Board gender diversity and the effect on ESG ratings

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Abstract

The growing attention for non-financial reporting introduces many laws and guidelines to increase non-financial performance and reporting. Previous researched topics in this area are ESG ratings and gender diversity in corporate board of directors. Governments around the world try to improve the gender diversity of corporate boards and previous literature finds positive connections between gender diverse boards and non-financial performances. On the other hand, ESG ratings are measuring these non-financial performances. The non-financial performance measurements are also becoming more regulated in the upcoming years. This paper tries to connect these topics, by analyzing the effect of gender diverse boards on the ESG performance of Dutch companies. The results show that increasing the amount of (underrepresented) females in the board of directors, which increases gender diversity of a board, leads to an increase in all three pillars of the ESG score of a firm.

Keywords: ESG score, environment, social, governance, board gender diversity

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1. Introduction

Research on gender equality is a wide topic with many prior literatures which analyze effects of including, or excluding, different genders. In the labor market, this topic also gets a lot of attention. Reasons for the interest in this topic are pay gaps, which might be based on gender differences, and the distribution of men and women in the workspace. Data from The World Bank Group (2023) shows that the percentage of females working with an advanced, basic or intermediate education background is lower than that of their male counterparts. This lower percentage of female participation is also visible in the board of directors of large firms worldwide. Adams and Ferreira (2009) showed that women only held 14.8% of fortune 500 board seats. In Europe, at the time, only 8.0% of the directors was female and there used to be firms without any female directors (Laffarga, de Fuentes, & Reguera-Alvarado, 2015). The percentage of female directors in Europe has grown in the past years to 30.6% in 2021 (Kerneïs, 2022)

To adress these differences in board (in)equality, many researches came with reasons why a more diverse board would be beneficial. Part of the findings of this prior literature is focussed on financial effects of firms. The findings have contradicting results. Erhardt, Werbel and Shrader (2003), Post and Byron (2015), Laffarga et al., (2015), and Gordini & Rancati (2016) all found positive effects between board diversity of a firm and its financial performances. On the other hand, Adams and Ferreira (2009), Mínguez-Vera and Martin (2011), and Darmadi (2011) all disagree with these findings and conclude no or negative relations between board diversity and financial performances.

Another part of previous literature shows non-financial benefits of more diverse boards. General research about gender diversity show that females care more (Queller, 1997) and behave more ethical (Mason & Mudrack, 1996) than males. Sánchez-Teba et al., (2021) translate this to the board workspace by finding that female directors are valuable through their empathic capabilities and their group interest. They also find that women have more risk-aversion and are more open to innovation.
Other research find that gender diverse boards also have improved supervision on activities of a firm and boards are better monitored (Erhardt et al., 2003 and Adams & Ferreira, 2009). These findings relate to work of Cumming, Leung and Rui (2015), who find a negative correlation between gender diversity and the frequency of fraud of a company. These findings are also in line with Bernardi and Threadgill (2010), who conclude that gender diversity improve corporate social responsibility of a company and diverse boards tend to care more about society.
Lastly, prior research also finds positive relations between gender diverse boards and the environment. Al-shaer and Zaman (2016) find that gender diverse boards have qualitative higher sustainability reports. Adding to these findings, Li, Zhao and Chen (2016) show an increase in a firms' enviromantal policy if boards are more gender diverse.

So the above findings on gender diverse boards are more pronounced for non-financial activities. These non-financial activities are becoming increasingly important for both firms themselves and their stakeholders. In 2022, the European Parliament voted in favor for the adoption of a new Corporate Sustainability Reporting Directive (CSRD). This new directive is the successor of the current Non-Financial Reporting Directive (NFRD) and aims to make European businesses more accountable for the public through mandatory reporting standards on their environmental and societal activities. The CSRD should help in achieving the European climate goals, reduce greenwashing, strengthen the European social market economy, and become the basis of a universal framework for sustainability reporting (Yakimova, 2022; European Parliament, 2022).

One of the adoptions in the new directive, is a framework to disclose Environment, Social and Governance (ESG) related risks (European Parliament, 2022). ESG reporting is considered as one of the biggest developments in recent years and is widely integrated in the decision-making process of directors, shareholders, and other stakeholders (Christensen, Serafeim, & Sickochi, 2022). Several rating agencies rate companies on their ESG performances and the US Securities and Exchange Commission (SEC) is already increasingly regulating ESG disclosures. For example, the SEC charged Goldman Sachs Asset Management on the 22nd of November last year, because Goldman Sachs failed to follow their policies related to ESG investments (SEC, 2022).

Besides being more regulated, ESG reporting is shown to affect firm value as well. As mentioned above, ESG related information affects the decision making process of different stakholders. Serafeim and Yoon (2022) find that both ESG ratings and ESG related news is positively related to stockprise increases of a given firm, which shows that investors use ESG information in their decision to value a company. Fatemi, Glaum and Kaiser (2018) add to this literature, as they find that disclosing ESG information affects investor decisions. Positive ESG disclosure tend to strenghten firm value, while negative ESG disclosure weakenss a decrease in firm value.

One of the countries in the EU which will get regulated on ESG reporting, by the new CRSD, is the Netherlands. Besides these new regulations, the Dutch government itself accepted a law to equal the male-female distribution in the top of the businesslife (Rijksoverheid, 2021). This law is active since the beginning of 2022 and with this “ingrowht quota”, as it is called, the Dutch government tries to wider the pool of (manegerial) talent and aims to capture the previous mentioned benefits of gender diverse boards (SER, 2019).

Combining the positive effects of gender diverse boards on non-financial reporting and the raising importance of non-financial reporting, this paper aims to find out if these positive effects are indeed visible in the ESG rating of Dutchs companies. The above mentioned benefits of gender diverse boards, seem related to the pillars of ESG. Increased enviromental policies relate to the Environment pillar[1], improved social responsibility link to the Social pillar[2] and the diversity itself and behavior of a board is attatched to the Governance pillar[3]. These three relations lead to the following research question of this paper:

[1] Based on the definition of MSCI (2020) and Thomson Reuters (2017)
[2] Based on the definition of MSCI (2020) and Thomson Reuters (2017)
[3] Based on the definition of MSCI (2020) and Thomson Reuters (2017)

"How does board gender diversity affect a firm's ESG performance in the Netherlands"

This research question contributes to prior research on the literature of board diversity. By adding information of the effecs of board gender diversity on the ESG performance of a company, the literature about non-financial effects of gender diversity in boards will be broadened. The use of the Dutch market also benefits previous literature as, by the best knowledge of the author, this market is not commonly used before in this area. Mostly the US or countries with already existing genderquota's were used and got most attention in previous literature. See for example the work of Laffarga et al., (2015) and Mínguez-Vera and Martin (2011) in Spain or Leszczynska (2018) in Norway.

The results of this paper can be used by different stakeholders. First, companies themselves can use the results in the appointment of board members. When a company scores bad on ESG rating, it might consider a different composition of its board of directors. The results might also be used to change governance code of a firm, related to gender diversity. Second, regulators could use the results to determine if regulation on gender or genderquota's in boards are needed. With increasing the mandated ESG reporting, it might be helpful to set rules in board compositions that benefit behavior towards ESG reporting. Lastly, investors and other public, with special interest in ESG, could use the results from this paper in their investment decision of other decisions related to a specific firm. An investor with interest in ESG quality can use the results of this paper to look at the effect of gender diversity on ESG performance. Investors then can set a certain amount of gender diversity as a benchmark and use it as a factor in deciding whether or not to invest in a firm with certain board gender diversity levels.

The paper is structured as follows. First, data selection and summary statistics are presented to form a view of the used dataset. This section is followed by the methodology of this paper, where the OLS regegression for the research is explained. Next, the results are presented per ESG pillar. The results start with the regressions for the environmental pillar, followed by the social and governance pillars. To end the result section, the total ESG score and the robustness checks are presented. The conclusion gives a short summary of the results and a discussion for further research.

2. Theoretical background

This chapter explains the theoretical background of gender diversity and ESG. First, the literature on gender diversity will be summarized. Second, there will be a concise explanation on what ESG is, what the components are and how these are measured. After the theory is explained, hypothesis will be created to answer the research question.

2.1 Gender diversity in the Netherlands

Gender diversity studies are not a new concept. The first studies date back to the end of last century (e.g., Siciliano (1996) and Elgart (1983)). At the time, most studies found that women were underrepresented in boards. In 1980, only 2.8 percent of director positions of Fortune 500 firms were covered by females, and it was forecasted that it would take nearly 200 years to get an equal representation (Elgart, 1983). This percentage has grown over the years. Kerneïs (2022) show that, in the European Union, this percentage was 30.6% for the largest publicly listed companies in 2021.

One way to improve this percentage, is through (mandatory) genderquota's. The European Comission (2012) is trying to improve gender diversity through directives about gender quota's since 2012. Their proposal gave the member states an option to choose their own measurments to achieve the goals stated in the directive. The main goal is to eventually get 40% of the underrepresented gender in the board of directors as non-executive director. In 2021, 16 out of 27 member states had some kind of gender measure (Kerneïs 2022). The share of womans in countries with mandatory gender quota's was on average of 35%. Countries with soft measures score just less than the EU average, with around 29%. This percentage is still nearly double the amount of the countries without any action taken on gender diversity. These countries only have an average female director share of 17%.

The Netherlands is one of the countries which use actions to equal the gender diversity ratio of boards. The population in the Netherlands has an equal gender distribution, where for every 99 males, there are 100 females (CBS, 2022). With an average female representation in boards of 27,7% in 2022, Dutch companies are 25th in the EU (CBS, 2023). Between 2013 and 2020, the Netherlands had a system of "comply or explain". Through this approach, companies got to choose if they would balance the gender distribution in their boards or not. The rule was that the board of directors[4] (in Dutch RvB) and the supervisory board[5] (in dutch RvC) must consist of at least 30 percent male and 30 percent female. The other 40 percent is free for both gender, as long as the target of 30 percent per gender holds. If a firm balanced their gender distribution, it would comply with the regulation method of the Dutch Social Economic Counsil (later called 'SER'). When a firm choose to not balance their gender distribution, it had to explain why they choose not to do so and report this to the SER (2019).

[4] In a one tier board: Executive directors.
[5] In a one tier board: non-executive directors.

This approach did not lead to the desired effect. Only 16 out of 89 listed companies complied with this approach (Lückerath-Rovers M., 2021). In combination with the facts that nearly 53% of students is female and over 68% of females participate in the labourmarket, as of 2022 (CBS, 2023), the Dutch government changed their approach. This led to a new legislative propasal, which was accepted and became active per first of januari 2022, named "evenwichtiger verhouding vrouwen en mannen in het bestuur en raad van comissarissen". This so called gender diversity law becomes mandatory and states that at least one third of the non-executive directors must be male and at least one third must be female for listed Dutch companies. These companies cannot attract an non-executive director of a gender if the opposite gender does not comply with the new law. For executive directors of these listed companies and both types of directors of the 5000 non-listed big Dutch companies, applies the same distribution in the form of a targetnumber. This targetnumber must be substantiated through an action plan. (Dutch Government, 2021; SER, 2019).

2.2 The rise of ESG

Another item for companies that is becoming more regulated, is sustainability reporting. In 2014, the EU adopted the NFRD to require larger companies to disclose non-financial information which is relevant for investors and other stakeholders (European Comission, 2014). This information consists of environmental matters, social and employee aspects, human rights, diversity in boards and anti-corruption reporting. Firms in the EU had to report on their non-financial policies and their non-financial results. The guidelines for disclosing this information were non-binding. Companies have no framework on how to report this information and could even choose to not report at all. This also means there is no universal definition of ESG performance. Rating companies, such as MSCI, Asset4 or Sustainalytics, try to capture ESG performance based on provided sustainability related information in companies' (financial) statements. Based on their own frameworks, these rating agencies give firms a score for their ESG performance (Christensen et al., 2022)

After the damage of Covid-19, the aim to become a resource efficient union, and to protect the health and well-being of EU citizens, the European Parliament (2022) came with the new CSRD to improve the sustainability reporting requirements of the NFRD. This new directive covers all relevant ESG elements and will be active for big companies at the beginning of 2024. The ESG elements are covered under the European Sustainability Reporting Standards (ESRS), which are provided by the European Financial Reporting Advisory Group or EFRAG. The ESG pillars will be classified in E, S and G. At the time of writing, EFRAG (2022) provide the following definitions in their first draft.

The E pillar stands for environment and consist of ESRS E1-E5. It will cover pollution, climate change, biodiversity and ecosystems, water and marine resources, and resource use and circular economy. Next, the S pillar stands for social and is made up from ESRS S1-S4. Own workforce, workers in the value chain, affected communities, and consumers and end users are all included in this pillar. The last pillar is G and aims to describe the governance. ESRS G1 refers to this pillar and includes governance, risk management, internal control, and business conduct.

Besides the non-financial effects associated with ESG scores, there is also research on the financial effects of ESG scores. Approximately 90% of studies find a non-negative effect and more than half conclude a positive relation between ESG rating and financial performance (Friede, Busch, & Bassen, 2015). Shanaev and Ghimire (2022), Kang and Jung (2020), and Berg, Heeb and Kölbel (2023) all measure the effect of ESG on firm value. They find that an upgrade in ESG rating leads to a smal (in)significant increase in abnormal returns, while a decrease in ESG rating causes a relatively bigger decrease in stock value. Serafeim and Yoon (2022) add to these findings that disagreements among raters, due to the missing framework at the time, reduce the above mentiond effects. The positive relation between ESG rating and a firm's (corporate) financial performance, is seen as a mediating effect of the positive relation between ESG and firm value (Zhou, Liu, & Luo, 2022).

2.3 Connection between gender diversity and ESG

So far, the growing emphasis of gender diversity in boards and the benefits of ESG ratings are explained. As mentioned in the introduction, prior literature on gender diversity shows positive relations for non-financial effects and contradictory results for financial effects. Gender diverse boards tend to have higher quality sustainability reports, which include social and environmental information about a company (Al-shaer & Zaman, 2016). The positive relations of non-financial reporting, like the increased sustainability reporting quality, could be connected to the ESG rating according to definitions of EFRAG (2022) and raters such as MSCI (2020) and Thomson Reuters (2017).

Liao, Luo and Tang (2015) find in their report that the gender diversity in boards has a positive relation with the amount of greenhouse gas disclosure. These boards have a higher change to voluntary disclose greenhouse gas information and provide significant more information. As seen before, greenhouse gas can be placed in the environmental pillar of ESG. MSCI (2020) has greenhouse gas defined in their emission, same as Thomson Reuters (2017), and carbon intensity parts of the environment pillar. Greenhouse gas is also included by the EFRAG (2022), which made ESRS for climate change[6] and pollution[7].
Another ESRS for the environmental pillar is water and marine resources [8]. This relates to recent research of Peng, Lan, Li and Fan (2023), who find a positive relation between gender diversity and water disclosure of a company. Both researches mention that these positive relations are caused by the moral characteristics of female board members. Thomson Reuters (2017) also mention the importance of resource use in their environment pillar.
Lastly, Li et al., (2016) add to the above findings by concluding that a firm's environmental policy is positively affected by a more gender diverse board. All these previous findings lead to the first hypothesis of this paper:

> *H1: There is a positive relation between gender diversity in boards and environment performance of a firm.*

[6] ESRS E1 (EFRAG, 2022)
[7] ESRS E2 (EFRAG, 2022)
[8] ESRS E3 (EFRAG, 2022)

This paper expects a positive relation between diversity and the E pillar score of a firm, because the previous literature concludes several positive effects on environmental related cases. The E pillar score represents the environmental performance of a firm.

Another part of previous research on gender diversity relates to the social pillar of ESG. Female directors are more likely to care about the community rather than individuals (Queller, 1997). This is also shown by Sánchez-Teba et al., (2021) who analyzed that an increase in females in an male dominated board lead to more attention for group interest. This community interest consist of nearly a quarter of the weight in the social pillar and 8% of the total ESG score measured by Thomson Reuters (2017). The only measurment with a bigger weight in the social pillar is workforce, which is twice as big. Workforce and community are also mentioned by the EFRAG (2022), divided in own workforce[9], workers in the value chain[10] and affected community[11].
Bernardi and Threadgill (2010) and Lin, Liu, Huang and Chen (2018) analyse the effect of gender diverse board on community and workforce. For the community benefits, the paper finds that a gender diverse board is more likely to sponsor or create organizations that benefits surrouding communities, such as employee volunteer programs and increased charitable donations. They also find that (female) employees get more benefits and suitable policies if boards are more gender diverse. Ranta and Ylinen (2023) add to this by concluding that a gender diverse board improve overall gender equality and inclusiveness among employees. They also mention that not all kind of diversities have a significant positive relation with gender diverse boards, such as age diversity. The overall conclusion of the papers is that the social involvement increases when females are added to a board. Based on these findings, the second hypothesis will be as follows:

> *H2: There is a positive relation between gender diversity in boards and social performance of a firm.*

Going further on the previous literature, the expecations of this paper are an increase in S pillar score, which represents the social performance, when gender in boards is more equal. It is important to mention that gender diversity of a board itself is also included in some definitions as a measurment of the social pillar. Therefore, if gender diversity increases, the social pillar score would automatically rise along. Both MSCI (2020) and ESRS S1 mention that they include a gender diversity ratio in their measurment. To measue the second hypothesis in this paper, the analysis that will be conducted shall be done both with and without this measurment to reduce causality in the results. This measurment is later defined as the 'Workforce score'.

[9] ESRS S1
[10] ESRS S2
[11] ESRS S3

The last pillar of ESG is the governance pillar. The governance pillar includes the corporate culture of management (Thomson Reuters, 2017; EFRAG, 2022). This is defined by the monitoring of management and the amount of corruption and bribery of the board. Also corporate social responsibility (CSR) strategy itself is included in the G pillar (EFRAG, 2022; Thomson Reuters, 2017).
Prior literature on gender diversity assumes a positive effect with corporate culture in boards. Bernardi and Threadgill (2010), and Gupta, Lam, Sami and Zhou (2015) confirm this by pointing out that gender diverse boards have a positive effect on CSR strategy. This is also the case for monitoring of the board. Adams and Ferreira (2009) mention that females improve monitoring of the board, as they are more likely to attend meetings and join monitoring committees. Another reasearch related to corporate culture, is from Cumming et al. (2015). Due to the increased risk aversion of females, they find a negative relation between gender diversity and frequency of fraud in a company. This negative relation is more pronounced if females join a board in a male dominated industry. The same results hold for the severity of fraud. Also the amount of restatements decreases when at least one female is on the board (Abbott, Parker, & Presley, 2012) These relations lead to the third hypothesis of this paper:

> *H3: There is a positive relation between gender diversity in boards and governance performance of a firm.*

As previous literatue on monitoring and fraud show positive effects of gender diversity, this paper expects to see a positive relation between board gender diversity and the governance score.

Lastly, a fourth hypothesis will be constructed for the total ESG score. This hypothesis will become important when at least one previous hypothesis is rejected. As this paper expects a positive relation for all three pillars of ESG, the last hypothesis will be:

> *H4: There is a positive relation between gender diversity in boards and overall ESG score of a firm.*

3. Data and Methodology

This chapter gives information about where the used data came from, and which methodology is used to measure the results. First, the source and process of the data selection is explained. After this, the formula to answer the hypothesis is explained in the methodology section.

3.1 Sample Selection

Data on board characteristics is obtained from BoardEx through Wharton Research Data Services (WRDS). First, BoardEx database of Europe is chosen, and the 'organizational summary' data is selected to create a dataset. This dataset is filtered to board related information of companies in the Netherlands. This led to a dataset of 1,108 board-year observations of Dutch firms.

Next, data on ESG ratings is collected from Asset4, which is owned by Thomson Reuters. This rater is commonly used in prior ESG research[12] and is also, at the time of drafting this research, the only rater with recent data available for the researcher. The Asset4 data is retrieved from the Erasmus Data Service Center (EDSC). The whole Asset4 dataset is filtered based on the Dutch companies included in the first dataset. Then, the dataset is used to calculate average E, S and G scores. After removing missing values, the ESG dataset includes 495 firm-year observations. Lastly, financial data is collected form the Amadeus database of Bureau van Dijk. Here, the ROA, Leverage and Size of the companies are collected.

After collecting all three datasets, the data is merged into the final dataset and observations with missing values are filtered out. Based on ISIN[13] number and year, the final dataset consists of 224 board-year observations which include both the board characteristics and ESG data of 44 Dutch firms. This sample size is relatively small compared to other literature such as the studies Harjoto et al. (2015), Christensen et al. (2022) and Serafeim and Yoon (2022), which have respectively around 10,000, 30,000 and 30,000 firm-year observations. The small sample of 224 board-years could limit the ability to generalize the results of this paper on the real world. By limiting to Dutch companies, our results may not hold for countries with a different culture. Additionally, results can be affected more by outliers and become less precise.

This paper uses prior literature with smaller sample sizes than mentioned above, to contextualize the sample size. Velte (2016), which has around 1,000 firm-year observations of German and Austrian firms, comes closer to the sample size of this paper. This study mentions that the small sample size reduces the significance of their results and comment this as an improvement point for further research. Another paper with a comparable sample size, is Alazzani, Hassanein and Aljanadi (2017). This paper analyses the effect of female directors on social and environemnt perfromance of Malaysian firms during 2009 and had 133 observations. They show that their results show useful insights despite the small smaple size. A limitation mentioned in this paper is the fact that not all countries have the same culture as Malaysia and therefore results might nog hold for other countries. Lastly, a study from Marinova, Platenga and Remery (2016) also made conclusions about the effect of gender diverse boards, based on similar observations. The paper used the Amadeus database of Bureau van Dijk for both Dutch and Danish companies. Here, a total of 186 observations were

[12] E.g., Velte (2016), Serafeim and Yoon (2022), and Berg et al. (2022)

[13] International Securities Identification Number

used to analyze the effect of female board members on financial results in 2007. The measurment for board gender diversity also consist of the percentage of females in boards.

Although these limitations also hold for this paper, efforts are made to validate the results. To mitigate the effects of outliers, nontabulated robustness checks are performed with standardized values of the variables. The precision of the results is also strengthened with the use of regressions with different sets of variables from the dataset. These additions, in combination with the use of previous literature which use comparable sample sizes, affirms the feasibility of meaningful outcomes of this research, even within the constrained data context. Table 3.1 shows the descriptive statistics of the final dataset.

The period of the data is form 2010 until 2022. The starting year is based on data availability at the time of writing this paper. Data of Asset4 is available, for this research, since 2010. This is used as reason to use 2010 as starting point for the dataset. The endings year is based on the most recent available data for the researcher. This consist of data of Dutch companies through Bureau van Dijk, Asset4 and BoardEx. This period also includes a period before and after the introduction of the NFRD, which focused on voluntary non-financial reporting. The NFRD became law in EU countries by the end of 2016 (European Comission, 2014). This paper will account for this event through year fixed effects.

Table 3.1 shows the ESG related measurements used for the Asset4 dataset. First, the environment pillar consists of the resource use score, emission score and environmental innovation score. Second, the social pillar includes workforce, human rights, community, and product responsibility scores. Workforce will be excluded in a second analysis for the social pillar. Next the governance pillar includes CSR strategy score, shareholder score and management score. Table 3.2 shows an overview of the used measurements and provides definitions for the used abbreviations for the measurement variables. Table 3.3 shows a list of the 44 Dutch companies which are included in this paper including their ISIN number and SIC code.

Table 3.1 also shows statistics of company's board characteristics. FemaleFrequency is the number of females divided by the total amount of board members. Here, the average female frequency is 21% of the total board and this frequency ranges from 0 till 50%. This shows female board members are underrepresented compared to male board members, which are represented between 50% and 100% of board members and on average 79% represented, at the time of writing this paper. Prinses Laurentien of the SER (2019) mentions that real equality between male and female, should result in a 'fifty-fifty' distribution of power. Thus, an increase in female directors from 21% to 50% will lead to a more equal distribution of power in the board of directors according to the Ser (2019). This variable is therefore used as the main independent variable in the OLS regression. When the frequency of females increases, gender diversity becomes more present. Further variables are NationalityMix, which shows the proportion of member from a different country, and NoDirectors, which display the number of directors on a board.
Individual characteristics are taken to an average per board. TimeRetirement, for example, shows how many years a director has till retirement. This is the average of all members in the board. TimeRole, TimeBrd, TimeinCo show the years a director is in a role, board, or company and AvgTimeOthCo shows the average time of a director in other companies. Next, the

number of qualifications and network size of directors are displayed. Data on age, total previous board sat on and total current boards sitting on is left out of the final data, because there were too many missing values. Table 3.1 ends with financial data of the Dutch companies. ROA is defined as profit divided by total assets; Leverage is defined as debt divided by total assets and Size is equal to the natural logarithm of the total assets. This last value is transformed, because the total asset had a different measurement unit and bigger size than the rest of the variables.

Table 3.1 Descriptive Statistics

	n	Mean	Sd	Min	Max	Range
ESG_Score	224	58.78	17.34	7.46	92.1	84.7
esgru_s	224	63.05	28.24	0.00	99.7	99.7
esge_s	224	58.23	27.40	0.00	99.0	99.0
esgi_s	224	41.71	30.97	0.00	99.7	99.7
esgm_s	224	49.99	26.61	0.67	98.9	98.2
esgs_s	224	55.34	27.22	0.67	99.5	98.8
esgcsrs_s	224	48.21	30.38	0.00	98.1	98.1
esgw_s	224	71.31	18.29	21.28	99.2	78.0
esghr_s	224	56.69	34.81	0.00	98.4	98.4
esgcom_s	224	73.04	24.63	0.95	99.7	98.8
esgpr_s	224	54.93	27.82	0.00	98.2	98.2
E_Score	224	54.33	23.59	0.00	98.8	98.8
S_Score	224	63.99	19.66	8.31	96.8	88.5
G_Score	224	51.18	18.59	5.50	92.5	87.0
FemaleFreq	224	0.21	0.12	0.00	0.5	0.5
NatMix	224	0.49	0.28	0.00	0.8	0.8
NoDirector	224	9.30	2.72	4.00	19.6	15.6
TimeRetirement	224	9.43	3.01	0.68	22.6	22.0
TimeRole	224	4.45	1.97	0.00	10.0	10.0
TimeBrd	224	5.82	2.58	0.00	13.3	13.3
TimeInCo	224	7.04	3.13	0.00	15.5	15.5
AvgTimeOthCo	224	3.25	1.66	0.00	8.6	8.6
NoQuals	224	1.98	0.47	0.83	3.4	2.6
NetworkSize	224	1228.77	716.08	106.20	3214.8	3108.6
ROA	224	4.50	10.17	-84.07	45.2	129.2
Leverage	224	0.57	0.21	0.061	1.3	1.2
Size	224	22.40	1.67	14.012	25.5	11.5

Note: All variables are on original scale except for Size, which represents the natural logarithm of total asset value of Dutch firms.

Table 3.2 ESG measurement definitions

Score Type	Abbreviation
ESG Score	esg_s
Resource Use Score	esgru_s
Emissions Score	esge_s
Environmental Innovation Score	esgi_s
Management Score	esgm_s
Shareholders Score	esgs_s
CSR Strategy Score	esgcsrs_s
Workforce Score	esgw_s
Human Rights Score	esghr_s
Community Score	esgcom_s
Product Responsibility Score	esgpr_s

Table 3.3 Names of companies in dataset

ISIN	Name	Firm-years	SIC
NL0000008977	HEINEKEN HOLDING N.V.	10	2082
NL0000009082	KONINKLIJKE KPN N.V.	7	4813
NL0000009165	HEINEKEN N.V.	10	2082
NL0000009538	KONINKLIJKE PHILIPS N.V.	6	3845
NL0000235190	AIRBUS SE	10	3721
NL0000288918	VASTNED RETAIL N.V.	3	6798
NL0000289213	WERELDHAVE N.V.	9	6798
NL0000334118	ASM INTERNATIONAL N.V.	8	3559
NL0000337319	KONINKLIJKE BAM GROEP N.V.	4	1600
NL0000360618	SBM OFFSHORE N.V.	8	1389
NL0000379121	RANDSTAD N.V.	10	7363
NL0000395903	WOLTERS KLUWER N.V.	9	8111
NL0000852523	TKH GROUP N.V.	4	3357
NL0000852531	KENDRION N.V.	3	3714
NL0000852564	AALBERTS N.V.	10	3490
NL0000888691	AMG CRITICAL MATERIALS N.V.	2	3310
NL0006237562	ARCADIS N.V.	3	8711
NL0006294274	EURONEXT N.V.	3	6200
NL0009432491	KONINKLIJKE VOPAK N.V.	10	4220
NL0009739416	POSTNL N.V.	7	4210
NL0009805522	YANDEX N.V.	1	7370
NL0010273215	ASML HOLDING N.V.	7	3559
NL0010558797	OCI N.V.	5	2870
NL0010583399	CORBION N.V.	5	2090
NL0010776944	BRUNEL INTERNATIONAL N.V.	3	7361
NL0010801007	IMCD N.V.	6	5160
NL0010832176	ARGENX SE	3	2836
NL0011660485	SIF HOLDING N.V.	1	3312
NL0011794037	KONINKLIJKE AHOLD DELHAIZE N.V.	6	5411
NL0011832811	FORFARMERS N.V.	3	2040
NL0011872650	BASIC-FIT N.V.	3	7990
NL0012015705	JUST EAT TAKEAWAY.COM N.V.	2	5961
NL0012044747	REDCARE PHARMACY N.V.	1	5912
NL0012169213	QIAGEN N.V.	10	3826
NL0012365084	NSI N.V.	3	6798
NL0012817175	ALFEN N.V.	2	3613
NL0013267909	AKZO NOBEL N.V.	3	2851
NL0013332471	TOMTOM N.V.	9	3812
NL0013654783	PROSUS N.V.	3	5961
NL0014332678	JDE PEET'S N.V.	1	2090
NL00150001Q9	STELLANTIS N.V.	3	3711
NL00150003D3	MELTWATER N.V.	1	8742
NL00150006R6	CTP N.V.	1	6519
NL0015000K93	EUROCOMMERCIAL PROPERTIES N.V.	6	6798

3.2 Methodology

The methodology used in this research will be a linear regression with year fixed effects. This approach is suitable, as the only variable of interest is gender diversity. The approach is like the research of Ahern and Dittmar (2012), who measured the effect of female directors on Tobin's Q, and Velte (2016), who measured the effect of gender diverse boards on ESG performance for German and Austrian companies. A difference-in-difference approach would also be suitable, by comparing ESG scores non-complaint firms before 2022 with compliant firms after 2022. Unfortunately, this is not workable at time of writing this paper due to the small sample size. Based on available data, only one firm could be used for the treatment group.

The dependent variable in this regression is the ESG rating of a company. For every hypothesis, the dependent variable will either be the E, S or G score of the ESG rating. The main independent variable is board gender diversity, expressed as fraction of female board members. The goal of this model is to capture if a more gender equal board influences the ESG rating. The formula used per hypothesis will be as follows:

$$(1)\quad ESG_{ti} = a + b_1 * FemaleFreq_{it} + b_n * Control_{it} + Y_{it} + I_{it} + e_{it}$$

In this formula a defines the constant and ESG_{it} stands for the E/S/G rating for firm 'i' in year 't.' $FemaleFreq_{it-1}$ is the main independent variable and shows the fraction of female directors in the board of directors. A positive relation of this variable with the dependent variable would mean that an increase in female board members increases E/S/G rating. As control variables, $b_n * Control_{it}$ is used to control for the other board characteristics, personal characteristics and firm characteristics. This includes the nationality mix and the number of directors, as well as the averaged individual characteristics. Because the measurement of total assets is different in both size and unit, a log transformation is used to calculate the 'Size' variable. This allows for a clearer interpretation and reduces variance. Next Y_{it} is used for the year fixed effects. These effects are used to capture changes due to macroeconomic events over the year, such as introduction of NFRD or the Covid-19 pandemic. Due to the small number of firms in the dataset, only the first digit of the SIC code is used for industry fixed effects, noted as I_{it}, to control for industry related factors. Lastly, the error term is included with the e_{it}.

4. Results

In this section, the results of the OLS regression will be shown per hypothesis. For each hypothesis will be clear if the expected outcome will hold or if the hypothesis will be rejected. This is based on a null hypothesis which states that there will be no effect of gender diversity on E/S/G rating. To evaluate the significance of all outcomes, the t-statistic can be calculated form the coefficient divided by the standard error, which is in parentheses. An effect of the independent variable on the dependent variable is always expressed by assuming everything else stays constant. As the unit of the main variable ranges from 0 till 1, the effects are explained as a 0.1-unit increase leads to an increase of 0.1 times the coefficient in E/S/G score, rounded to two decimals.
First, the results of the E score will be shown. S and G will follow next. The last results are from the total ESG score. When reading the outcomes, the first column shows the result of the linear regression based on the main independent variable only. The second column includes the control variables. Columns 3 and 4 repeat the steps taken in the first two columns, but with the inclusion of year and industry fixed effects. The inclusion of these fixed effects causes a different value for the coefficient, because fixed effects absorb the average effects of the predictors. The fixed effects control for time specific events, such as the introduction of NFRD or the covid 19 crisis, as well as industry related events such as differences in risk and performance across industries. After the main results, this section will end with robustness checks.

4.1 Environmental score

The first test is whether gender diversity influences the environmental score. The results of the linear regressions are visible in Table 4.1.

In the first column, FemaleFreq has a positive significant coefficient of 70.535 on a 99% significance level and a standard error of 12.282. When the number of females increases with .1, the environment score increases with 7.05 points. The high standard error is due to the small sample size. When adding control variables, the R-squared becomes larger and the coefficient of the main variable stays positive and significant. Another positive significant variable is the size of the company. There is also a variable with a negative effect on environment score. Keeping everything else equal, the environment score drops when a board member with a non-Dutch nationality joins the board. This is without considering fixed effects. After including the year and industry fixed effects, the sign and significance of the main coefficient stays the same. An increase in the female frequency with 0.1 leads to an increase in environment score of 8.71 in the single linear regression and 4.20 in the linear regression with multiple variables. The effects for nationality mix becomes insignificant and both time in board and time in company coefficients become significant on 95% level. This shows that the longer a board member is active in the company the lower the environment score is, but the longer the member is in the board itself, the environment score rises. The firm specific variables are all positive related to the environment score and only Size is significant. This indicates that larger firms tend to care more about the environment and have a higher score for this pillar.

Based on the findings in Table 4.1, the null hypothesis can be rejected. An increase in the frequency of female directors does lead to a better environment score. Therefore, the prediction in this paper, a positive relation between gender diverse boards and environmental score, holds.

Table 4.1 Linear regression results for the relation between the frequency of females and the environmental score

Variable	(1)	(2)	(3)	(4)
FemaleFreq	70.535***	35.905***	87.076***	41.988***
	(12.282)	(11.211)	(21.214)	(15.300)
NatMix		-24.621***		-10.330
		(6.034)		(11.176)
NoDirector		0.789		0.909
		(0.596)		(0.958)
TimeRetirement		0.254		0.285
		(0.463)		(0.710)
TimeRole		0.087		0.283
		(1.140)		(1.329)
TimeBrd		1.339		3.606**
		(1.483)		(1.483)
TimeInCo		-1.041		-3.367**
		(0.963)		(1.335)
AvgTimeOthCo		1.249		1.881
		(1.050)		(1.825)
NoQuals		4.377		0.891
		(2.949)		(5.670)
NetworkSize		0.010***		0.006
		(0.002)		(0.004)
ROA		0.187		0.149
		(0.119)		(0.097)
Leverage		8.876		11.504
		(6.701)		(10.487)
Size		5.821***		6.428**
		(1.254)		(2.736)
Constant	39.616***	-113.009***		
	(2.956)	(23.951)		
Observations	224	224	224	224
R2	0.129	0.506	0.289	0.646
Adjusted R2	0.125	0.476	0.219	0.586
Residual Std. Error	22.063 (df = 222)	17.081 (df = 210)	20.843 (df = 203)	15.175 (df = 191)
F Statistic	32.979*** (df = 1; 222)	16.568*** (df = 13; 210)		

Note: Standard errors are in parentheses. Column (1) and (2) represent respectively one and multiple variables in the regression. Column (3) and (4) also represent respectively one and multiple variables and include both year and 1 digit SIC code industry fixed effects. All standard errors are clustered at firm level. *p<0.1; **p<0.05; ***p<0.01

4.2 Social Score

In the second hypothesis, the social pillar will be evaluated. For this pillar, two tests will be performed. One including the workforce measurement and one without this measurement. The results are visible in Table 4.2 and Table 4.3.

Table 4.2 Linear regression results for the relation between the frequency of females and the social score

Variable	(1)	(2)	(3)	(4)
FemaleFreq	51.485***	31.115***	65.793***	39.781**
	(10.411)	(9.540)	(23.699)	(15.524)
NatMix		-11.110**		-5.858
		(5.135)		(7.696)
NoDirector		1.857***		0.781
		(0.507)		(0.635)
TimeRetirement		-0.665*		-0.078
		(0.394)		(0.424)
TimeRole		1.071		1.774
		(0.970)		(1.083)
TimeBrd		2.202*		1.960
		(1.262)		(1.388)
TimeInCo		-0.963		-1.508
		(0.820)		(0.981)
AvgTimeOthCo		-1.132		-1.391
		(0.894)		(1.387)
NoQuals		1.633		0.828
		(2.510)		(3.916)
NetworkSize		0.006***		0.008**
		(0.002)		(0.003)
ROA		0.052		0.130
		(0.101)		(0.120)
Leverage		-4.872		-20.229***
		(5.702)		(7.146)
Size		4.243***		4.913**
		(1.067)		(1.958)
Constant	53.252***	-58.678***		
	(2.506)	(20.381)		
Observations	224	224	224	224
R2	0.099	0.485	0.346	0.642
Adjusted R2	0.095	0.453	0.281	0.582
Residual Std. Error	18.701 (df = 222)	14.535 (df = 210)	16.666 (df = 203)	12.709 (df = 191)
F Statistic	24.455*** (df = 1; 222)	15.232*** (df = 13; 210)		

Note: Standard errors are in parentheses. Column (1) and (2) represent respectively one and multiple variables in the regression. Column (3) and (4) also represent respectively one and multiple variables and include both year and 1 digit SIC code industry fixed effects. All standard errors are clustered at firm level. *p<0.1; **p<0.05; ***p<0.01

In Table 4.2, the first column shows a significant positive effect of female frequency on social score, with a coefficient of 51.485. In the second column, this coefficient is lower, but still positive and significant. Here, a 0.1 unit increase in FemaleFreq, results in an increase of 3.11 points in the score of the social pillar. Only the number of directors, network size and Size are positive and significant on the same level. As by the environment score, the nationality mix has a negative effect and is significant on the 95% significance level.
When fixed effects are included, all positive and negative effects stay the same. Only the significance threshold changes. The main independent variable stays positive significant with a coefficient of respectively 65.793 and 39.781. This means that an increase in the ratio of females increases with 0.1, leads to an increase in social score of approximately 6.58 (3.40). The effect is smaller compared to the effects on environmental score. Also, leverage is negative in social score, but was positive on the environmental score. This means that companies with more debt perform less in social score. An explanation could be that companies with more debt have not enough own money to participate in social related events, such as donating to charity.

When excluding the workforce measurement, the coefficients change. Table 4.3 shows the coefficients of the independent variables on the social score, after excluding the workforce measurement. Here, FemaleFreq stays positive and significant in all regressions. After the inclusion of fixed effects, the coefficient of the main variable becomes 47.376 and the other coefficients stay around the same as when workforce was included. Only time in company and time in role become significant in Table 4.3. This assumes that social score is affected by these variables when the workforce measurement is excluded.

The results in Table 4.2 and Table 4.3 show evidence to reject the null hypothesis, as the number of female directors does positively influence the social score of a company with and without the inclusion of the workforce measurement. Although the effect of female directors on the social score is the lowest of all three pillars, the results are still positive and significant. Therefore, the expected hypothesis of this paper can be confirmed.

Table 4.3 Linear regression results for the relation between the frequency of females and the social score excluding the workforce measurement.

Variable	(1)	(2)	(3)	(4)
FemaleFreq	55.241***	36.336***	68.091**	47.376**
	(12.124)	(11.360)	(26.371)	(19.373)
NatMix		-10.506*		-6.748
		(6.114)		(8.227)
NoDirector		1.776***		0.639
		(0.604)		(0.705)
TimeRetirement		-1.336***		-0.620
		(0.470)		(0.496)
TimeRole		1.984*		2.381**
		(1.155)		(1.198)
TimeBrd		2.045		1.787
		(1.503)		(1.647)
TimeInCo		-1.467		-1.971*
		(0.976)		(1.121)
AvgTimeOthCo		-1.340		-1.768
		(1.064)		(1.704)
NoQuals		-1.607		-1.675
		(2.989)		(4.723)
NetworkSize		0.008***		0.010**
		(0.002)		(0.004)
ROA		0.076		0.175
		(0.121)		(0.142)
Leverage		-2.567		-20.455**
		(6.790)		(8.436)
Size		4.442***		5.226**
		(1.270)		(2.323)
Constant	50.031***	-55.857**		
	(2.918)	(24.269)		
Observations	224	224	224	224
R2	0.086	0.454	0.377	0.629
Adjusted R2	0.081	0.420	0.316	0.567
Residual Std. Error	21.778 (df = 222)	17.308 (df = 210)	18.795 (df =	203) 14.954 (df = 191)
F Statistic	20.761*** (df = 1; 222)	13.412*** (df = 13; 210)		

Note: Standard errors are in parentheses. Column (1) and (2) represent respectively one and multiple variables in the regression. Column (3) and (4) also represent respectively one and multiple variables and include both year and 1 digit SIC code industry fixed effects. All standard errors are clustered at firm level. *p<0.1; **p<0.05; ***p<0.01

4.3 Governance Score

The last pillar of the ESG rating is the governance pillar. Table 4.4 shows the effect of the main and control variables on the governance score.

Table 4.4 Linear regression results for the relation between the frequency of females and the governance score.

Variable	(1)	(2)	(3)	(4)
FemaleFreq	65.526***	58.139***	63.825***	57.262***
	(9.395)	(9.325)	(20.814)	(14.455)
NatMix		-1.977		-7.071
		(5.019)		(9.195)
NoDirector		1.478***		1.273
		(0.496)		(0.878)
TimeRetirement		-1.207***		-1.006*
		(0.385)		(0.589)
TimeRole		1.400		2.119
		(0.948)		(1.519)
TimeBrd		-1.047		-1.651
		(1.234)		(1.897)
TimeInCo		-0.807		-0.289
		(0.801)		(1.287)
AvgTimeOthCo		-0.733		-0.897
		(0.873)		(1.497)
NoQuals		4.868**		6.632
		(2.453)		(4.915)
NetworkSize		0.001		0.003
		(0.002)		(0.004)
ROA		0.074		0.136
		(0.099)		(0.112)
Leverage		6.763		4.855
		(5.574)		(12.749)
Size		2.101**		1.690
		(1.043)		(1.647)
Constant	37.507***	-16.645		
	(2.261)	(19.922)		
Observations	224	224	224	224
R2	0.180	0.450	0.307	0.526
Adjusted R2	0.176	0.416	0.239	0.446
Residual Std. Error	16.875 (df = 222)	14.208 (df = 210)	16.221 (df = 203)	13.836 (df = 191)
F Statistic	48.648*** (df = 1; 222)	13.217*** (df = 13; 210)		

Note: Standard errors are in parentheses. Column (1) and (2) represent respectively one and multiple variables in the regression. Column (3) and (4) also represent respectively one and multiple variables and include both year and 1 digit SIC code industry fixed effects. All standard errors are clustered at firm level. *p<0.1; **p<0.05; ***p<0.01

The results of the independent variable in Table 4.4 do not differ much from the previous two pillars. The female frequency is positive and significant in all regressions and its coefficient is higher for this pillar than in the others. With fixed effects, an increase in the frequency of female directors with 0.1 results in an increase in governance rating of 5.73 points in governance score.
Further, time to retirement and the number of directors is significant without fixed effects, but only time to retirement stays significant, on a lower interval, after fixed effects are included. This means that the governance performance drops when directors are aged closer to their retirement age. All other variables do not have any significance after including fixed effects. This is the only pillar which is not affected by any financial performance variable.

Table 4.4 confirms the expectation of this paper and rejects the null hypothesis. The frequency of females on a board do influence the governance rating of a firm. Companies could include more female directors to increase board diversity and create better governance in the company.

4.4 Overall ESG Score

Based on the findings of the individual pillars, the conclusion can be drawn that a more gender diverse board increases the ESG rating of a company. To reinforce this result, Table 4.5 will show the coefficient of the main and control variables on the overall ESG score.

The coefficient of FemaleFreq in the second column of Table 4.5, shows that an increase in female frequency of 0.1 increases the total ESG score with 3.96 before fixed effects. After adding the fixed effects to the regression, this effect increases to 4.45 ESG points. All other board characteristics do not have a significant effect. The individual variable network size and the firm specific variables ROA and Size all have a positive significant effect on the ESG score, while there is no variable which has significant negative relation.

When comparing the three pillars to each other, the frequency of female directors has the most effect on the governance score of a company and the least effect on the social score. Governance score is more affected by an increase in female directors than the overall ESG score, while the environment and social score had relatively lower coefficients than the overall ESG score.
Other findings based on these results are that nationality mix is always negative related and the number of directors always positive. The inclusion of fixed effect causes these variables to be insignificant. Also, NetworkSize is the only personal characteristic variable that is significant in almost all regressions. Lastly, the financial control variables are most of the time positive. Only leverage is negative and significant for social score. This impact is so large, that the total effect on ESG is also negative, but it is not significant.

Table 4.5 Linear regression results for the relation between the frequency of females and the ESG score.

Variable	(1)	(2)	(3)	(4)
FemaleFreq	62.105***	39.590***	74.658***	44.509***
	(8.730)	(7.547)	(20.359)	(11.177)
NatMix		-9.776**		-1.201
		(4.062)		(6.797)
NoDirector		1.563***		0.933
		(0.401)		(0.591)
TimeRetirement		-0.297		-0.026
		(0.312)		(0.455)
TimeRole		0.164		0.947
		(0.767)		(1.046)
TimeBrd		1.709*		2.029
		(0.998)		(1.426)
TimeInCo		-0.817		-1.656
		(0.648)		(1.083)
AvgTimeOthCo		-0.302		0.016
		(0.707)		(1.161)
NoQuals		4.652**		2.789
		(1.985)		(3.865)
NetworkSize		0.007***		0.008***
		(0.001)		(0.003)
ROA		0.077		0.111*
		(0.080)		(0.058)
Leverage		-2.149		-9.751
		(4.511)		(6.621)
Size		3.359***		3.615**
		(0.844)		(1.662)
Constant	45.827***	-52.437***		
	(2.101)	(16.123)		
Observations	224	224	224	224
R2	0.186	0.586	0.321	0.681
Adjusted R2	0.182	0.560	0.254	0.628
Residual Std. Error	15.681 (df = 222)	11.499 (df = 210)	14.975 (df = 203)	10.582 (df = 191)
F Statistic	50.613*** (df = 1; 222)	22.846*** (df = 13; 210)		

Note: Standard errors are in parentheses. Column (1) and (2) represent respectively one and multiple variables in the regression. Column (3) and (4) also represent respectively one and multiple variables and include both year and 1 digit SIC code industry fixed effects. All standard errors are clustered at firm level. *p<0.1; **p<0.05; ***p<0.01

4.5 Robustness checks

The last part of this result section will show robustness tests to test the reliability of the results of this research. This is done by selecting different groups of variables to perform two extra linear regressions. The firm specific variables are included in all regressions. The results of these tests are included in the appendix of this paper. Again, columns 3 and 4 show the regressions with year fixed effects. Lastly, the regressions are also performed while all variables are scaled by mean around zero and a standard deviation of one. These results are not tabulated.

First, a regression is performed with only the independent variable and the board characteristics provided in the dataset. This are the variables 'FemaleFreq' (independent), 'NatMix' and 'NoDirector'. Column 1 and 3 of the robustness results refer to these tests. Columns 2 and 4 of the robustness results, refer to the second robustness test. Here, the averaged individual characteristics are included and replace the board characteristics in the regression.

For the environment score, Table 7.1, the independent variable stays positive and significant in both checks. This also holds for the Size, time in board and time in company variable which were initially significant. When the standardized regressions are performed, the main independent variable is also positive significant.
Next, the social score is shown in Table 7.2 and 7.3 (excluding workforce measurement). Also, for this score, the frequency of female directors has a significant positive effect in the tabulated and nontabulated regression results. The control variable 'TimeRole' becomes significant in the tabulated results of Table 7.2, meaning that social scores increase if a board member is longer active in his/her role within the board. This was already the case for the regression without including the workforce measurement.
The same explanation could be used for the governance score, Table 7.4, and overall ESG score, which robustness checks are visible in Table 7.5. The robustness check of the governance score also has no difference on the independent variable. In the nontabulated results, the coefficient of the standardized main coefficient is the largest for governance score. It has also relatively the largest effect on the governance score out of all variables used. This means that the increase in females had the most effect on the governance score of a firm and that governance is most affected by the female frequency out of all used variables. For the overall ESG rating, all financial control variables become significant in the robustness check. So, when ROA or Size increases, the total ESG score increase. If the leverage of a firm increases, the ESG score is assumed to go down.

5. Conclusion and Discussion

This paper investigates the effects of board diversity on the ESG performance of companies in the Netherlands. Previous research shows a positive relation between the addition of female directors and non-financial performances of firms. With the current female director percentage of 21%, the Dutch government imposes a new law to improve the number of females in the board of directors.
To test if an increase in female directors is useful for ESG performance and to test if previous non-financial benefits can be expressed in the ESG score, 4 hypotheses are formulated to answer the research question. The main independent variable in this paper is the frequency of female directors.
This paper shows evidence that a more gender diverse board, through an increase in underrepresented female directors, leads to improved ESG scores. First, the environment score has a significant positive relation with an increase in female directors. This does not change after robustness checks. For the social and governance scores, the frequency of female directors is also positively related. When testing for reliability of the results, the main independent variable did not change.
After conducting the main regression and the (non) tabulated robustness checks, all expectations at the beginning of this paper are confirmed. Meaning that an increase in female directors, and thus an increase in gender diverse boards, result in better ESG performances. The effect is most visible on governance score, followed by environment and social score.

To end this section, it is important to mention that there are some shortcomings in this paper. First, the dataset only consists of 224 observations of Dutch firms. This limits the generalizability of the results. The use of a dataset with more firms is beneficial, because more data result in more precise outcomes, less influence of outliers and more precise estimates of coefficients. Also, the use of multiple digit industry fixed effects is possible with more firms (per industry) in the dataset. This paper thus recommends further research to extend these findings by using a bigger dataset and preferable include multiple countries. Another point for future research, is to extend the research model. When more data is known for the period after 2022, a difference-in-difference approach can investigate if the Dutch gender diversity law has its desired benefits. A treatment group of firms which comply with this percentage should then have a significant higher increase in ESG score than firms who did not comply before the law.
Lastly, when the CSRD becomes active, future research might investigate whether the findings in this paper still hold based on new future definitions of ESG measurements and increased knowledge about these ESG measurements. The definitions of ESG measurements might change in the future and capture more facets of ESG performance of a firm. Furthermore, the amount of education on this topic should increase when stakeholders become more familiar with the new directive. A future analysis could explore the effect of (ESG related) education of board members on the ESG performance of a firm.

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7. Appendix

Table 7.1 Robust linear regression results for the relation between the frequency of females and the environmental score

Variable	(1)	(2)	(3)	(4)
FemaleFreq	49.433***	30.277***	52.997**	41.505**
	(10.793)	(11.487)	(22.039)	(16.090)
NatMix	-12.770**		-6.775	
	(5.975)		(16.233)	
NoDirector	0.509		0.737	
	(0.569)		(0.990)	
TimeRetirement		0.522		0.389
		(0.474)		(0.764)
TimeRole		0.311		0.459
		(1.169)		(1.320)
TimeBrd		0.538		3.088**
		(1.469)		(1.495)
TimeInCo		-0.635		-3.263**
		(0.984)		(1.356)
AvgTimeOthCo		1.031		1.903
		(1.079)		(1.657)
NoQuals		3.607		0.496
		(3.037)		(5.656)
NetworkSize		0.008***		0.006
		(0.002)		(0.004)
ROA	0.139	0.203*	0.101	0.169
	(0.125)	(0.121)	(0.115)	(0.120)
Leverage	9.448	15.485**	10.165	12.280
	(6.741)	(6.633)	(13.193)	(9.814)
Size	7.662***	4.783***	7.838***	6.518***
	(1.026)	(1.103)	(2.482)	(2.203)
Constant	-132.071***	-93.962***		
	(19.343)	(23.046)		
Observations	224	224	224	224
R2	0.415	0.467	0.568	0.639
Adjusted R2	0.399	0.440	0.513	0.583
Residual Std. Error	18.289 (df = 217)	17.662 (df = 212)	16.462 (df =	198) 15.230 (df = 193)
F Statistic	25.680*** (df = 6; 217)	16.899*** (df = 11; 212)		

Note: Standard errors are in parentheses. Column (1) and (2) represent respectively one and multiple variables in the regression. Column (3) and (4) also represent respectively one and multiple variables and include both year and 1 digit SIC code industry fixed effects. All standard errors are clustered at firm level. *p<0.1; **p<0.05; ***p<0.01

Table 7.2 Robust linear regression results for the relation between the frequency of females and the social score

Variable	(1)	(2)	(3)	(4)
FemaleFreq	36.210***	30.250***	46.807***	40.239**
	(9.092)	(9.725)	(17.138)	(15.936)
NatMix	-2.042		2.565	
	(5.033)		(9.266)	
NoDirector	1.130**		0.564	
	(0.479)		(0.690)	
TimeRetirement		-0.491		-0.004
		(0.401)		(0.464)
TimeRole		1.534		1.967*
		(0.989)		(1.069)
TimeBrd		0.836		1.477
		(1.244)		(1.390)
TimeInCo		-0.488		-1.404
		(0.833)		(1.001)
AvgTimeOthCo		-1.516*		-1.436
		(0.913)		(1.399)
NoQuals		1.801		0.709
		(2.571)		(3.945)
NetworkSize		0.005***		0.008***
		(0.002)		(0.003)
ROA	0.022	0.113	0.075	0.151
	(0.105)	(0.103)	(0.134)	(0.125)
Leverage	-7.323	-4.792	-19.369**	-20.445***
	(5.679)	(5.616)	(7.670)	(7.041)
Size	5.820***	5.411***	5.865***	5.219***
	(0.864)	(0.933)	(1.465)	(1.804)
Constant	-79.322***	-70.101***		
	(16.296)	(19.512)		
Observations	224	224	224	224
R2	0.402	0.450	0.578	0.637
Adjusted R2	0.386	0.422	0.525	0.581
Residual Std. Error	15.408 (df = 217)	14.953 (df = 212)	13.547 (df = 198)	12.731 (df = 193)
F Statistic	24.348*** (df = 6; 217)	15.771*** (df = 11; 212)		

Note: Standard errors are in parentheses. Column (1) and (2) represent respectively one and multiple variables in the regression. Column (3) and (4) also represent respectively one and multiple variables and include both year and 1 digit SIC code industry fixed effects. All standard errors are clustered at firm level. *p<0.1; **p<0.05; ***p<0.01

Table 7.3 Robust linear regression results for the relation between the frequency of females and the social score excluding the workforce measurement.

Variable	(1)	(2)	(3)	(4)
FemaleFreq	36.431***	35.540***	46.940**	47.184**
	(10.935)	(11.447)	(20.319)	(19.390)
NatMix	0.380		2.571	
	(6.054)		(9.437)	
NoDirector	0.984*		0.519	
	(0.576)		(0.776)	
TimeRetirement		-1.170**		-0.550
		(0.472)		(0.540)
TimeRole		2.426**		2.511**
		(1.165)		(1.207)
TimeBrd		0.740		1.417
		(1.464)		(1.684)
TimeInCo		-1.014		-1.895*
		(0.981)		(1.141)
AvgTimeOthCo		-1.706		-1.764
		(1.075)		(1.701)
NoQuals		-1.441		-1.915
		(3.027)		(4.642)
NetworkSize		0.007***		0.010**
		(0.002)		(0.004)
ROA	0.060	0.135	0.136	0.190
	(0.127)	(0.121)	(0.154)	(0.144)
Leverage	-3.820	-2.529	-16.888*	-20.059**
	(6.830)	(6.610)	(9.871)	(7.975)
Size	6.221***	5.568***	6.052***	5.328**
	(1.040)	(1.099)	(1.606)	(2.075)
Constant	-92.804***	-66.922***		
	(19.599)	(22.967)		
Observations	224	224	0.505	224
R2	0.353	0.430	46.940**	0.626
Adjusted R2	0.335	0.400	-20.319	0.568
Residual Std.	18.530 (df =	17.601 (df =	15.981 (df =	198) 14.939 (df
Error	217)	212)	198)	= 193)
F Statistic	19.718*** (df =	14.514*** (df =		
	6; 217)	11; 212)		

Note: Standard errors are in parentheses. Column (1) and (2) represent respectively one and multiple variables in the regression. Column (3) and (4) also represent respectively one and multiple variables and include both year and 1 digit SIC code industry fixed effects. All standard errors are clustered at firm level. *p<0.1; **p<0.05; ***p<0.01

Table 7.4 Robust linear regression results for the relation between the frequency of females and the governance score.

Variable	(1)	(2)	(3)	(4)
FemaleFreq	50.520***	59.266***	45.005***	58.725***
	(8.858)	(9.398)	(16.466)	(14.763)
NatMix	3.492		1.440	
	(4.903)		(9.467)	
NoDirector	1.871***		1.714*	
	(0.467)		(0.876)	
TimeRetirement		-1.135***		-0.899
		(0.388)		(0.645)
TimeRole		1.759*		2.467*
		(0.956)		(1.327)
TimeBrd		-2.058*		-2.468
		(1.202)		(1.626)
TimeInCo		-0.500		-0.107
		(0.805)		(1.249)
AvgTimeOthCo		-1.020		-1.025
		(0.883)		(1.310)
NoQuals		5.291**		6.618
		(2.485)		(4.971)
NetworkSize		0.001		0.003
		(0.002)		(0.004)
ROA	0.050	0.127	0.092	0.173
	(0.102)	(0.099)	(0.121)	(0.110)
Leverage	10.018*	4.559	8.299	3.779
	(5.532)	(5.427)	(13.808)	(11.803)
Size	1.580*	3.559***	1.815	2.376
	(0.842)	(0.902)	(1.447)	(1.525)
Constant	-19.819	-33.978*		
	(15.875)	(18.856)		
Observations	224	224	224	224
R2	0.366	0.426	0.443	0.512
Adjusted R2	0.348	0.396	0.373	0.436
Residual Std. Error	15.010 (df = 217)	14.451 (df = 212)	14.722 (df = 198)	13.963 (df = 193)
F Statistic	20.851*** (df = 6; 217)	14.281*** (df = 11; 212)		

Note: Standard errors are in parentheses. Column (1) and (2) represent respectively one and multiple variables in the regression. Column (3) and (4) also represent respectively one and multiple variables and include both year and 1 digit SIC code industry fixed effects. All standard errors are clustered at firm level. *p<0.1; **p<0.05; ***p<0.01

Table 7.5 Robust linear regression results for the relation between the frequency of females and the ESG score.

Variable	(1)	(2)	(3)	(4)
FemaleFreq	47.007***	38.749***	52.687***	46.733***
	(7.382)	(7.731)	(15.035)	(11.915)
NatMix	0.104		6.634	
	(4.087)		(10.034)	
NoDirector	1.169***		0.784	
	(0.389)		(0.640)	
TimeRetirement		-0.146		0.032
		(0.319)		(0.490)
TimeRole		0.554		1.258
		(0.786)		(1.027)
TimeBrd		0.554		1.381
		(0.989)		(1.399)
TimeInCo		-0.414		-1.502
		(0.662)		(1.101)
AvgTimeOthCo		-0.626		-0.163
		(0.726)		(1.046)
NoQuals		4.775**		3.069
		(2.044)		(3.921)
NetworkSize		0.006***		0.008***
		(0.001)		(0.003)
ROA	0.037	0.128	0.053	0.143**
	(0.085)	(0.082)	(0.082)	(0.064)
Leverage	-2.754	-1.940	-9.908	-11.703*
	(4.611)	(4.464)	(6.932)	(6.111)
Size	4.670***	4.309***	4.924***	4.418***
	(0.702)	(0.742)	(1.502)	(1.461)
Constant	-65.111***	-61.539***		
	(13.231)	(15.510)		
Observations	224	224	224	224
R2	0.493	0.553	0.602	0.672
Adjusted R2	0.479	0.530	0.551	0.621
Residual Std. Error	12.509 (df = 217)	11.886 (df = 212)	11.614 (df = 198)	10.679 (df = 193)
F Statistic	35.230*** (df = 6; 217)	23.860*** (df = 11; 212)		

Note: Standard errors are in parentheses. Column (1) and (2) represent respectively one and multiple variables in the regression. Column (3) and (4) also represent respectively one and multiple variables and include both year and 1 digit SIC code industry fixed effects. All standard errors are clustered at firm level. *p<0.1; **p<0.05; ***p<0.01