.055	.061
		(1.289)	(1.510)		(1.490)	(1.562)
L_EMP	.024***	.023***	.026***	.037***	.038***	.041***
	(4.028)	(4.344)	(4.241)	(2.765)	(3.149)	(3.007)
DEBT	-.112***	-.105**	-.106**	-.125	-.110	-.111
	(-2.712)	(-2.544)	(-2.555)	(-1.345)	(-1.185)	(-1.189)
L_FAGE	.019	.013	.013	.025	.012	.011
	(1.376)	(.937)	(.897)	(.820)	(.368)	(.345)
L_BSIZE	-.016		-.041	.007		-.051
	(-.361)		(-.865)	(.066)		(-.483)
Year	Yes	Yes	Yes	Yes	Yes	Yes
ADJ. R^2	.095	.101	.100	.014	.023	.020
F-Statistic	2.915***	3.053***	2.885***	1.251	1.434	1.344
N	243	243	243	241	241	241

Dependent variables: ROS en TQ

	ROS			TQ		
MODEL	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.105*	-.006	-.095	1.145***	1.673***	.989**
	(-1.792)	(-.158)	(-1.566)	(2.837)	(5.754)	(2.149)
CM_D		.027	.012		-.191	-.335**
		(1.235)	(.540)		(-1.245)	(-2.071)
L_EMP	.014	.024***	.015*	-.106*	-.060	-.126**
	(1.636)	(3.216)	(1.699)	(-1.926)	(-1.211)	(-2.268)
DEBT	-.020	-.019	-.017	-.677*	-.767*	-.760**
	(-.358)	(-.337)	(-.302)	(-1.750)	(-1.964)	(-1.970)
L_FAGE	.008	.002	.005	-.060	.000	.016
	(.431)	(.092)	(.260)	(-.478)	(.001)	(.126)
L_BSIZE	.138**		.126**	.796*		1.11**
	(.025)		(1.957)	(1.937)		(2.551)
Year	Yes	Yes	Yes	Yes	Yes	Yes
ADJ. R^2	.050	.034	.047	.073	.064	.087
F-Statistic	1.926**	1.626*	1.803**	2.443***	2.253***	2.608***
N	230	230	230	241	241	241

Robustness check using one-year lagged independent variable

Dependent variables: ROS en TQ

	ROS			TQ		
MODEL	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.026	.030	-.004	1.529***	1.697***	1.384***
	(-.336)	(.417)	(-.052)	(4.584)	(5.470)	(4.073)
TWD(t-1)		.108*	.091		-.382	-.564**
		(1.871)	(1.527)		(-1.459)	(-2.061)
L_EMP	-.007	-.003	-.007	-.041	-.009	-.041
	(-.920)	(-.501)	(-.976)	(-1.259)	(-.326)	(-1.276)
DEBT	.118**	.120***	.110**	-1.064***	-.938***	-1.024***
	(2.567)	(2.648)	(2.385)	(-5.161)	(-4.610)	(-4.962)
L_FAGE	.013	.009	.008	-.158**	-.115	-.126*
	(.874)	(.577)	(.514)	(-2.216)	(-1.588)	(-1.730)
L_BSIZE	.081		.061	.393*		.544**
	(1.559)		(1.126)	(1.678)		(2.222)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
ADJ. R^2	.024	.026	.027	.162	.160	.167
F-Statistic	1.737**	1.803**	1.775**	6.682***	6.812***	6.759***
N	506	506	506	517	517	517