Soft Law versus Hard Law – How Effective are Boardroom Gender Quotas?

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I hereby declare and confirm that this thesis is entirely the result of my own work except where otherwise indicated. I acknowledge the supervision and guidance I have received from Professor Carlos Gómez Ligüerre. This thesis is not used as part of any other examination and has not yet been published.

Maaike Cleijne, 11-08-2021

Abstract

As a response to the persisting underrepresentation of women in company boards, many European countries introduced boardroom gender quotas. Gender quotas can be binding (hard quotas) or have a comply-or-explain character (soft quotas). Hard gender quotas limit the ability of companies to freely appoint directors. If the limitation is necessary, it is justifiable. Whether or not a hard quota is necessary, depends on the effectiveness of the soft alternative. This paper examines the effectiveness of soft and hard gender quotas in increasing female representation in boards of publicly listed companies in France, the Netherlands, Norway and Spain. Using data on board composition, this paper empirically assesses the effect of both quotas on female representation and gender balance on boards of directors. I find that quotas positively affect female representation and gender balance. As expected, the effect on gender equality is smaller in countries that introduced soft quotas rather than hard quotas. In some countries, gender quotas can be complied with by appointing female non-executive directors only. Therefore, I also estimate the effect of quotas on female representation among executives only. Results show that gender quotas do not increase female executive participation as much as female participation in general. This effect is even smaller for soft quotas. Therefore, this paper concludes that soft quotas are less effective than hard quotas in achieving gender equality. Hence, one could say that hard quotas are necessary in achieving gender balance on corporate boards and are therefore a justifiable limit to the freedom of contract.

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1. Introduction

Over the past decades, the number of women participating in labor markets all over the world has increased substantially. Although gender gaps are narrowing, the road to gender equality continues to be rocky. Women’s salaries and labor participation rates are lower than those of their male counterparts (McGuire & Reskin, 1993), and women are still underrepresented in top-level employment positions (Blau, Ferber, & Winkler, 2013; Bertrand & Hallock, 2001).

The European labor market forms no exception to this trend. Although the European labor market consists of approximately 45% women, women account for less than 27% of corporate board members and for approximately 7% of CEOs (European Commission, 2019). While this is an increase compared to previous years, gender equality in Europe is still a long way off. In fact, the European Commission recently presented the EU Gender Equality Strategy 2020-2025. One of the key objectives of this strategy is to achieve gender balance in economic decision-making (European Commission, 2020). The report states that women face discrimination in the workplace and that men advance more easily through the so-called old boys’ network. The underrepresentation of women in many top-level positions supports the notion of the glass ceiling, “a transparent barrier that keeps women from rising above a certain level in corporations” (Morrison, White, & Van Velsor, 1987).

Currently, many nations take active action against gender inequality and the glass ceiling. This suggests that gender gaps, irrespective of what causes them, are considered problematic. Gender inequality is not solely a matter of social injustice, but may also have large economic implications. Underrepresentation of women in boards and management can be a missed opportunity from an economic point of view. Underrepresentation of women in top-level positions potentially leads to low aggregate market output per person, as women’s talent and skills are not applied to their full potential (Hsieh, Hurst, Jones, & Klenow, 2019). Moreover, Kim and Starks (2016) argue that gender diversity in corporate boards increases firm value as female directors contribute skills to corporate boards that increase board advisory effectiveness.

An increasingly popular response to gender inequality and female underrepresentation in business is the introduction of a gender quota. A gender quota specifies the minimum number or percentage of seats or places to be filled by men and/or women (European Institute for Gender Equality). Gender quotas exist in the political as well as in the corporate environment and can be either binding or have a comply-or-explain character. I classify binding quotas as hard law, and comply-or-explain quotas as soft law. Several countries have imposed gender quotas in corporate boards. The first European country to take such action was Norway. In 2003, the Norwegian parliament passed a gender quota law that required 40% representation of each gender in the boards of publicly listed corporations (Teigen, 2012). At first, the quota was non-binding, but it was transformed into a binding one in 2016. Other European countries followed and imposed gender quotas as well. Some quotas are binding, for example in France, Germany and Italy, and some non-binding, such as in Spain, Luxembourg, and the Netherlands. Although more gender-diverse boards are generally assumed to perform better than less diverse boards, scholars question the use of gender quotas as a desirable response to gender diversity. Previous studies found that, if anything, gender quotas do not have a positive effect on the profitability of a company (Bøhren & Staubo, 2014; Eckbo, Nygaard, & Thorburn, 2016).

Considering the EU Gender Equality Strategy, a more interesting issue is the effect of gender quotas on actual gender equality. As women evidently face discrimination and difficulties in breaking the glass ceiling, it is important to analyze the impact of gender quotas on such obstacles. A gender quota can decrease the impact of discrimination in the workplace and help breach the old boys' network. Forced exposure to women in leadership positions reduces bias and improves perceptions about the capabilities and performance of female leaders (Beaman, Chattopadhyay, Duflo, Pande, & Topalova, 2009). Moreover, representation of more women on boards positively affects participation of women in other levels of the organization (Elsaid & Ursel, 2011; Matsa & Miller, 2011; Wang & Kelan, 2013).

Anti-discriminatory measures support Article 14 of the European Convention on Human Rights, which states that everybody has the right not to be discriminated against. However, it is generally assumed that taking anti-discriminatory measures such as gender quotas conflict with the freedom of contract. According to the freedom of contract, a decision-maker is free to choose who to appoint as a director, even if this is based on discrimination. Restricting the free choice of the decision-maker by the introduction of a gender quota, is therefore inevitably a limit to the freedom of contract (Besson, 1999). According to the Coase Theorem, freedom of contract is essential from an economic point of view in the absence of transaction costs, as it enables contracting parties to maximize utility (Coase, 1960). When contracting parties are biased, however, limiting this freedom may be desirable (Koszegi, 2014). Whether or not this limitation is justifiable, is not clear-cut. Some scholars argue that anti-discriminatory measures (such as quotas) should not be allowed (Epstein, 1995), and others disagree (Besson, 1999). Undoubtedly, a binding gender quota infringes on the freedom of contract more than a quota with comply-or-explain character. Therefore, in case soft gender quotas affect gender equality in the same way hard quotas do, the binding character of quotas should be reconsidered.

For the abovementioned reasons, my research focuses on the effectiveness of gender quotas, and in particular on whether the effectiveness differs for soft quotas relative to hard quotas. In previous studies, the effectiveness and efficiency of a gender quota has mainly been studied looking at its economic effects in terms of firm performance and firm value. However, in this paper, I focus on actual effectiveness of gender quotas in light of their initial goal, namely improving gender equality. I compare male and female representation in publicly listed companies in France, the Netherlands, Norway, and Spain. I empirically assess the effects in terms of gender equality of both binding (hard law) and comply-or-explain (soft law) boardroom gender quotas. Previous research on gender quotas and their effectiveness has mainly focused on the changes after the implementation of a quota in one specific country. My research extends this by analyzing four countries at the same time, allowing for time trends to be filtered out. Using data from BoardEx on company details, I compare the likelihood of a board member to be female in the pre-quota period and post-quota period in each country. Moreover, I examine the probability of a company to achieve gender equality, both before as well as after the introduction of a gender quota. I then distinguish between the effect of a binding and a non-binding quota. Furthermore, I analyze whether soft law quotas positively affect female representation among executive directors as well, a group not directly targeted by quotas. Using these data and methods, I aim to answer my main research question: How effective are soft gender quotas in comparison to hard gender quotas?

I find that gender quotas increase female participation and gender balance on boards. This effect is largest for France compared to other countries. Moreover, using a difference-in-difference approach, I find that the effect of soft gender quotas on gender equality is not as strong as the effect of hard quotas. Especially when considering the effect on executive directors, soft quotas are not as effective as hard quotas. Based on these findings, I conclude that the binding character of hard quotas forms a justifiable limit to the freedom of contract.

The remainder of this paper is divided into six sections. Section 2 of this paper contains an overview of prior research and theories on gender inequality and discrimination. Section 3 describes the institutional context of the countries that are investigated. Section 4 explains the data selection process and gives a broad overview of the data. In section 5 I discuss the methodology. The results are presented in section 6 and section 7 concludes.

2. Background Literature and Hypotheses

In this section, I discuss existing literature related to boardroom gender quotas. I present current numbers on gender gaps and measures taken in response. Secondly, I explain different theories of discrimination and how they affect the impact of gender quotas. Thirdly, I delve into the economic effects of gender equality and gender quotas. Then, I explain how the freedom of contract may be violated by the imposition of a quota and how different types of quotas affect the magnitude of the violation. Lastly, I develop three hypotheses.

2.1. Gender gaps and potential measures

Despite the improvement of women's positions in the labor market in countries all over Europe over the past years, gender inequality in the workplace remains to exist. Women continue to be underrepresented in upper-tier occupations (International Labour Organization, 2020). Women make up 45% of the labor force across the European Union (European Commission, 2020) and account for approximately 23% of board seats of the largest stock exchange listed companies in the European Union (Jourova, 2016). Although this percentage has significantly increased over the years, gender equality is still a long way off. As a response, many countries have taken measures to enhance gender diversity. Examples of such measures are equal-pay laws, more inclusive recruitment processes and the introduction of gender quotas. Such measures can be binding or non-binding, depending on the decisions made by national governments.

In 2003, Norway was the first European country to introduce a voluntary gender quota, which was transformed into a binding quota in 2006. Following Norway, other countries such as France, Italy, the Netherlands, Germany, Greece, and Spain introduced soft or hard quotas as well.

2.2. Economic theory of discrimination

As becomes clear from the previous sub-section, women are still not breaking through the glass ceiling of corporate boardrooms (International Labour Organization, 2020). This metaphorical ceiling refers to the "artificial barriers to the advancement of women and minorities", according to the Federal Glass Ceiling Commission (1995). In a male dominated hierarchy, women face difficulties in being hired in management or board-level positions. The barriers women face are generally unwritten, which means that they stem from biases (conscious or unconscious) rather than from actual policies.

A term often associated with the glass ceiling is the 'old boys' network'. The old boys' network implies that males advance in the workplace or in other contexts relying on decisions made by an existing elite of males. Potential new board members are nominated by current directors, management, shareholders, or a search committee. If these nominating parties are predominately male, an old boys' network could prevent women from entering the boardroom. Kanter (1977) already elaborated on the idea that people tend to select individuals who are similar to themselves in all kinds of decisions. She calls this tendency 'homosocial reproduction'. Decision-makers select employees with the same characteristics as themselves since it reduces the perceived risk that is associated with uncertain performance in higher positions. Forasmuch as women are underrepresented in top-level positions, there are less opportunities for them to rely on such reproductive practices.

When it comes to gender gaps and biases, two types of discrimination should be distinguished. On the one hand, statistical discrimination implies that inequality arises when information about the other party is imperfect. In the employment sphere, this means that an employer that is unsure about an employee's productivity, uses statistical information on the group that the employee belongs to in order to make a prediction about the employee's productivity (Becker, 1971). If women are generally less productive in a position than men, a female applicant is expected to be less productive than a man and employers will treat women accordingly. Discrimination is then based on a preference for more productive employees. If those who select the board believe that men are more productive directors than women, this would be statistical discrimination. Taste-based discrimination, on the other hand, is not based on behavioral uncertainty. This implies that it brings the decision-maker disutility to interact with a specific group of people (often minorities), for example with people of the opposite gender. Even when objective qualifications and factors like work ethic are equal, nominators may appoint the individual belonging to the majority rather than the minority applicant. Taste-based discrimination occurs when those who select the board hold less favorable attitudes towards women and therefore prefer male over female directors (Becker, 1971).

A gender quota may decrease the impact of statistical and taste-based discrimination in workplace-related decisions. If those female directors that were appointed because of the quota turn out to be productive, rational expectations of female board members will improve. Furthermore, the more women on boards, the more exposure to women as capable directors and the weaker the negative unconscious bias towards women. This is in line with a study conducted by Beaman et al. (2009), concluding that forced exposure to female leadership improves perceptions about the performance of female leaders.

Gender quotas could change people's attitude towards women, but could also affect female participation and representation through actions of those female board members. Although Bertrand et al. (2019) found little effect of gender quotas on women in business, apart from the direct impact on those females directors who were appointed because of the quota, most studies found positive spillover effects of gender quotas. Matsa and Miller (2011) and Elsaid and Ursel (2011) found that greater female board participation increases the number of women in management positions. Wang and Kelan (2013) explain that the increase of female representation within the board of directors as a result of the gender quota leads to more equal opportunities for women in the corporation. Using data on Norwegian corporations, they argue that female directors can exercise more power and appoint more women as CEO or board chairs when a ‘critical mass’ of women on the board is attained. More in-depth research on this critical mass shows that the presence of three women at board meetings allows female directors to exert more power over board decisions (Erkut & Konrad, 2008).

These findings support the notion of homosocial reproduction and the old boys’ network. Female directors promote or hire women because they prefer choosing someone that is similar to them (Kanter, 1977). Especially when women are underrepresented in top-level positions, females prefer hiring other females (Gorman, 2005). This way, a boardroom quota may help women break the glass ceiling and break up the old boys’ club. Yet, in some countries, companies can satisfy gender quotas by hiring female non-executive directors only. While an executive director (ED) is concerned with day-to-day management, a non-executive director (NED) does not have management responsibilities but has a broader oversight. One could say that executive directors play a more significant role in a company. Therefore, the ability to comply with gender targets by hiring non-executive directors only may not solve the issues related to the old boys’ network and the glass ceiling. If executive positions remain to be mainly filled by men, an old boys’ network may persists in day-to-day management.

2.3. Gender quotas and firm value

A corporate boardroom gender quota may not only affect gender diversity, but also firm value and firm performance. First, it is interesting to look at the effect of gender diversity on the value of a company and its performance. Women and men possess different skills which affect the decisions taken and direction of the firm. The general economic argument in favor of gender equality concerns the efficient allocation of resources. Hsieh et al. (2019) argue that discrimination in the employment sphere leads to misallocation of talent, which in turn results in lower productivity and lower aggregate market output per person. Firm productivity is expected to improve if capable women, who would otherwise be passed over for a board position, are offered a seat as a director. This theory supports two studies conducted by Kim and Starks. First, they uncovered a positive relationship between heterogeneous expertise among directors and firm value (Kim & Starks, 2015). Their second study on this topic showed that female board members diversify expertise on the board more than men do and that women contribute distinctive skills and competences to boards of directors (Kim & Starks, 2016). The combined results of both studies provide evidence for a positive effect of a gender-diverse board on firm value. Moreover, Adams and Ferreira (2009) found that more gender-diverse boards in the United States have higher meeting attendance rates than less diverse boards. Furthermore, gender-diverse boards of directors put more effort into their monitoring tasks than less gender-diverse boards. Three years later, Adams, together with Funk (2012), concluded that female board members are more benign than their male counterparts while they are less focused on power. Contrary to their expectations, Adams and Funk found that female directors are more risk loving than male directors. Accordingly, a more gender-diverse board affect board decisions, firm value, and firm performance.

Although gender-diverse boards are generally expected to operate well, the involuntary hire of a female director as a result of a quota could affect firm value and firm performance negatively. In other words, the road towards gender-diverse boards must be taken into account. If the only reason for a woman to be hired is her gender and not her skillset or her knowledge, while an alternative, male candidate would have added better skills or knowledge, a gender quota could negatively impact firm value and performance. After the introduction of the Norwegian quota in 2003, several researchers studied the effect of the quota on firm value and firm performance. Ahern and Dittmar (2012) found that the results of the quota were less experienced boards and a decrease in firm performance. Their theory states that companies usually choose boards in order to maximize value. A quota can then be a barrier to achieving this goal. However, other scholars criticized Ahern and Dittmar's instrument chosen to conduct their study and found no effect of the gender quota on firm value and profitability (Eckbo, Nygaard, & Thorburn, 2016). The same Norwegian quota was analyzed by Bøhren and Staubo (2014). They conclude that involuntary board restructuring as a result of a gender quota is costly and leads to inefficient organizational structures and boards.

On the positive side, Ferreira et al. (2017) found gender quotas to result in more stable matches and lower termination rates. Similarly, Bertrand et al. (2019) concluded that director qualifications were better after the introduction of the Norwegian quota. Their explanation is in line with the theory of efficient allocation of resources (Hsieh, Hurst, Jones, & Klenow, 2019).

Overall, scholars have found a small, insignificant impact of the gender quota on firm performance, but a positive impact on social firm behavior.

2.4. The right to non-discrimination and freedom of contract

This article discusses discrimination and anti-discrimination in the workplace. On the one hand, Article 14 of the Human Rights Act prohibits discrimination based on a range of grounds including gender, race, religion, and political views. On the other hand, freedom of contract is a core pillar of contract law all around Europe. Freedom of contract implies that one is free to decide with whom to conclude a contract and to specify the content of the contract. There exists an apparent antithesis between the right not to be discriminated against and the freedom of contract (Besson, 1999).

According to the Coase Theorem (Coase, 1960), freedom of contract is crucial to an efficient exchange when transaction costs are absent or negligible. Two rational parties that voluntarily enter into a contract are expected to maximize their utility by the contract. According to this theorem, limiting the freedom of contract will not enhance welfare. However, there are a handful of reasons for freedom of contract to be rightfully limited. When transaction costs are present, it can be beneficial to impede certain contracts. For instance, the existence of negative externalities, that is a cost suffered by a third party, can make it beneficial not to enforce a contract (Spier & Whinston, 1995). Others have argued that not enforcing a contract can be desirable in case of asymmetric or imperfect information (Aghion & Hermalin, 1990). Another situation in which the prohibition of a contract can be advantageous, is when parties to a contract are biased (Koszegi, 2014). As explained in a previous section, biases can result in discrimination. For this reason, a bias as potential justifiable limitation to the freedom of contract is of importance to this research. Both opponents as well as proponents of anti-discrimination law agree on the statement that such laws interfere with freedom of contract. What they disagree on, is whether or not this interference is justifiable. According to Epstein, anti-discrimination law excessively limits the freedom of contract (Epstein, 1995). Other scholars, such as Besson (1999), view anti-discriminatory measures as necessary limitations to the freedom of contract. If freedom of contract prevails, decision-makers of a company may choose to hire only men as directors if they want. Restricting the choice of the decision-makers by obliging them to hire a certain number of female directors limits the freedom of contract.

In light of this discussion it is crucial to delve deeper into gender quotas and distinguish between different types of quotas. Gender quotas consist of a targets that must be achieved within a specific period of time. This target can be an absolute number or a percentage. In the case of gender policy in boardrooms, European quotas usually aim at a percentage between 30% and 40% of women and men in board seats. The strength of the quota is defined by its sanctions for non-compliance (Selanec & Senden, 2013). Two main types of quotas can be identified. First, a binding quota legally forces firms to have a minimum percentage of each gender on the board at a certain point in time. With a binding quota, non-compliance leads to sanctions. A comply-or-explain quota sets a similar goal for gender representation in boardrooms, but offers more flexibility. In principle, companies subject to such a quota must comply with the target. However, in case the company does not comply, it has to explain publicly why it does not. By the nature of the sanctions, I classify the binding quota as 'hard law' and the comply-or-explain quota as 'soft law'. Given the strictness of the sanctions, I expect the effect of hard law on gender equality to be stronger than the effect of soft law on gender equality.

I argue that, for binding quotas to be a justifiable limit to the freedom of contract, it should be a necessary tool in attaining gender equality. Consequently, if soft gender quotas are significantly less effective than hard gender quotas, one could say that hard gender quotas are necessary tools in achieving gender balance on boards.

2.5. Hypotheses

Based on the information presented in this section, I develop three main hypotheses. The hypotheses are addressed empirically. I test the hypotheses in order to formulate an answer to my main research question:

"How effective are soft gender quotas in comparison to hard gender quotas?"

The first hypothesis I test concerns the effectiveness of gender quotas in general, without distinguishing between the sanctions for non-compliance. Based on the literature previously mentioned, I expect gender quotas to increase female representation and gender balance on company boards.

H1: A gender quota increases female representation and gender balance on company boards

Secondly, considering the hardness of the sanctions and based on the fact that some countries have decided to transform their soft quotas into hard ones, I expect hard quotas to be more effective in increasing gender equality than soft quotas.

H2: The effect of a soft gender quota on gender equality is smaller than the effect of a hard gender quota

Lastly, considering that, in some of the countries, gender quotas can be satisfied by appointing female non-executive directors only, I expect the quotas to have a smaller effect on gender equality among executives. More specifically, I expect the quota effect on female executive directors to be even smaller when quotas are non-binding.

H3: The effect of a gender quota on female executive representation is smaller for soft quotas than for hard quotas

3. Institutional Context

In this paragraph I provide an overview of the institutional background of the four countries I investigate. In order to examine the effect of gender quotas on gender equality, it is essential to get a better idea of what the gender quotas, its sanctions and other relevant factors such as board structure entail in different countries. Corporate boards can have a one-tier or a two-tier structure. In a one-tier board structure, executive directors and non-executive directors are all members of one and the same board. In a two-tier board system, companies have a supervisory board as well as a managing board. The supervisory board supervises the managing board and advises the managing directors.

The countries I focus on in this paper are France, the Netherlands, Norway, and Spain. For the sake of simplicity and comparability, I only focus my study on publicly listed companies, unless stated otherwise.

France: In 2011, the Copé-Zimmermann law was published, which provided the phased introduction of gender balance in French boardrooms. By 2017, at least 40% representation of both genders was required. The quota can be fulfilled by appointing female non-executive directors only. The quota applies to companies listed on the French stock exchange and unlisted joint stock corporations and limited partnerships with over 500 employees and revenues or total assets over 50 million euros. The quota is binding and non-compliance will result in nullification of the appointment and suspension of directors' compensation until gender balance is reached (The French National Assembly, 2021). In France, firms have the possibility to choose either a one-tier or a two-tier board structure. Nonetheless, the one-tier board structure is predominantly used.

The Netherlands: In January 2013, the Management and Supervision Act introduced a gender boardroom target of 30% for Dutch listed companies. Both the executive board and supervisory board of listed companies should consist of at least 30% men and 30% women since 2016. This means that the quota cannot be satisfied by appointing non-executive directors only. This quota has a comply-or-explain character. If a company does not meet this quota, the reason for non-compliance must be explained in its annual report (Luckerath-Rovers, 2015). Although the Dutch House of Representatives adopted a new bill in February 2021 that introduces a binding gender quota for corporate boards, I will not take this binding quota into account due to a lack of data and analyze the data associated with the comply-or-explain quota only. For Dutch companies above a certain size, a two-tier board structure is mandatory. For smaller companies, a one-tier board structure is allowed as well.

Norway: As of January 2008, all Norwegian listed companies must have at least 40% representation of both men and women on the board. This quota is binding, but can be complied with by appointing non-executive directors. Before 2008, Norwegian listed companies were subject to a non-binding gender quota that came into effect in 2005. This means that there was a non-binding quota from 2005-2008. At the start of 2006, however, it was announced that quota would be binding starting from 2008. Therefore I chose 2006 and 2007 as transition period, because it transitioned into the binding quota that it is today. Non-compliance leads to dissolution of the firm. In Norway, both listed and non-listed companies use a one-tier board structure.

Spain: In February 2015, the new Good Governance Code of Listed Companies approved the adoption of a gender quota that requires at least 30% of board members to be represented by each gender by 2020. Companies subject to the quota must comply or explain non-compliance with the target in their annual report. In Spain, listed and non-listed companies use a one-tier board structure. Since the quota applies to the board as a whole, it can be satisfied by hiring non-executive female directors only.

4. Data

In this section, I describe the data and methodology used to address my main research question and test my hypotheses. First, I elaborate on the data selection process. Secondly, I describe the variables used and generated in my paper. Lastly, descriptive statistics are provided.

4.1. Data collection

The goal of this article is to compare the effectiveness of binding and non-binding boardroom gender quotas. As becomes clear from the previous section, national governments are free to decide whether to implement a gender quota and which companies the quota applies to. For the sake of simplicity and interpretability of the results, I choose to focus my analysis on stock exchange listed companies only. One reason for this is that in each of the four countries I selected, the gender quota applies to stock exchange listed companies. Moreover, both financial as well as organizational data is well-documented and complete for publicly listed companies.

Firstly, I created an extensive list of relevant companies in France, the Netherlands, Norway, and Spain over the years 2003 and 2020. A relevant company is a company that has become subject to a legal gender quota at a certain point in time between 2003 and 2020 and was listed on one of the national stock exchanges throughout that whole period. I chose this period because it includes a pre-quota period and a post-quota period for each selected country. For some countries, 2003 is the first year for which detailed data on gender composition and board characteristics was available. Year 2020 is selected because it is the most recent data available. The data on company names, International Securities Identification Numbers (ISIN) and markets, I retrieved from Euronext Paris for France, Euronext Amsterdam for the Netherlands, Euronext Oslo for Norway, and Bolsa de Madrid for Spain. Using historical data from archives of each national stock exchange on listings (and de-listings), I selected companies that are relevant for this research and removed companies that were listed after 2003 from the sample. Since this information was not explicitly available for the Netherlands, I requested information on stock exchange listed companies in 2003 from Euronext Amsterdam.

Secondly, I used each company's ISIN to retrieve data on company and board characteristics from BoardEx. Missing or incomplete data was manually added. Combining all datasets for each country yields a total sample of 92978 observations on director-board-year-level. This means there are 92978 different combinations of board member, firm, and year. On board-year-level, i.e. data on company and board characteristics in a certain company in a certain year, there are 5613 observations.

4.2. Variables

In this sub-paragraph I describe the dependent and independent variables used on director-, board-, and country-level. This subsection reports how the variables are generated, whether they are continuous or categorical and what values they can take on.

4.2.1. Director-level

Dependent variables

Naturally, the most important dependent variable in my study is the variable *Female*. In the dataset retrieved from BoardEx, gender data is provided. Female is indicated by "*F*" and male by "*M*". I manually collected data in case information on the gender of a director was missing. In some cases, data on titles such as Mr or Mrs was available, from which I could infer the gender of a board member. In other cases, I looked at the name or a picture of the director and inferred the gender that way. Using this information, I created binary variable *Female* that takes on value 1 for a female director and value 0 for a male director.

In this research, a distinction has to be made between executive directors (ED) and non-executive directors (NED). The director-level data retrieved from BoardEx includes a variable NED. For non-executive directors, NED is "Yes" and for executive directors, NED is "No". Using this information, I created binary variable *Non-executive* that takes on value 1 when the board member is not part of the executive team and value 0 otherwise. Table A1 in the Appendix shows an overview of different board roles that are considered as executive.

Independent variables

Other variables used are *Age* and *Tenure*. These variables serve as control variables. Information on age and tenure was not available for each director and could not be collected through other means. *Age* is calculated by subtracting the board member's birthdate from the reporting date. Because of the panel nature of the data, this means that for each director that served on a board for several years, *Age* is adjusted according to the reporting year. *Tenure* refers to the years of experience on a particular board. Both variables are continuous.

4.2.2. Company-level

Dependent variables

An important dependent variable on company-level is the gender composition of the board. Data from BoardEx precisely state the gender ratio of each company board in each year. The data from BoardEx show the proportion of men on company boards. Since I use the variable *Female* as a dependent variable on director-level, I transformed the gender ratio into variable *Female ratio* by subtracting the gender ratio from 1. This way, a higher value of *Female ratio* means a higher percentage of female directors on the board. This variable is continuous and can take on every value from 0 to 1. It is important to distinguish between the variable *Female* on director-level and *Female ratio* on firm-level, since the former comments only on the percentage of female directors in a country overall, and the latter on the average percentage of female directors within companies.

Since each country defines its own target representation of both genders in boardrooms, focusing solely on the proportion of female directors relative to their male counterparts, may complicate interpretation of the results. For this reason, I generate variable *Gender balance*, similar to a study conducted by De Cabo et al. (2019). This variable takes on value 1 if a company complies with the legal quota that it is subject to. For example, a company with 35% women and 65% men on the board of directors satisfies the quota in the Netherlands (*Gender balance* = 1) but not in France (*Gender balance* = 0).

Independent variables

In many companies, the number of board members elected is not fixed and may differ from year to year and from company to company. The size of a board may not only affect the absolute number of women elected, but also the proportion of women that are assigned a seat on the board. Companies with larger boards of directors are expected to hire relatively more female directors than those with a smaller board size (Mateos de Cabo, Gimeno, & Nieto, 2009). For this reason, it is important to control for board size when analyzing the effect of gender quotas on female representation in corporate boards. *Number of board members* is a continuous variable.

Another important factor to take into account is the sector that a company operates in. BoardEx provides sector information for each company. *Sector* is a categorical variable. In sectors such as transport, information technology and engineering, women are generally underrepresented in every level of the company (World Economic Forum, 2016). Female representation in the highest level of the organization is expected to be inherently low as well. Not controlling for sector may therefore bias the results. In my total sample, 37 sectors are represented. An overview of all sectors and frequencies can be found in Table A2 in the Appendix.

4.2.3. Country-level

Independent variables

As becomes clear from the institutional context, each country introduced the gender quota at a different time. Generally, governments introduce the gender quota, specify its sanctions, and set a due date for compliance. This means that, from the moment that the gender quota is introduced, companies may (slowly) adapt to the rules that they have to comply with at the due date. This means that for each country, one can specify a pre-quota announcement period, a transition period, and a post-quota period. I created binary variables *Pre, Transition* and *Post* for each country. As an example, for the Netherlands, *Pre* takes on value 1 for observations in year 2003 up to and including 2014 and 0 otherwise. In the beginning of 2014, the Dutch government announced the introduction of the comply-or-explain gender quota and its due date on the 1st of January, 2016. *Transition* therefore equals 1 from 2014 until 2016 and 0 otherwise. Variable *Post* only takes on value 1 for each observation after the 1st of January, 2016.

Furthermore, I created a country dummy for each country in the dataset consisting of all data. For this reason, the combined dataset includes four binary variables, i.e. *France, Netherlands, Norway* and *Spain* that take on value 1 in case the company in question is listed on the stock exchange in that particular country and 0 otherwise.

Lastly, in order to compare soft and hard quota effectives, I created binary variable *Soft*, that equals 1 in case the company in question is listed in the Netherlands or Spain, and 0 otherwise.

4.3. Descriptive statistics

Table 1 shows the descriptive statistics for variables on director-level. It provides a summary of variables *Female, Age, Tenure,* and *Non-executive Director.* Panel A describes the statistics for the combined dataset, and each subsequent panel presents the data of a specific country. Panel A shows that overall, 17.9% of the directors in the sample is female. The average age of board members is approximately 61 and on average board members in the sample occupied a board seat for almost 8 years. The majority of board members is not a part of the executive team, i.e. 94% of the directors are non-executives.

Panel B shows the same director characteristics for France. Between 2003 and 2020, approximately 20% of the French board seats were occupied by women. The average age of a director in France is 61 and board tenure is on average 8 years. Then, 94% of the board members are non-executive. Panel C shows that during the period of interest, approximately 14% of board members in the Netherlands were female. Average director age lies between 62 and 63 years old and tenure was on average 6.2 years. Non-executive directors account for 97.3% of the sample. For Norway, the first country to introduce a quota, average female representation is relatively high. Roughly 38% of all board members between 2003 and 2020 were female. The average age of a director and board tenure are relatively low in Norway, namely 56 and 5 years, respectively. However, in terms of the share of non-executives, Norwegian numbers are similar to those of the other countries. Lastly, only 12.5% of company directors in Spain were female during 2003-2020. The average age is 61 and average tenure 7.9 years. Non-executives account for 88.7% of all observations in Spain.

Table 1. **Summary Statistics – Individual Director Level**

Variables	(1) Obs	(2) Mean	(3) Std. Dev.	(4) Min	(5) Max
Panel A: Total					
Female	92978	0.179	0.383	0	1
Age	70537	61.100	9.222	20	94
Tenure	83380	7.506	6.676	0	52.9
Non-executive Director	92978	0.935	0.247	0	1
Panel B: France					
Female	48989	0.202	0.401	0	1
Age	44554	61.084	9.776	20	94
Tenure	44580	7.916	6.978	0	52.9
Non-executive Director	48989	0.943	0.232	0	1
Panel C: The Netherlands					
Female	15510	0.139	0.346	0	1
Age	12971	62.763	6.670	33	94
Tenure	13957	6.230	5.063	0	49.9
Non-executive Director	15510	0.973	0.163	0	1
Panel D: Norway					
Female	4083	0.377	0.485	0	1
Age	3821	56.331	8.355	20	82
Tenure	3606	5.268	4.646	0	45.9
Non-executive Director	4083	0.975	0.155	0	1
Panel E: Spain					
Female	24396	0.125	0.331	0	1
Age	15725	60.816	8.171	31	88
Tenure	21237	7.863	7.062	0	50.4
Non-executive Director	24396	0.887	0.317	0	1

Notes The number of observations varies within countries since data is missing for some individual characteristics.

The variation in female board representation is to be expected considering the different timing of the quota introduction in each country. For instance, most Norwegian observations are from the post-quota period, whereas most Spanish data are observed in the pre-quota period.

Table 2. **Summary Statistics – Company Level**

Variables	(1) Obs	(2) Mean	(3) Std. Dev.	(4) Min	(5) Max
Panel A: Total					
Female ratio	5613	0.219	0.164	0	0.800
Gender balance	5613	0.235	0.424	0	1
Number of board members	5613	10.573	3.900	3	26
Panel B: France					
Female ratio	3085	0.242	0.165	0	0.800
Gender balance	3085	0.235	0.424	0	1
Number of board members	3085	11.058	4.108	3	25
Panel C: The Netherlands					
Female ratio	752	0.139	0.126	0	0.500
Gender balance	752	0.127	0.334	0	1
Number of board members	752	9.269	2.942	3	22
Panel D: Norway					
Female ratio	532	0.387	0.120	0	0.600
Gender balance	532	0.654	0.476	0	1
Number of board members	532	7.848	2.911	3	25
Panel E: Spain					
Female ratio	1244	0.139	0.122	0	0.571
Gender balance	1244	0.121	0. 327	0	1
Number of board members	1244	11.323	3.547	4	26

Table 2 shows the summary statistics for three company-level variables, *Female ratio, Gender balance* and *Number of board members*. A frequency table of *Sector* is displayed in Appendix A2. In the dataset of 5613 firm-year combinations, the average proportion of females in boards between 2003 and 2020 is 22% and roughly 24% of companies comply with gender balance targets. On average, boards consist of approximately 11 members. The smallest board in the sample has 3 members, and the largest board 26. The average board of a company listed in France consisted of 24.2% females and 23.5% of French companies met target gender balance. For firms listed on the Norwegian stock exchange, the average female ratio was 38.7%, while over 65% of firms complied with gender quota targets. For companies listed in the Netherlands or Spain, an average company board consisted of 13.9% women. In the Netherlands, roughly 13% of companies met gender balance targets, while this was 12% in Spain.

On country-level, the most important descriptive statistics concern the timing of the pre-quota, transition, and post-quota periods and the number of observations per period. Table 3 gives an overview of this information. It should be noted that in Norway the pre-quota period also covers a period of a non-binding quota that was announced in 2004 with a due date in 2005. However, I chose to mark this as pre-quota period as well, since it is in fact the period prior to the binding quota as it is now. Moreover, data on the period prior to the announcement of the soft gender quota, show that the average proportion of women on boards was already 25%[1], which is only slightly lower than the average percentage of women on Norwegian boards in the period that I classified as 'pre-quota'. Given that the period before the announcement of a voluntary gender quota only includes observations of one year, I classified observations in the year 2004 and 2005 as 'pre-quota' as well.

Table 3. **Overview Time Periods and Frequency Table per Country**

	Year	Hard quota	Soft quota	Target representation	Only NED possible	Freq.	Percent
Panel A: Total							
Pre-quota	-	-	-	-	-	40,875	43.96
Transition	-	-	-	-	-	27,921	30.03
Post-quota	-	-	-	-	-	24,182	26.01
Panel B: France							
Pre-quota	2003 – 2010	No	No			16,779	34.25
Transition	2011 – 2016	No	Yes			18,236	37.22
Post-quota	2017 – 2020	Yes	No	40%	Yes	13,974	28.52
Panel C: The Netherlands							
Pre-quota	2003 – 2013	No	No			8,406	54.20
Transition	2014 – 2015	No	No			2,048	13.20
Post-quota	2016 – 2020	No	Yes	30%	No	5,056	32.60
Panel D: Norway							
Pre-quota	2003 – 2005	No	No			242	5.93
Transition	2006 – 2007	No	Yes			268	6.56
Post-quota	2007 – 2020	Yes	No	40%	Yes	3,573	87.51
Panel E: Spain							
Pre-quota	2003 – 2015	No	No			15,448	63.32
Transition	2016 – 2019	No	No			7,369	30.21
Post-quota	2020 – 2020	No	Yes	30%	Yes	1,579	6.47

[1] The data in my sample for Norway in 2003 consists of 118 observations. Summary statistics show that in the period prior to the transition period into a soft gender quota, 25% of the directors in Norway were female. This percentage is the same for non-executive directors. Moreover, similar to the numbers shown in Table 2, there were no female executive directors in Norway in 2003.

To get a rough impression of the effect of a gender quota, Table 4 shows the proportion of female directors, the average female representation on the board and the proportion of companies satisfying gender balance pre-quota (column 1) and post-quota (column 2) for the combined dataset and for each country separately. Moreover, I split the group of female directors into a *Non-executive* and *Executive* group in order to see whether female participation has increased more in one group relatively to the other differences in means are shown in column (3). I perform t-tests to compare means in the two time periods, and two sided P-values are used to calculate the significance levels.

Table 4. **Female Representation and Gender Balance on Boards – Pre-Quota and Post-Quota**

	Pre-quota	Post-quota	
	(1)	(2)	(3)
Variables	Mean	Mean	Mean difference
Panel A: Total			
Female	0.0721	0.3394	-0.267***
Non-executive	0.0754	0.3472	-0.272***
Executive	0.0401	0.1165	-0.076***
Female ratio	0.0903	0.3707	-0.280***
Gender balance	0.0221	0.5928	-0.571***
Panel B: France			
Female	0.0578	0.3726	-0.315***
Non-executive	0.0607	0.3820	-0.321***
Executive	0.0224	0.1533	-0.131***
Female ratio	0.0843	0.4052	-0.321***
Gender balance	0.0040	0.6380	-0.634***
Panel C: The Netherlands			
Female	0.0793	0.2364	-0.157***
Non-executive	0.0823	0.2402	-0.158***
Executive	0.0000	0.1078	-0.108***
Female ratio	0.0780	0.2259	-0.148***
Gender balance	0.0203	0.2928	-0.273***
Panel D: Norway			
Female	0.2644	0.3865	-0.122***
Non-executive	0.2783	0.3957	-0.117***
Executive	0.0000	0.0000	0.000
Female ratio	0.2299	0.4053	-0.175***
Gender balance	0.1860	0.7038	-0.518***
Panel E: Spain			
Female	0.0807	0.2685	-0.188***
Non-executive	0.0849	0.2784	-0.194***
Executive	0.0558	0.0864	-0.031***
Female ratio	0.0967	0.2649	-0.168***
Gender balance	0.0373	0.4483	-0.411***

Notes: Column (1) reports summary statistics for directors and companies prior to the introduction of a corporate gender quota. Column (2) shows summary statistics for directors and companies after a corporate gender quota was in place. Column (3) reports the differences in means (Mean(Pre-Quota) – Mean(Post-Quota)). The results of the t-tests are indicated by the following significance levels: *** p<0.01, ** p<0.05, * p<0.1.

In each panel of Table 4, it is clearly visible that the probability that a director is female is significantly higher in the post-quota period than in the pre-quota period. Overall, the largest difference is observed in France and the smallest in Norway. In each country but Norway, there is a significant increase in the proportion of female board members among both executive as well as non-executive directors, although this increase is smaller for executives. In Norway, no significant change in female representation among executives is observed, since there are no women in executive director positions prior to and after the quota.

For each country, the female ratio on company boards and the proportion of companies complying with gender balance targets are also significantly higher in the post-quota period than before the introduction of a quota. The numbers on female representation roughly correspond to the numbers presented by the European Commission (European Commission, 2019).

5. Methodology

In this section, I describe the empirical approach I use to examine the effect of binding and comply-or-explain gender quotas on gender equality. Each model is estimated by a simple Ordinary Least Squared (OLS) regression, using *Female, Female ratio,* or *Gender balance* as dependent variable.

For *Female* and *Gender balance,* the model is a linear probability model since the variables are binary. This means that the estimated coefficients are interpreted as the change in the probability that a director is female (*Female* =1) or that a company achieves gender balance (*Gender balance* = 1) given a certain value of my variable of interest, holding constant other predicting variables. There is an ongoing debate regarding the suitability of the linear approach for a binary dependent variable. Nevertheless, when the dataset satisfies certain criteria mentioned in the next paragraph, the arguments against the linear probability do not hold

(Hellevik, 2009). I choose to use the linear probability model since the greatest advantage of this approach is its convenient interpretation, as opposed to other methods. However, I estimate probit models as well in order to verify the robustness of my results to an alternative estimation method.

It should be noted that these three dependent variables are consistently used throughout the analyses. In sub-section 5.1, I will explain all models and their interpretation with each dependent variable separately (models 1 to 3). However, although I conduct each analysis with all three dependent variables, I will mainly explain the models using *Female* as dependent variable in sub-section 5.2.

5.1. The effectiveness of gender quotas

To begin with, I examine the effect of gender quotas in general, without distinguishing between the different sanctions for non-compliance.

$$Female_{it} = \beta_0 + \beta_1 Post_t + \boldsymbol{X}_{it} + \boldsymbol{V}_{ct} + + e_{it} \qquad (1)$$

In equation 1, β_0 is the constant. Variable $Post_t$ denotes whether or not the gender quota applies and captures the change in probability that a director is female after introduction of the quota. I compare the post-period with the pre-period, and leave out the transition period. If gender quotas increase the probability of a director being female, coefficient β_1 should be positive. Moreover, $\boldsymbol{X_{it}}$ is a vector of control variables on individual level including age and tenure and $\boldsymbol{V}_{ct}$ is a vector of company-specific control variables including sector and size of the board. The error term is denoted by e_i.

Another dependent variable of interest is the *Female ratio*. In contrast to variable *Female*, *Female ratio* takes into account that board sizes differ. If a female director replaces a man in a 3-person board and female director replaces a man in a 26-person board, the effect of both hires on variable *Female* is equal. However, in terms of gender equality on boards, the former hire is more impactful than the latter. *Female ratio* captures the effect of an additional female director relative to the number of men on the board. Since *Female ratio* is a continuous variable, I can use a linear regression model shown in specification (2) without having to take into account the potential risks of using such a model in case of a binary dependent variable.

$$Female\ ratio_{ct} = \beta_0 + \beta_1 Post_t + \boldsymbol{V}_{ct} + e_{ct} \qquad (2)$$

Model 2 is the second basic model. Again, β_0 is the constant. Variable $Post_t$ denotes the time period. If gender quotas are effective in enhancing gender equality, coefficient β_1 should be positive and the error term is denoted by e_i. Control variables including board size and sector are captured by $\boldsymbol{V}_{ct}$.

A potential risk of using models 1 and 2 is the difference in target representation of both genders on boards. France and Norway use a target representation of 40% whereas the Netherlands and Spain aim at 30% of each gender on corporate boards. Although I focus my analysis on relative changes in female representation on boards and not on absolute percentages, I am of the opinion that it is crucial to control for the differences in target representation. In order to control for this, I use gender balance as envisioned by national governments as dependent variable.

$$Gender\ balance_{ct} = \beta_0 + \beta_1 Post_t + \boldsymbol{V}_{ct} + e_{ct} \qquad (3)$$

Model 3 is the third basic model used to verify whether or not gender quotas in general enhance gender equality. As is the case with the *Female* variable in model 1, *Gender balance* is a binary variable. This means that model 3 takes the form of a linear probability model. The coefficient of interest, β_1 represents the change in the probability that a company satisfies gender balance (*Gender balance* = 1) after the introduction of a quota relative to prior to the quota, holding constant other predicting variables. Again, I estimate a probit model to check the robustness of my result.

5.2. Hard quotas versus soft quotas

5.2.1. Comparing countries

Secondly, I investigate the effect of a gender quota for each country separately. A first approach could be to focus on the change in female representation on boards in a certain country before and after the quota. However, there may be a trend, independent from the quota, that affects the number of female directors and as such biases the results. Pooling data on multiple countries allows me to control for such a trend. I include an interaction term that captures solely the effect of a quota in a specific country (Ferreira, Ginglinger, Laguna, & Skalli, 2017). Below I present the models developed for each country separately.

Model 4 captures the change in probability that a director is female after the introduction of the gender quota in France. In this model, *PostFrance* indicates the post-quota period for France. Similarly, in models 5, 6 and 7, this first variable denotes the post-quota period for the specific country of interest. In model 4, β_1 captures the general change in female participation after 2016, the French post-quota period. *France* is a dummy variable that equals 1 if the observation is of a company listed on the French stock exchange, and 0 otherwise. This variable captures the baseline difference of female representation of France compared to the other countries. The most interesting variable, however, is the interaction term *France x PostFrance*. This difference-in-difference estimator presents the change in probability that a director is female in France, after the quota, relative to other countries and previous periods. In other words, in case the positive effect of the gender quota is relatively large in France, β_3 should be positive.

$$Female_{it} = \beta_0 + \beta_1 PostFrance_t + \beta_2 France + \beta_3 France * PostFrance_t + \boldsymbol{X}_{it} + \boldsymbol{V}_{ct} + e_{it} \quad (4)$$

In specification 5, a similar model is estimated for the Netherlands. In case the effect of a gender quota is smaller if the quota has a comply-or-explain character rather than a binding one, one could expect the interaction coefficient, β_3 to be negative.

$$Female_{it} = \beta_0 + \beta_1 PostNetherlands_t + \beta_2 Netherlands + \beta_3 Netherlands * PostNetherlands_t + \boldsymbol{X}_{it} + \boldsymbol{V}_{ct} + e_{it} \quad (5)$$

In model 6, the same method is used to estimate the effect of the Norwegian gender quota. Since it has been shown that Norway already had a relatively high female director proportion prior to the introduction of a (soft) quota, I expect β_3 to be rather small, or perhaps even negative, even though the quota that is in place now is binding.

$$Female_{it} = \beta_0 + \beta_1 PostNorway_t + \beta_2 Norway + \beta_3 Norway * PostNorway_t + \boldsymbol{X}_{it} + \boldsymbol{V}_{ct} + e_{it} \quad (6)$$

For Spain, the expected outcome is rather similar to the expected outcome for the Netherlands. Specification 7 presents the estimated model for companies listed on the Spanish stock exchange.

$$Female_{it} = \beta_0 + \beta_1 PostSpain_t + \beta_2 Spain + \beta_3 Spain * PostSpain_t + \boldsymbol{X}_{it} + \boldsymbol{V}_{ct} + e_{it} \quad (7)$$

In each model, control variables are added on individual level and on company or country level. Moreover, all four specifications are also estimated using *Female ratio* and *Gender balance* as dependent variable. Lastly, probit models are estimated for *Female* and *Gender balance* as well.

5.2.2. Comparing hard and soft law

The most important part of my analysis focuses on the distinction between hard quotas and soft quotas. In model 8, a difference-in-difference specification similar to the ones in the previous section is presented. Here, *Post* reflects the introduction of a gender quota. *Soft* represents the Netherlands and Spain. *Post x Soft* is the most important variable in this model. This variable denotes whether the probability that a director is female after the introduction of a quota is higher or lower in countries with a soft quota compared to those with a hard quota. In other words, I expect β_3 to be (significant and) negative, supporting the hypothesis that hard quotas are more effective in achieving gender equality than soft quotas.

$$Female_{it} = \beta_0 + \beta_1 Post_t + \beta_2 Soft_c + \beta_3 Post_t * Soft_c + \beta_4 Year_t + \boldsymbol{X} + \boldsymbol{V}_{ct} + e_{ict} \quad (8)$$

In the models comparing soft quotas with hard quotas, I also add the control variables that were mentioned in the previous sub-section. Additionally, since not all quotas are introduced at the same time I add a control variable *Year*, controlling for time-varying factors that may affect gender representation on boards. For instance, changing attitudes towards gender equality may result in a tendency to hire more women on boards over time regardless of the quotas.

The same specification is estimated using a probit model, rather than a linear probability approach. Furthermore, specification 8 is also estimated using *Female ratio* as dependent variable. For the sample used in this study, the countries with hard quotas aim at 40% female representation on boards, whereas the soft quotas are associated with a target of 30%.

Controlling for differences in target representation is therefore even more important in this specification than in previous models. For this reason, I emphasize the importance of estimating model 9, with *Gender balance* as dependent variable.

$$Gender\ balance_{ct} = \beta_0 + \beta_1 Post_t + \beta_2 Soft_c + \beta_3 Post_t * Soft_c + \beta_4 Year_t + \boldsymbol{V}_{ct} + e_{ct} \quad (9)$$

In model 9, the coefficient of interest is β_3. A negative coefficient indicates a weaker effect of soft gender quotas than hard quotas on gender balance. In case the effect of both types of quotas is similar, β_3 cannot be significantly different from zero. Since *Gender balance* is a binary variable, I also estimate a probit model to check the robustness of the predictions of model 9.

5.2.3. Executive gender equality

For companies listed in France, Norway, and Spain it is possible to satisfy the gender quota by appointing non-executive directors only. In order to investigate whether a boardroom gender quota may actually break the old boys' network and result in more gender equality in companies, I estimate two models using *Female* as dependent variable for a sample of executive directors only. The first model estimated for executives only is specified below (model 10). Since the Netherlands is the only country for which the gender quota applies specifically to the executive board as well, I also estimate this model for a sample excluding companies listed in the Netherlands.

$$Executive\ Female_{it} = \beta_0 + \beta_1 Post_t + \boldsymbol{X}_{it} + \boldsymbol{V}_{ct} + +e_{it} \quad (10)$$

Lastly, I estimate a difference-in-difference model similar to specification 8. Here, the analysis is conducted for executive directors only. For the same reasons mentioned above, this model is estimated twice; once including companies listed on the Dutch stock exchange, and once excluding these companies.

$$Executive\ Female_{it} = \beta_0 + \beta_1 Post_t + \beta_2 Soft_c + \beta_3 Post_t * Soft_c + \beta_4 Year_t + \boldsymbol{X}_{it} + \boldsymbol{V}_{ct} + e_{ict} \qquad (11)$$

Given the binary nature of the dependent variable, I also estimate these models using a probit regression to check the robustness of my results.

6. Results

In this section, I present the results of my study. Throughout my research, I use three different dependent variables. Two dependent variables, *Female* and *Gender balance* are binary. In order to test the hypotheses, I perform Ordinary Least Squares (OLS) regressions. All models include robust standard errors, which are shown in parentheses. With a binary dependent variable, this estimation follows a linear probability approach. As briefly mentioned before, various arguments against the use of such models have been formulated. The arguments concern the non-normality and heteroscedasticity of error terms and the unboundedness of predicted probabilities. Non-normality of error terms and heteroscedasticity may make the least squares approach inefficient, while unbounded probabilities can lead to nonsensical predictions, which means values smaller than zero or larger than one (Maddala, 1986). To address these issues, the linear probability models include robust standard errors. These heteroscedastic corrected standard errors take heteroscedasticity into account. Furthermore, a non-normal distribution of error terms is of minor concern since the sample size is large. This means that a linear probability model can be used in case no nonsensical values are predicted. The linear probability model with its intuitive interpretation of differences in probabilities is then at least as suitable as a probit model (Hellevik, 2009). Nevertheless, I also estimate probit models for the binary dependent variables as a robustness check.

6.1. The effectiveness of gender quotas

Model 1, 2, and 3 address the effectiveness of gender quotas in general, without distinguishing between sanctions. In column (1) and (2) of Table 5 I used binary variable *Female* as dependent variable, in column (3) and (4) *Female ratio* and in column (5) and (6) *Gender balance*. Column (1), (3) and (5) show results of the regressions without statistical controls. In the even-numbered columns, control variables are added to the models. As becomes clear from the *Post* coefficients, adding control variables does not lead to substantial changes in the relationship between *Post* and each dependent variable. I will focus the interpretation of my results on the models with control variables included. Moreover, the constant will not be interpreted in most cases since this does not give any information about the effectiveness of gender quotas and is meaningless without the interpretation of control variables.

Table 5**. OLS Regression Results models 1-3**

Variables	(1) *Female*	(2) *Female*	(3) *Female ratio*	(4) *Female ratio*	(5) *Gender balance*	(6) *Gender balance*
Post	0.217*** (0.00329)	0.219*** (0.00375)	0.219*** (0.00371)	0.224*** (0.00378)	0.515*** (0.0126)	0.513*** (0.0132)
Constant	0.122*** (0.00125)	0.752*** (0.0127)	0.152*** (0.00209)	0.138*** (0.00702)	0.0776*** (0.00429)	0.0904*** (0.0183)
Individual controls added	NO	YES	NO	NO	NO	NO
Company controls added	NO	YES	NO	YES	NO	YES
Observations	92,978	61,085	5,613	5,232	5,613	5,232
R-squared	0.062	0.136	0.378	0.390	0.313	0.314

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

In column (2) of Table 5, the *Post* coefficient shows that on average, the probability of a director being female in the countries of interest is 21.9 percentage points higher after the introduction of gender quotas compared to before. This is a significant difference. Secondly, column (4) presents a *Post* coefficient of 0.224, implying that the average representation of women within a board was 0.224 higher after quotas were in place compared to before. Lastly, in column (6) it is shown that the probability of companies achieving gender balance according to national standards[2], is 51.3 percentage point higher after rather than before the quota, keeping all else constant. The results of all three models suggest that gender quotas increase the number and proportion of female directors. Using a linear probability approach for model 1 and 3 is appropriate in this study, if and only if there are no nonsensical predictions. Table A3 in the Appendix shows a complete overview of all coefficients, including the ones for control variables. For all possible input variable combinations, predictions for *Female* and *Gender balance* are not lower than 0 or higher than 1, which means that the model does not result in nonsensical predictions.

Table 6. **Probit Regression Results models 1 and 3**

Variables	(1) *Female*	(2) *Female marginal effects*	(3) *Gender balance*	(4) *Gender balance marginal effects*
Post	0.793*** (0.0130)	0.184*** (0.0023)	1.638*** (0.0450)	0.363*** (0.0059)
Constant	1.273*** (0.0488)		-1.336*** (0.0870)	
Individual controls added	YES		NO	
Company controls added	YES		YES	
Observations	61,085	61,085	5,232	5,232

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

[2] France: 40%-60% of each gender represented on the BOD
The Netherlands: 30%-70% of each gender represented on the BOD
Norway: 40%-60% of each gender represented on the BOD
Spain: 30%-70% of each gender represented on the BOD

Even though a linear probability model can be used, I also estimate probit models for *Female* and *Gender balance*. The results of the probit models are presented in Table 6. Column (1) and (3) reflect the outcome of the probit models. From this table, it becomes clear that the quota increases the probability that a director is female, at the 1% significance level. Moreover, the probability that a company satisfies gender balance is also significantly higher after the introduction of the quotas.

The marginal effects of the quota must be analyzed in order to interpret the size of the coefficients. Column (2) and (4) therefore give marginal effects, using the pre-quota period as a baseline. Compared to the pre-quota period, it is 18.4% more probable that a director is female in the post-quota period, and it is 36.3% more likely that a company satisfies the gender balance criteria. Although the magnitude of the effects in the probit model cannot be interpreted in the same way as the coefficients of the linear probability model, the results show a similar pattern. The results support hypothesis 1.

6.2. Hard quotas versus soft quotas

6.2.1. Comparing countries

In this sub-section, I show the results of regressions that compare the effectiveness of gender quotas in different countries. Here, I expect the increase in female participation on boards to be larger for France and Norway than for the Netherlands and Spain, considering the hardness of the quota in the first two countries.

Table 7 presents the models 4, 5, 6 and 7. The first column corresponds to France, the second one to the Netherlands, the third one to Norway and the fourth one to Spain. In column (1), the coefficient for *Post* can be interpreted as the increase in the probability that a director in a country is a woman after the introduction of the French quota (i.e. after 2016). Moreover, there is a 2.33 percentage point higher probability for a director to be female in France compared to other country, regardless of the quota. In this table, the coefficient for *Post x Country* is the coefficient of interest. The coefficient must be interpreted as the change in the probability that a director is female in the post-quota period in the country of interest (the treated group) relative to the non-treated group. By including this interaction term, I control for the possibility that there exists a trend that affects the outcome variable, independently from the introduction of a gender quota. The interaction coefficient 0.117 for France should therefore be interpreted as a 11.7 percentage point higher probability of a director being female in France after the introduction of the French quota compared to other countries. In column (2), the interaction coefficient for the Netherlands is equal to -0.0496. In this linear probability model, this is interpreted as a 4.96 percentage point lower probability of a director being female in the Netherlands after the introduction of the quota compared to other countries. It should be noted, however, that this does not mean that the effect of the quota on female participation in the board is negative. The probability that a director is female is higher after the introduction of the quota than before (indicated by the substantial and significant positive coefficient for *Post-quota country*. Yet, in order to compare this effect for the Netherlands to other countries, the post quota-effect must be adjusted downward by the predicted coefficients for *Country* and *Post x Country*. A similar result is shown in column (4), concerning the Spanish quota. This means that, compared to the other countries, the quota did not increase the percentage of women on the board as much. Also for Norway, the interaction coefficient is significantly negative. A possible explanation for this could be the high baseline female participation for Norway (see Table 4 Panel D), and the fact that Norway is generally considered to be one of the more progressive countries with respect to gender equality. A quota there may not affect gender equality as much as in less progressive countries.

Similar results are found in the probit regression (see Table A6 in the Appendix). The only difference is that the Spanish post-quota effect is insignificant. Moreover, a similar pattern is observed when *Female ratio* is used as dependent variable (see Table A7 in the Appendix).

Table 7. **Difference-in-difference OLS Regression Results models 4-7**

Variables	(1) FRANCE *Female*	(2) NETHERLANDS *Female*	(3) NORWAY *Female*	(4) SPAIN *Female*
Post-quota country	0.128***	0.211***	0.189***	0.202***
	(0.00566)	(0.00385)	(0.00286)	(0.00781)
Country	0.0233***	-0.0334***	0.219***	-0.0893***
	(0.00325)	(0.00388)	(0.0200)	(0.00389)
Post x Country	0.117***	-0.0496***	-0.125***	-0.0478**
	(0.00746)	(0.00825)	(0.0217)	(0.0203)
Constant	0.801***	0.794***	0.678***	0.866***
	(0.0129)	(0.0128)	(0.0128)	(0.0129)
Individual controls added	YES	YES	YES	YES
Company controls added	YES	YES	YES	YES
Observations	61,085	61,085	61,085	61,085
R-squared	0.136	0.137	0.109	0.096

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

At this point it is important to re-emphasize the importance of taking into account the differences in target gender representation. For this reason, running the same regression with *Gender balance* as dependent variable, is crucial.

In Table 8, the linear probability model, controlling for time trends and using gender balance as dependent variable is presented. For each country, *Post x Country* represents the effect of the gender quota in that specific country compared to other countries. The effect is largest in France, where the change in the probability of a company complying with gender balance is larger than in the other countries. In the Netherlands, the quota affects gender balance significantly less than in other countries, even though the Dutch baseline gender balance is relatively low (Table 4 Panel C). The effects of the quotas on gender balance in Norway and Spain do not significantly differ from the effects in other countries.

Table 8. **Difference-in-difference OLS Regression Results models 4-7**

Variables	(1) FRANCE *Gender balance*	(2) NETHERLANDS *Gender balance*	(3) NORWAY *Gender balance*	(4) SPAIN *Gender balance*
Post-quota country	0.227***	0.412***	0.223***	0.374***
	(0.0206)	(0.0137)	(0.00761)	(0.0295)
Country	-0.101***	-0.0726***	0.374***	-0.132***
	(0.0105)	(0.0114)	(0.0537)	(0.0116)
Post x Country	0.339***	-0.156***	0.0893	-0.0293
	(0.0270)	(0.0335)	(0.0582)	(0.0641)
Individual controls added	NO	NO	NO	NO
Company controls added	YES	YES	YES	YES
Constant	0.269***	0.209***	0.0374*	0.359***
	(0.0210)	(0.0214)	(0.0208)	(0.0209)
Observations	5,232	5,232	5,232	5,232
R-squared	0.241	0.226	0.152	0.083

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

For the sake of robustness, a probit model is estimated as well. The results of the probit regression can be found in Table A9 in the Appendix. For France and Spain, a result similar to that in Table 8 is observed in the probit model. However, in contrast to the linear probability model results for the Netherlands, the probit marginal effects do not show a significantly different effect of the quota on gender balance in the Netherlands compared to other countries. For Norway, the opposite pattern is observed. In the probit regression, a significant negative marginal effect is observed for Norway. This means that it is not clear-cut whether the Dutch and Norwegian quotas increased gender balance as much as quotas in other countries did. Overall, however, I conclude that in France, female representation in boards increased most strongly as a result of the gender quota compared to other countries. The positive effect of gender quotas is smaller in the Netherlands, Norway, and Spain.

6.2.2. Comparing hard and soft law

The next part of my analysis compares the effect of soft gender quotas and hard gender quotas on gender equality. Table 9 shows the empirical results of model 8. All three dependent variables are represented in the table. Column (1) and (2) present results for the model with *Female* as dependent variable. Column (3) and (4) show results for the effect of quotas on *Female ratio* and column (5) and (6) the effect on *Gender balance*. In each even-numbered column, *Year* is added to the model to control for factors affecting the dependent variables over time.

The output for *Post* shows that in any case, the introduction of a quota increases the probability of a director being female, the average proportion of women on boards and the probability that a company complies with the target gender representation. *Soft* shows that for countries with soft quotas, the baseline female participation is significantly lower than for hard quota countries. There is no significant difference in gender balance.

The interaction term between *Post* and *Soft* is the main focus of this part. This coefficient denotes the quota effect on gender equality for soft quotas only. As becomes clear from the third row in the table, the probability of a director being female after the introduction of a soft quota is significantly lower than the probability of a director being female after the introduction of a hard law quota. Controlling for *Year* does not alter this result. The coefficient in column (2) describes that this probability increases with 6.29 percentage points less compared to hard quotas. Similarly, the female ratio increases significantly less after the introduction of a soft quota compared to a hard quota. The difference in probability is 0.124. Lastly, especially the effect of a quota on gender balance differs for soft and hard quotas. In column (6), it is shown that the probability of a company achieving gender balance after the introduction of a quota is 35.3 percentage points lower for companies subject to a soft quota compared to those subject to a hard quota.

Table 9. **Difference-in-difference OLS Regression Results models 8-9**

Variables	(1) *Female*	(2) *Female*	(3) *Female ratio*	(4) *Female ratio*	(5) *Gender balance*	(6) *Gender balance*
Post	0.230***	0.0976***	0.238***	0.137***	0.587***	0.487***
	(0.00447)	(0.00552)	(0.00429)	(0.00529)	(0.0159)	(0.0194)
Soft	-0.0450***	-0.0593***	-0.0439***	-0.0650***	0.0101	0.00140
	(0.00311)	(0.00308)	(0.00468)	(0.00387)	(0.0104)	(0.00987)
Post x Soft	-0.0695***	-0.0629***	-0.118***	-0.124***	-0.348***	-0.353***
	(0.00799)	(0.00794)	(0.00917)	(0.00866)	(0.0326)	(0.0324)
Individual controls added	YES	YES	NO	NO	NO	NO
Company controls added	YES	YES	YES	YES	YES	YES
Year		0.0158***		0.0125***		0.0106***
		(0.000320)		(0.000394)		(0.00110)
Constant	0.760***	-35.30***	0.166***	-29.46***	0.0910***	-29.14***
	(0.0128)	(0.761)	(0.0110)	(0.909)	(0.0314)	(2.845)
Observations	61,085	61,085	4,398	4,398	4,398	4,398
R-squared	0.143	0.169	0.467	0.579	0.342	0.358

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

The results of the first and third specification are robust to a probit approach. Table 10 shows the results of the probit model using both binary variables (*Female* and *Gender balance*) as dependent variables. The table includes marginal effects for the independent variable of interest, *Post x Soft*. The coefficients corresponding to the interaction term show that the effect of a gender quota on the probability that a director is female (column (1) and (2)) and on the probability that a company complies with gender balance (column (3) and (4)) is significantly lower if the quota has a comply-or-explain character rather than a binding character. The results in this section are in line with hypothesis 2, stating that the effect of a soft gender quota on gender equality on boards of directors is smaller than the effect of a hard gender quota.

Table 10. **Difference-in-difference Probit Regression Results models 8-9**

Variables	(1) *Female*	(2) *Female marginal effects*	(3) *Gender balance*	(4) *Gender balance marginal effects*
Post	0.172***		1.359***	
	(0.0205)		(0.0742)	
Soft	-0.339***		-0.00471	
	(0.0186)		(0.0686)	
Post x Soft	-0.1071***	-0.023***	-0.989***	-0.204***
	(0.0498)	(0.0067)	(0.110)	(0.0218)
Individual controls added	YES	YES	NO	NO
Company controls added	YES	YES	YES	YES
Constant	-182.1***		-174.3***	
	(4.093)		(16.02)	
Observations	61,085	61,085	4,398	4,398

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

6.2.3. Executive gender equality

In this last sub-section, results of the regressions for executive directors only are displayed. As most countries can comply with gender quotas by appointing female non-executive directors only, these results show whether or not gender quotas also lead to more gender equality in board roles that are not necessarily targeted by the gender quota. Column (1) in Table 11 represents regression 10 and shows the effect of gender quotas on the probability that an executive director is female. Column (2) shows the results of the same regression, excluding companies listed in the Netherlands, since the Dutch gender quota applies to executive directors as well.

The *Post* coefficient in column (1) shows that the probability that an executive director is female, is 6.43 percentage points higher after the introduction of a gender quota than before. This coefficient is roughly the same when the Netherlands is excluded from the sample, namely 6.81 percentage points, suggesting that gender quotas have positive spillover effects on executive directors, who are not necessarily targeted by the quota. These numbers are substantially lower than 21.9 percentage points, which reflects the increase in the probability that a director in general is female after the introduction of a quota (see Table 5 column (2)).

This means that the quotas, regardless of the hardness of their sanctions, increase female representation among executive directors less than among directors in general.

In column (3), the results for the difference-in-difference analysis of model 11 are displayed. The coefficient for *Post x Soft* shows that the effect of gender quotas on the probability that a director is female is significantly smaller for countries with soft quotas compared to hard quotas. If the Netherlands is excluded from the sample, this difference is even larger. This means that, in comparison to countries making use of hard gender quotas, countries using soft quotas experience a smaller increase in female executive representation after introduction of the quota. The magnitude of the difference is larger in absolute terms when looking at the group of executive directors only (-0.131), compared to looking at the changing probability of a director to be female in general (-0.0629). This suggests that the probability of an executive director being female increases relatively less after the introduction of a soft quota than the probability of a director being female, taking into account non-executive directors as well. These results support the third hypothesis.

Table 11. **Difference-in-difference OLS Regression Results models 10-11**

Variables	(1) *Female*	(2) *Female excl. Netherlands*	(3) *Female*	(4) *Female excl. Netherlands*
Post	0.0643***	0.0681***	0.0304*	0.0283*
	(0.0134)	(0.0144)	(0.0161)	(0.0165)
Soft			-0.00103	0.0137
			(0.00894)	(0.0108)
Post x Soft			-0.0979***	-0.1310***
			(0.0200)	(0.0197)
Individual controls added	YES	YES	YES	YES
Company controls added	YES	YES	YES	YES
Year			0.00575***	0.00588***
			(0.000895)	(0.000966)
Constant	0.364***	0.383***	-11.17***	-11.43***
	(0.0393)	(0.0409)	(1.790)	(1.933)
Observations	3,562	3,311	3,562	3,311
R-squared	0.048	0.051	0.060	0.062

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

7. Concluding Remarks

In this section, I discuss the main findings of my research. Moreover, I elaborate on the limitations of my study and I briefly mention suggestions for future research.

7.1. Discussion of findings and implications

This paper examines the effectiveness of boardroom gender quotas and focuses on the difference in effectiveness between soft quotas and hard quotas. As a response to the persisting gender inequality in boardrooms, several European countries installed gender quotas. Gender quotas can be classified as soft law when they have a comply-or-explain character, and as hard law when they are binding. Companies subject to a comply-or-explain quota must either comply with the quota or explain the reason for non-compliance in their annual statement. The Netherlands and Spain use such quotas. For companies subject to a binding quota, non-compliance results in nullification of the appointment and suspension of director compensation until gender balance is reached (France) or even dissolution of the company (Norway).

Gender quotas are examples of anti-discrimination rules. A company that must comply with a binding gender quota is not free to appoint a male director if women are underrepresented in the board and the quota is not met. By definition, such measures conflict with the freedom of contract (Besson, 1999). Some scholars argue that anti-discriminatory measures are necessary limits to the freedom of contract (Besson, 1999), while others disagree (Epstein, 1995). In deciding whether or not a hard gender quota is necessary, I argue that one should investigate whether a softer alternative has the same effects. In other words, in case hard quotas are significantly more effective than their soft counterparts in enhancing gender equality, one could say that they are a necessary limit to the freedom of contract. If, on the contrary, soft quotas are equally effective, the hardness of binding gender quotas might be excessive. The objective of this article is to examine the effectiveness of soft gender quotas in comparison to hard gender quotas.

Using data retrieved from BoardEx on board composition of companies listed on the stock exchange in France, the Netherlands, Norway, and Spain, I analyze the change in probability of a director being female, a company reaching gender balance and in the percentage of women on boards after the introduction of a quota.

To begin with, I find that gender quotas increase female representation on boards significantly. Compared to before the introduction of quotas, the probability that a director is female increased with 0.219 after a quota was installed. On average, the female-to-male ratio on boards increased by 0.224 and the likelihood that a company satisfied gender balance according to the country it was listed in, increased by 51.3 percentage points. These results support the idea that a quota helps breaking the glass ceiling by providing women with more opportunities to enter the boardroom.

Secondly, I find that the effect of the gender quota on gender equality is largest in France. Since France is a country that introduced a hard gender quota, this result suggests that hard quotas may be more effective than soft quotas. Although Norway uses a hard quota as well, its gender quota effect is not as large as in France. Nevertheless, this could be attributed to the progressive gender culture in Norway prior to introduction of the quota. To verify whether hard and soft quotas affect gender equality differently, I conducted the analysis for soft law countries as opposed to hard law countries. This analysis showed that, indeed, soft quotas are significantly less successful in increasing female participation on boards compared to hard quotas. This means that, even with a high baseline gender equality for Norway, hard quotas are more effective in reaching gender equality than soft quotas. This supports hypothesis 2.

Lastly, I find that introducing gender quotas also increases the probability that an executive director, although not necessarily targeted by the quota, is female. The effect of a gender quota on female representation in the executive team is substantially lower than on female representation in boards in general. Yet, gender quotas may still help to break an old boys' network present in the executive team. However, the effect of soft quotas on the likelihood that an executive director is female is significantly smaller than the effect of hard quotas. This means that the positive spillover effects of a gender quota are substantially smaller when the quota has a comply-or-explain character.

All in all, I conclude that, although soft quotas positively affect gender equality, their effect is smaller than the effect of hard quotas. Practically, this implies that hard gender quotas seem to be necessary limits to the freedom of contract, in order to reach gender balance on corporate boards and break the old boys' network. From a policy perspective, the introduction of hard gender quotas is justifiable in the pursuit of gender equality. These findings support the transformation of soft quotas into hard quotas in, for example, Norway and the Netherlands.

7.2. Limitations and recommendations for future research

One limitation of my study is that in pooling the data, the magnitude of the partial sample for each country is not taken into account. As becomes clear from the descriptive statistics, the pooled dataset consists mostly of French observations. For this reason, French data affect the results of the pooled analyses to a larger extent than e.g. Norwegian data, which could over- or underestimate the magnitude of the results. Future research could take this into account by controlling for the size of the sub-sample per country on the pooled dataset.

Another limitation of this study concerns selection bias and the possibility of companies to avoid the quota. In the Netherlands, Norway and Spain, companies can delist in order to not be subjected to the quota. In France this is not possible since the quota also applies to non-listed companies. Since in my sample, I have only selected companies that were listed each year between 2003 and 2020, I do not have data on companies that have delisted before or at the due date of a gender quota. It is possible that firms that were reluctant to hire more women on their boards, delisted as a way to avoid being forced to do so. If this is the case, my results may be biased, either because the baseline gender balance on boards used in my sample was too high and therefore the effect of the quota is underestimated, or because compliance with the quota was in reality lower than in my dataset, which may overestimate the results. An interesting avenue for future research would therefore be to investigate the board characteristics of companies that delisted in this around the due date of the quota and the reasons for delisting.

Moreover, in my study I specified representation of women on boards (executives and non-executives) as indicator for gender equality. However, gender equality consists of other aspects as well. For instance, another measure of equality can be the payment of board members. Appointing more women on boards and reaching gender balance by meeting a target percentage, does not necessarily imply equal payment. Future research must be conducted to examine whether allowing more women to take board seats also results in gender balance with respect to payment. Moreover, it would be interesting to investigate what the effect is of gender quotas on female representation in the company as a whole. Since women at the top may serve as a role model for other women, forcing more women to be on boards may lead to more women being present in all levels of the hierarchy.

Appendix

Table A1. **Classification of non-executive directors**

Board Role
Executive Director
(Co)-CEO
(Co)-CFO
(Co)-COO
(Co)-Chairman (Executive)
Secretary
Vice President
Other

Table A2. **Tabulation of Sector**

Sector	Freq.	Percent
Aerospace & Defense	76	1.00
Automobiles & Parts	292	3.86
Banks	347	4.58
Beverages	134	1.77
Business Services	190	2.51
Chemicals	224	2.96
Clothing & Personal Products	199	2.63
Construction & Building Materials	436	5.76
Containers & Packaging	15	0.20
Diversified Industrials	143	1.89
Electricity	56	0.74
Electronic & Electrical Equipment	246	3.25
Engineering & Machinery	381	5.03
Food & Drug Retailers	94	1.24
Food Producers & Processors	244	3.22
Forestry & Paper	39	0.52
Health	221	2.92
Household Products	95	1.25
Information Technology & Hardware	202	2.67
Insurance	134	1.77
Investment	69	0.91
Leisure & Hotels	226	2.99
Leisure Goods	45	0.59
Life Assurance	36	0.48
Media & Entertainment	391	5.16
Oil & Gas	288	3.80
Pharmaceuticals & Biotechnology	426	5.63
Publishing	21	0.28
Real Estate	481	6.35
Renewable Energy	126	1.66
Software & Computer Services	568	7.50
Specialty & Other Finance	237	3.13
Steel & Other Metals	174	2.30
Telecommunication Services	181	2.39
Transport	234	3.09
Utilities - Other	128	1.69
Wholesale	172	2.27
Total	7571	100.00

Table A3. **OLS Regression Results with control variables models 1-3**

Variables	(1) *Female*	(2) *Female*	(3) *Female ratio*	(4) *Female ratio*	(5) *Gender balance*	(6) *Gender balance*
Post	0.217***	0.219***	0.219***	0.224***	0.515***	0.513***
	(0.00329)	(0.00375)	(0.00371)	(0.00378)	(0.0126)	(0.0132)
Age		-0.00936***				
		(0.000186)				
Tenure		-0.00529***				
		(0.000218)				
Number of directors		0.000152		0.00146***		-0.00172
		(0.000374)		(0.000480)		(0.00124)
Sector		Categorical		Categorical		Categorical
		-		-		-
Constant	0.122***	0.752***	0.152***	0.138***	0.0776***	0.0904***
	(0.00125)	(0.0127)	(0.00209)	(0.00702)	(0.00429)	(0.0183)
Observations	92,978	61,085	5,613	5,232	5,613	5,232
R-squared	0.062	0.136	0.378	0.390	0.313	0.314

Notes: *Sector* is a categorical dummy variable with 37 different possible values. Considering the large number of sectors, the insignificance of most *Sector* coefficients and the low importance of the *Sector* variable in this paper, I decided to not include the coefficients for each sector in the tables. However, for calculating whether or not the predictions of my model are sensical, I took into account the coefficient per sector.

Table A4. **Probit Regression Results with control variables models 1 and 3**

Variables	(1) Female	(2) Female marginal effects	(3) Gender balance	(4) Gender balance marginal effects
Post	0.793***	0.184***	1.638***	0.363***
	(0.0130)	(0.0023)	(0.0450)	(0.0059)
Age	-0.0365***			
	(0.000752)			
Tenure	-0.0306***			
	(0.00157)			
Number of directors	0.000945		-0.0103*	
	(0.00157)		(0.00577)	
Sector	Categorical		Categorical	
	-		-	
Constant	1.273***		-1.336***	
	(0.0488)		(0.0870)	
Observations	61,085	61,085	5,232	5,232

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

Table A5. **Difference-in-difference OLS Regression Results with control variables models 4-7**

Variables	(1) FRANCE Female	(2) NETHERLANDS Female	(3) NORWAY Female	(4) SPAIN Female
Post-quota country	0.128***	0.211***	0.189***	0.202***
	(0.00566)	(0.00385)	(0.00286)	(0.00781)
Country	0.0233***	-0.0334***	0.219***	-0.0893***
	(0.00325)	(0.00388)	(0.0200)	(0.00389)
Post x Country	0.117***	-0.0496***	-0.125***	-0.0478**
	(0.00746)	(0.00825)	(0.0217)	(0.0203)
Age	-0.00938***	-0.00938***	-0.00953***	-0.00963***
	(0.000187)	(0.000188)	(0.000189)	(0.000189)
Tenure	-0.00619***	-0.00610***	-0.00601***	-0.00556***
	(0.000221)	(0.000223)	(0.000223)	(0.000220)
Number of directors	-0.00360***	-0.00247***	4.17e-05	-0.00266***
	(0.000374)	(0.000386)	(0.000385)	(0.000384)
Sector	Categorical	Categorical	Categorical	Categorical
	-	-	-	-
Constant	0.801***	0.794***	0.678***	0.866***
	(0.0129)	(0.0128)	(0.0128)	(0.0129)
Observations	61,085	61,085	61,085	61,085
R-squared	0.136	0.137	0.109	0.096

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

Table A6. **Difference-in-difference Probit Regression Results with control variables models 4-7**

Variables	(1) FRANCE Female	(2) NETHERLANDS Female	(3) NORWAY Female	(4) SPAIN Female
Post-quota country	0.518***	0.783***	1.037***	0.648***
	(0.0212)	(0.0141)	(0.0238)	(0.0226)
Country	0.110***	-0.179***	1.068***	-0.439***
	(0.0163)	(0.0234)	(0.0637)	(0.0221)
Post x Country	0.333***	-0.0767**	-0.815***	0.0260
	(0.0267)	(0.0328)	(0.0681)	(0.0705)
Marginal effect interaction	0.079***	-0.018**	-0.197 ***	0.006
	(0.0063)	(0.0077)	(0.0164)	(0.0174)
Age	-0.0363***	-0.0363***	-0.0365***	-0.0361***
	(0.000748)	(0.000761)	(0.000752)	(0.000734)
Tenure	-0.0346***	-0.0340***	-0.0324***	-0.0315***
	(0.00159)	(0.00160)	(0.00156)	(0.00151)
Number of directors	-0.0156***	-0.0103***	-5.09e-05	-0.0109***
	(0.00161)	(0.00162)	(0.00165)	(0.00155)
Sector	Categorical	Categorical	Categorical	Categorical
	-	-	-	-
Constant	1.460***	1.424***	0.675***	1.675***
	(0.0501)	(0.0488)	(0.0537)	(0.0476)
Observations	61,085	61,085	61,085	61,085

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

Table A7. **Difference-in-difference OLS Regression Results with control variables models 4-7**

	(1)	(2)	(3)	(4)
	FRANCE	NETHERLANDS	NORWAY	SPAIN
Variables	*Female ratio*	*Female ratio*	*Female ratio*	*Female ratio*
Post-quota country	0.109***	0.185***	0.170***	0.159***
	(0.00657)	(0.00429)	(0.00375)	(0.00691)
Country	0.0116**	-0.0729***	0.231***	-0.0991***
	(0.00478)	(0.00558)	(0.0170)	(0.00454)
Post x Country	0.126***	-0.0522***	-0.0483***	-0.0210
	(0.00795)	(0.0102)	(0.0179)	(0.0164)
Number of directors	-0.00265***	-0.00219***	0.00198***	-0.00231***
	(0.000505)	(0.000514)	(0.000542)	(0.000553)
Sector	Categorical	Categorical	Categorical	Categorical
	-	-	-	-
Constant	0.197***	0.198***	0.0470***	0.258***
	(0.00823)	(0.00808)	(0.00838)	(0.00802)
Observations	5,232	5,232	5,232	5,232
R-squared	0.303	0.323	0.265	0.130

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

Table A8. **Difference-in-difference OLS Regression Results with control variables models 4-7**

	(1)	(2)	(3)	(4)
	FRANCE	NETHERLANDS	NORWAY	SPAIN
Variables	*Gender balance*	*Gender balance*	*Gender balance*	*Gender balance*
Post-quota country	0.227***	0.412***	0.223***	0.374***
	(0.0206)	(0.0137)	(0.00761)	(0.0295)
Country	-0.101***	-0.0726***	0.374***	-0.132***
	(0.0105)	(0.0114)	(0.0537)	(0.0116)
Post x Country	0.339***	-0.156***	0.0893	-0.0293
	(0.0270)	(0.0335)	(0.0582)	(0.0641)
Number of directors	-0.00923***	-0.00939***	-0.00247*	-0.0115***
	(0.00130)	(0.00137)	(0.00139)	(0.00141)
Sector	Categorical	Categorical	Categorical	Categorical
	-	-	-	-
Constant	0.269***	0.209***	0.0374*	0.359***
	(0.0210)	(0.0214)	(0.0208)	(0.0209)
Observations	5,232	5,232	5,232	5,232
R-squared	0.241	0.226	0.152	0.083

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

Table A9. **Difference-in-difference Probit Regression Results with control variables models 4-7**

Variables	(1) FRANCE *Gender balance*	(2) NETHERLANDS *Gender balance*	(3) NORWAY *Gender balance*	(4) SPAIN *Gender balance*
Post-quota country	0.684***	1.324***	1.774***	0.999***
	(0.0598)	(0.0448)	(0.159)	(0.0794)
Country	-0.542***	-0.500***	2.207***	-0.551***
	(0.0567)	(0.111)	(0.211)	(0.0576)
Post x Country	1.177***	-0.121	-0.972***	0.146
	(0.0872)	(0.142)	(0.220)	(0.171)
Marginal effect interaction	0.283***	-0.029	-0.256***	0.042
	(0.0200)	(0.0344)	(0.0582)	(0.0491)
Number of directors	-0.0423***	-0.0437***	-0.0102*	-0.0417***
	(0.00582)	(0.00568)	(0.00555)	(0.00522)
Sector	Categorical	Categorical	Categorical	Categorical
	-	-	-	-
Constant	-0.519***	-0.803***	-2.383***	-0.279***
	(0.0843)	(0.0860)	(0.183)	(0.0725)
Observations	5,232	5,232	5,232	5,232

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

Table A10. **Difference-in-difference OLS Regression Results with control variables models 8-9**

Variables	(1) *Female*	(2) *Female*	(3) *Female ratio*	(4) *Female ratio*	(5) *Gender balance*	(6) *Gender balance*
Post	0.230***	0.0976***	0.238***	0.137***	0.587***	0.487***
	(0.00447)	(0.00552)	(0.00429)	(0.00529)	(0.0159)	(0.0194)
Soft	-0.0450***	-0.0593***	-0.0439***	-0.0650***	0.0222**	0.00140
	(0.00311)	(0.00308)	(0.00468)	(0.00387)	(0.0104)	(0.00987)
Post x Soft	-0.0695***	-0.0629***	-0.118***	-0.124***	-0.348***	-0.353***
	(0.00799)	(0.00794)	(0.00917)	(0.00866)	(0.0326)	(0.0324)
Age	-0.0089***	-0.0094***	-0.00026*	-0.0008***	-0.000226	-0.00077**
	(0.000186)	(0.000186)	(0.000137)	(0.000127)	(0.000392)	(0.000391)
Tenure	-0.0058***	-0.0063***	0.00161***	0.000605**	0.000744	-0.000246
	(0.000219)	(0.000221)	(0.000258)	(0.000238)	(0.000799)	(0.000797)
Number of directors	-0.00079**	0.000229	0.00124**	0.00209***	-0.00195	-0.00112
	(0.000374)	(0.000370)	(0.000494)	(0.000444)	(0.00135)	(0.00135)
Sector	Categorical	Categorical	Categorical	Categorical	Categorical	Categorical
	-	-	-	-	-	-
Year		0.0179***		0.0148***		0.0146***
		(0.000379)		(0.000453)		(0.00142)
Constant	0.760***	-35.30***	0.166***	-29.46***	0.0910***	-29.14***
	(0.0128)	(0.761)	(0.0110)	(0.909)	(0.0314)	(2.845)
Observations	61,085	61,085	4,398	4,398	4,398	4,398
R-squared	0.143	0.169	0.467	0.579	0.342	0.358

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

Table A11. **Difference-in-difference Probit Regression Results with control variables models 8-9**

Variables	(1) *Female*	(2) *Female marginal effects*	(3) *Gender balance*	(4) *Gender balance marginal effects*
Post	0.172***		1.359***	
	(0.0205)		(0.0742)	
Soft	-0.339***		-0.00471	
	(0.0186)		(0.0686)	
Post x Soft	-0.0371	-0.008	-0.989***	-0.204***
	(0.0298)	(0.0067)	(0.110)	(0.0218)
Age	-0.0380***		-0.00352*	
	(0.000784)		(0.00203)	
Tenure	-0.0350***		-0.00125	
	(0.00167)		(0.00379)	
Number of directors	-0.00146		-0.0129*	
	(0.00166)		(0.00684)	
Sector	Categorical		Categorical	
	-		-	
Year	0.0913***		0.0861***	
	(0.00204)		(0.00798)	
Constant	-182.1***		-174.3***	
	(4.093)		(16.02)	
Observations	61,085	61,085	4,398	4,398

Table A12. **Difference-in-difference OLS Regression Results with control variables models 10-11**

Variables	(1) *Female*	(2) *Female excl. Netherlands*	(3) *Female*	(4) *Female excl. Netherlands*
Post	0.0643***	0.0681***	0.0304*	0.0283*
	(0.0134)	(0.0144)	(0.0161)	(0.0165)
Soft			-0.00103	0.0137
			(0.00894)	(0.0108)
Post x Soft			-0.0979***	-0.1310***
			(0.0200)	(0.0197)
Age	-0.00497***	-0.00527***	-0.00517***	-0.00544***
	(0.000691)	(0.000725)	(0.000686)	(0.000714)
Tenure	0.000346	0.000406	4.36e-05	0.000100
	(0.000451)	(0.000463)	(0.000469)	(0.000477)
Number of directors	-0.00191*	-0.00223**	-0.00186*	-0.00280**
	(0.00100)	(0.00106)	(0.00105)	(0.00118)
Sector	Categorical	Categorical	Categorical	Categorical
	-	-	-	-
Year			0.00575***	0.00588***
			(0.000895)	(0.000966)
Constant	0.364***	0.383***	-11.17***	-11.43***
	(0.0393)	(0.0409)	(1.790)	(1.933)
Observations	3,562	3,311	3,562	3,311
R-squared	0.048	0.051	0.060	0.062

References

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

Adams, R. B., & Funk, P. (2012). Beyond the glass ceiling: Does gender matter? *Management Science, 58(2)*, 219-235.

Aghion, P., & Hermalin, B. (1990). Legal restrictions on private contracts can enhance efficiency. *Journal of Law, Economics, & Organization, 6(2)*, 381-409.

Ahern, K. R., & Dittmar, A. K. (2012). The Changing of the Boards: The Impact on Firm Valuation of Mandated Female Board Participation. *The Quarterly Journal of Economics, 127(1)*, 137-197.

Beaman, L., Chattopadhyay, R., Duflo, E., Pande, R., & Topalova, P. (2009). Powerful women: does exposure reduce bias?. The Quarterly journal of economics, 124(4). 1497-1540.

Becker, G. S. (1971). *The economics of discrimination.* Chicago: University of Chicago Press.

Bertrand, M., & Hallock, K. F. (2001). The Gender Gap in Top Corporate Jobs. *ILR Review, 55(1)*, 3-21.

Bertrand, M., Black, S. E., Jensen, S., & Lleras-Muney, A. (2019). Breaking the glass ceiling? The effect of board quotas on female labour market outcomes in Norway. *The Review of Economic Studies, 86(1)*, 191.

Besson, S. A. (1999). Discrimination and Freedom of Contract: Philosophical and Economic Foundations of the Law against Racial Discrimination in Employment. *International Journal of Discrimination and the Law, 3(4)*, 269-297.

Blau, F. D., Ferber, M. A., & Winkler, A. E. (2013). *The Economics of Women, Men and Work.* Pearson Higher Ed.

Bøhren, Ø., & Staubo, S. (2014). Does mandatory gender balance work? Changing organizational form to avoid board upheaval. *Journal of Corporate Finance, 28*, 152-168.

Coase, R. H. (1960). The problem of social cost. *Journal of Law and Economics, (3)*, 1-44.

de Cabo, R. M., Terjesen, S., Escot, L., & Gimeno, R. (2019). Do ‘soft law’ board gender quotas work? Evidence from a natural experiment. *European Management Journal, 37(5)*, 611-624.

Eckbo, B. E., Nygaard, K., & Thorburn, K. S. (2016). Does gender-balancing the board reduce firm value?

Elsaid, E., & Ursel, N. D. (2011). CEO succession, gender and risk taking. *Gender in Management: An International Journal.*

Epstein, R. A. (1995). *Forbidden grounds: The case against employment discrimination laws.* Harvard University Press.

Erkut, S. K., & Konrad, A. M. (2008). Critical mass: Does the number of women on a corporate board make a difference. *Women on corporate boards of directors: International research and practice*, 222.

European Commission. (2019). *Report on Equality between Men and Women in the EU.* Luxembourg:: Publications Office of the European Union.

European Commission. (2020). *A Union of Equality: Gender Equality Strategy 2020-2025.* Brussels.

European Institute for Gender Equality. (n.d.). *EIGE - Gender Quota.* Retrieved from Glossary & Thesaurus: https://eige.europa.eu/thesaurus/terms/1203

Federal Glass Ceiling Commission. (1995). *Good for Business: Making Full Use of the Nation's Human Capital.* U.S. Department of Labor.

Ferreira, D., Ginglinger, E., Laguna, M. A., & Skalli, Y. (2017). Board quotas and director-firm matching.

Gorman, E. H. (2005). Gender stereotypes, same-gender preferences, and organizational variation in the hiring of women: Evidence from law firms. *American Sociological Review, 70(4),* 702-728.

Hellevik, O. (2009). Linear versus Logistic Regression When the Dependent Variable is a Dichotomy. *Quality & Quantity, 43(1),* 59-74.

Hsieh, C. T., Hurst, E., Jones, C. I., & Klenow, P. J. (2019). The Allocation of Talent and U.S. Economic Growth. *Econometrica, 87(5),* 1439– 1474.

International Labour Organization. (2020). *Improving gender diversity in company boards.* Geneva.

Jourova, V. (2016). *Gender balance on corporate boards: Europe is cracking the glass ceiling.* Brussels: European Commission.

Kanter, R. M. (1977). *Men and Women of the Corporation.* New York: Basic Books.

Kim, D., & Starks, L. T. (2015). Board heterogeneity of expertise and firm performance. *27th Annual Conference on Financial Economics and Accounting Paper.*

Kim, D., & Starks, L. T. (2016). Gender diversity on corporate boards: Do women contribute unique skills? *American Economic Review, 106(5)*, 267-271.

Koszegi, B. (2014). Behavioral contract theory. *Journal of Economic Literature, 52(4)*, 1075-1118.

Luckerath-Rovers, M. (2015). Gender quota in the boardroom: The Dutch approach. *Deakin Law Review*, 20-75.

Maddala, G. S. (1986). *Limited-Dependent and Qualitative Variables in Econometrics.* Cambridge: Cambridge University Press.

Mateos de Cabo, R., Gimeno, R., & Nieto, M. (2009). Gender Diversity on European Banks' Board of Directors: Traces of Discrimination. *SSRN 1362593*.

Matsa, D. A., & Miller, A. R. (2011). Chipping away at the glass ceiling: Gender spillovers in corporate leadership. *American Economic Review, 101(3)*, 635-639.

McGuire, G. M., & Reskin, B. F. (1993). Authority Hierarchies at Work: The Impacts of Race and Sex. *Gender and Society, (7)*, 487-506.

Mensi-Klarbach, H., & Seierstad, C. (2020). Gender quotas on corporate boards: Similarities and differences in quota scenarios. *European Management Review, 17(3)*, 615-631.

Morrison, A. M., White, R. P., & Van Velsor, E. (1987). *Breaking The Glass Ceiling: Can Women Reach The Top Of America's Largest Corporations?* Reading, MA: Addison-Wesley.

Powell, G. N., & Butterfield, D. A. (2015). The glass ceiling: what have we learned 20 years on? *Journal of Organizational Effectiveness: People and Performance.*

Seierstad, C., Gabaldon, P., & Mensi-Klarbach, H. (2017). *Gender Diversity in the Boardroom: Volume 1: The Use of Different Quota Regulations.* Springer.

Selanec, G., & Senden, L. (2013). *Positive action measures to ensure full equality in practice between men and women, including on company boards.* EUR-OP.

Sojo, V. E., Wood, R. E., Wood, S. A., & Wheeler, M. A. (2016). Reporting requirements, targets, and quotas for women in leadership. *The Leadership Quarterly, 27(3)*, 519-536.

Spier, K. E., & Whinston, M. D. (1995). On the efficiency of privately stipulated damages for breach of contract: entry barriers, reliance, and renegotiation. *The RAND Journal of Economics*, 180-202.

Teigen, M. (2012). Gender quotas on corporate boards: On the diffusion of a distinct national policy reform. In B. Enjolras, & K. H. Sivesind, *Firms, boards and gender quotas: Comparative perspectives* (pp. 115–146). Emerald Group Publishing Limited.

The French National Assembly. (2021, July 27). *LOI n° 2011-103 du 27 janvier 2011 relative à la représentation équilibrée des femmes et des hommes au sein des conseils d'administration et de* *surveillance et à l'égalité professionnelle.* Retrieved from Légifrance: Le Service Public De L'accès Au Droit.

Wang, M., & Kelan, E. (2013). The gender quota and female leadership: Effects of the Norwegian gender quota on board chairs and CEOs. *Journal of business ethics, 117(3)*, 449-466.

World Economic Forum. (2016). *The Industry Gender Gap.* Geneva, Switzerland.