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The effect of soft quotas on the share of female directors in Europe

Master thesis in economics

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Foreword

This paper is a master thesis written by Rannei Skjermo Telstad at the Department of Economics at the Faculty of Economics and Management at the Norwegian University of Science and Technology, June 2019.

I would like to give my thanks to my supervisor Colin Green for giving me the data, correcting all my grammatical errors and providing invaluable inputs on my thesis. And I would like to thank 6best for helping me with problems big and small and keeping me sane.

Abstract

Abstract - English

The effect of soft quotas on the share of female directors in Europe

In 2006 Norway became the first country to introduce quotas to address the skewed gender composition on corporate boards. To ensure compliance they used harsh sanctions, and a 40% median was reached the year after the implementation. Other countries then adopted similar quotas, but with weaker sanctions. In this paper I have examined the effects of both the announcement and implementation of these soft quotas on the share of female directors on the corporate boards. I have provided a comprehensive overview of the various quotas in Europe and use data on company boards from all over Europe to examine the development over time and changes in the trends that can be attributed to quotas. I have also pooled these effects together across countries and looked at the effect of quotas as a whole; and found positive effects of the quota on the share of female directors. The effect of the announcement of the quota is robust and associated with a 6 percentage points increase in representation, while the effect of the implementation is around 3 percentage points, but less robust. This suggests that soft quotas has a weaker effect than the policy makers intended.

Sammendrag - Norsk

Effekten av myke kjønnskvoter på kvinneanndelen i europeiske bedriftsstyrer

I 2006 ble Norge det første landet til å introdusere kvoter for å jevne ut den skjeve kjønnssammensetningen i bedriftsstyrer. Denne loven ble fulgt opp med strenge sanksjoner mot bedriftene som ikke møtte kvoten, og innen et år var en median på 40% kvinner nådd. Andre land implementerte så lignende kvoter, men med svakere sanksjoner. I denne avhandlingen vil jeg undersøke effekten av både annonseringen og utførelsen av disse myke kvotene, og deres effekt på andelen kvinnelige styremedlemmer. Jeg gir en omfattende oversikt over de forskjellige kvotene i Europa, og bruker data fra europeiske bedriftsstyrer for å undersøke utviklingen over tid og om kvotene førte til noe endring. Jeg samler også effektene på tvers av land og ser på virkningen av disse kvotene som én, og finner positive effekter av kvoten på andelen kvinnelige styremedlemmer. Effekten av å annonsere en kvote er robust og assosieres med en 6 prosentpoengs økning i kvinneandelen, mens implementeringen forbindes med en 3 prosentpoengs økning, men dette resultatet er ikke robust. Dette tyder på at myke kvoter har en svakere effekt enn det de som utformet loven forventet.

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1 Introduction

As female labour participation increases, it has been observed that both the recruitment of female workers and the closing of the gender wage gap is slower the higher up the business ladder one gets (Booth (2006)). This has led to there being an absence of women in leadership positions. This is known as the glass ceiling, and labour economists have studied it for a long time (Cotter et al. (2001)). The issue has also been of interest to policy makers, who have introduced quotas in many countries to deal with the absence of women in leadership positions. In the corporate sector, Norway pioneered the quota policy and assigned harsh sanctions to publicly traded companies that failed to meet a quota of 40% gender diversity for their boards. The policy later spread to many other European countries, and even some countries outside of Europe. However, none of the other countries have made their quotas binding as Norway did. In this paper I will examine the effect of non binding quotas on the recruitment of female directors on the corporate boards.

The board of directors is in charge of the company's legal responsibility, jurisdiction and strategies; and most decisions concerning the company is made there. This makes it a good point of entry for intracompany policy changes and making a company more friendly towards women. So using the quotas as an entryway into a position of power, these newly appointed female directors can then pave the way for the next generation of female directors and top managers. The quota was meant to create positive trickle-down effects as the new female directors used their influence over the company policies and strategies to focus more on recruiting and promoting skilled women harmed by a lack of network, and improve the company's work-life balance (Bertrand et al. (2014)).

As women, more often than not, still take on the role as the primary care giver to her children, making sure that the company is accommodating towards mothers is important to increase female labour participation on a corporate level (Bertrand et al. (2009)). Measures might in-

clude more flexible work time, payed parental leave, and predictable working hours. Having more female directors was supposed to advance these measures, and was the main drive behind the quotas.

I will estimate the effect of both announcing and implementing soft quotas and discuss possible reasons and mechanisms tied to the results. And I will investigate how quotas affect the share of female directors, company's board size, and the number of both female directors and directorships. As Adams (2016) points out, there is a different degree of diversity if ten boards have a female director each and it is all the same woman, or if they are ten different women. I will therefore consider both number of directors and number of directorships.

A board consist of both supervising directors (SDs) and executive directors (EDs), where the EDs work in the company and the SDs are independent directors who's only tie to the company is through the board. I will focus on the recruitment of SDs, both because they are easier for the company to hire, as they do not have to chose from a limited pool of candidates already employed at the company, but also because the SDs outnumber the EDs on most boards.

My contributions to the literature on female labour participation and quotas will be that I provide an up to date overview of the various gender quotas for company boards in Europe, and that I analyse the effect on quotas with weak sanctions with companies from all over Europe. I am the first to estimate the effect of several European quotas at once.

This paper is structured the following way: I will go through previous research on quotas and gender diversity in leadership positions in section 2. Section 3 describes what methods I will be using for my analyses. Section 4 describes more of the history and motivation behind the European quotas. In section 5 I will describe my data material and examine developments in female representation by country. Section 6 contains my analysis of the effect of quotas on gender diversity on boards, robustness checks of the results, and mechanics surrounding quotas. Section 7 contains a discussion of my findings and conclusion.

2 | Previous research

In 2003, women made up 44% of the labour force in the European Union, but, according to Fagan (2013), only 8% of the directors of European corporate boards were women. So as labour participation has increased over time (Black and Juhn (2000)), little has happened at the very top of the company in terms of female representation (Bertrand and Hallock (2001)). And the few women who do reach the top earn less than their male counterparts according to Geiler and Renneboog (2015), and Blau and Kahn (2017). This phenomenon is popularly referred to as the glass ceiling, that some unobservable effect hinders women in reaching the top of the labour market. And the European commission lists that management and supervisory positions being overwhelmingly held by men as one of the main reasons behind the gender pay gap. This means that if one, as a society, wants to eliminate the gender pay gap, it is in ones best interest to work towards evening out the gender differences in the boardroom.

A way to change this trend and speed up female representation in the boardrooms has been to implement gender quotas. Norway acted as a pioneer here, and the policy later spread to other European countries and even to the state of California. A similar quota has also been adopted by the European Parliament. The different types of quotas and incentives have been studied both by Sojo et al. (2016), and Smith (2018). But to date, there has not been much data on the actual outcome. The results of the Norwegian quota has been thoroughly studied by, among others, Bertrand et al. (2014), Eckbo et al. (2018) and Ahern and Dittmar (2012). But other countries' quota implementations has not; there is an article on the French quota by Zenou et al. (2017) and a blog post by Terjesen (2019) on the Spanish quota, but that is more or less it. There is little research comparing the quotas to each other and looking at the effects of the quotas as a whole.

The reason why the quotas were implemented in the boardroom was to create a trickle-down effect to ensure more equal opportunities and pay further down the company ladder. However,

it is debated how much influence the board of directors actually have on the company. Green and Homroy (2018) finds that it is the committees located under the boards that has the bigger impact on the company. And Ahern and Dittmar (2012) debates what effect the board has on company output and value. Empirical research by Gregory-Smith et al. (2014) finds that more diverse board do not enhance the companies performance, and that proposals in favour of greater board diversity may be best structured around the moral value of diversity, rather than with reference to an expectation of improved company performance. This argument is also made by Adams (2016).

3 | Method

To analyse the quotas' effect on boardroom diversity I use a combination of standard OLS and fixed effects approaches. I will also take inspiration from the difference in differences method to look at possible changes in the mean share of female directors that coincide with the point in time that a quota was announced. The data that I am conducting most of my analyses on are panel data, which means that I have one observation per company per year. I follow the same companies over several time periods and can then look for changes within the company that coincide with the implementation of the quota.

I use cluster-robust standard errors for all my analyses, this implies that I obtain unbiased standard errors even with heteroskedastic error terms. More information on this can be found in Wooldridge (2015).

The method of ordinary least squares (OLS) is the most straight forward method to conduct a regression. OLS uses all the variation of in the model, both within the observations and across them. It is often criticised for just reporting the average effects without any concerns on weighting observations, but it is good for simple regressions and getting the general idea of the significance and direction of the various effects. OLS will only estimate linear models and construct an error term which is the squared deviations of observations from the linearly estimated trend. OLS will be the best linear unbiased estimator if the following constrictions are met:

- The model need to be linear and without multicolinarity. This means that no exogenous variable can be identically expressed as a combination of any other exogenous variables.
- The error term must be normally distributed with an expected value of 0, $E(u_{it}) = 0$. This requires that the data is randomly sampled and without bias. In my case case, this means that I must assume that there are no link between appearing on the EuroTop100 list and the gender composition of the board. There is much empirical research done on

the effect of gender composition on company outputs and a meta-analysis by Pletzer et al. (2015) finds only small and non-significant correlation between the percentage of women on corporate boards and firm performance. I will therefore assume that this constriction holds.

- Exogenous variables should be uncorrelated with the error term. This requires that the explanatory variables are correctly and precisely measured. $cov(x, u) = 0$

- The observations in the error term should be uncorrelated with each other. This requires that observation i does not correlate with observation j in any way. All the observations should be independent of each other. $cov(u_i, u_j) = E(u_i, u_j) = 0$

- The error term must have constant variance. Having a heteroscedastic error term will make the OLS estimator inefficient and underestimate the true variance and covariance of the model. $var(u_i|X_i) = \sigma^2$

If all of these constrictions are met, the OLS should give the most accurate estimation of the exogenous variables effect on my endogenous variable with correct standard errors.

The fixed effects (FE) estimator is a method often used when faced with models containing both unit specific and time specific effects. The estimator conduct a within-transformation of the model (as seen in equation (3.1) - (3.4)) to eliminate unit specific effects. This means that FE is only using the variation within each cross section (Wooldridge (2015)). I am using a model with both unit-specific (country and sector) and time-specific (year) variables. So in my case, this means that I remove all variation across countries and sectors from all units. I then get left with only the effect of the variables that vary over time, like yearly effects and the effect of quotas. This is a very convenient method for comparing the treatment effect of a policy without having to worry about country specific or sector specific effects interfere with the estimates.

The within-transformation is done in the following way:

$$y_{it} = \beta_1 x_{1it} + \beta_2 x_{2i} + \beta_3 x_{3t} + u_{it} \tag{3.1}$$

$$(y_{it} - \bar{y_i}) = \beta_1 (x_{it} - \bar{x_{1i}}) + \beta_2 (x_{2i} - \bar{x_{2i}}) + \beta_3 (x_{3t} - \bar{x_{2i}}) + u_{it} - \bar{u_i} \tag{3.2}$$

$$y_t = \beta_1 x_{1t} + \beta_3 x_{3t} + u_t \tag{3.3}$$

Where

$$\begin{aligned} \bar{y_{it}} &= 1/T(y_{i1}, y_{i2}, \ldots, y_{iT}) \\ \bar{x_{it}} &= 1/T(x_{i1}, x_{i2}, \ldots, x_{iT}) \\ \bar{u_{it}} &= 1/T(u_{i1}, u_{i2}, \ldots, u_{iT}) \end{aligned} \tag{3.4}$$

This also solves possible problem with unit specific error terms.

Difference in differences (DID) is a method used to compare the effect of a treatment on a treated group to a similar untreated group. DID seeks to compare the development of two similar units, when one receives a treatment and the other do not. In my case, I consider a company treated when they appear on a index in a country that has implemented a quota, from the year of implementation. They are then considered treated throughout the rest of the period of observation. The same goes for the treatment of quota announcements. This allows me to observe what deviation from the trend is due to being treated, and what is due to natural variations or external shocks. I use the countries without quotas as reference.

When examining the development in the mean share of female directors over time, I should be able to see a kink in the curve around the time of treatment for the treated countries. I will use this to look for the effects of the quotas.

4 | Background

In 2002 only 5% of directors in Norway were women (Bertrand et al. (2014)). To combat this imbalance, a law was passed demanding 40% representation of women on all publicly listed boards. The law was passed in 2003 with the threat that any company who failed to comply would be dissolved. In 2006 the quota was made mandatory and a 40% median was reached in 2007. If one were to measure the quota in terms of how well it increased female representation on boards of directors, on could conclude that it was very efficient.

The quota was passed with the argument that it would help qualified women, hurt by the absence of networks, reach directorship. This was intended to have a number of positive trickle-down effects. It would help improve the companies' work-life balance for its employees and would help women further down the business ladder. The new female directors would also serve as role models and mentors for aspiring female directors. And it was also argued that they would help eliminate workplace discrimination and dismantle the glass ceiling by showing that women could make good directors and do well in leading positions if given the chance.

The proposal to implement a quota was, of course, not without backlash. Many people feared that the quota would enforce negative stereotypes in that people would think the female directors *only* got their directorship because of the quota and their gender. They also feared that there were not enough qualified women available to fill 40% of the board seats and that underqualified directors would be a liability for the companies. Some also feared that the quota would provide an incentive for the companies to appoint unqualified women that would not take an active role in the decision-making of the board and just hold their seats to appease the quota. Research has, however, showed that none of these things happened.

The Norwegian quota did not change board composition substantially, except for the gender composition of course. The average age of the directors increased a bit, and the share of female directors with a business degree doubled. But except for that, there was no significant change

in board composition thanks to the quota, according to Bertrand et al. (2014). The expected trickle down effects also remained absent. The gender wage gap remained unaffected, hardly any women asked in a survey reported that the quota affected their fertility plans and fewer than 10% of women asked in another survey reported that the quota motivated them to pursue a business degree.

Nevertheless, the quota inspired many other countries to implement similar policies. In table 4.1 I have listed the countries in my data material that has announced quotas along with the year of announcement and implementation, and the size of the quota. The size indicates the minimum share of the underrepresented gender that must be on a board, but considering that no countries have a male minority, I will refer to it as a quota for women.

Table 4.1: Year of announcement and implementation of quota by country.

Country	**Announcement of quota**	**Implementation of quota**	**Size of quota**
Norway	2003	2006	40%
France	2011	2017	40% [1]
Spain	2007	2015	40%
Netherlands	2010	2013	30%
Germany	2015	2016	30%
Austria	2017	2018	30% [2]
Belgium	2011	2018	33%
Portugal	2017	2018	20%

Finding the exact timing of the implementation of the quotas was more difficult than expected as some papers use the year the quota was announced while other use the year it was made mandatory, and some use the year the quota was met[3]. Some countries also implemented board quotas at different times for different companies, differentiating between privately owned, state owned, partly state owned companies, and companies with more than a set number of employees. All these various dates often get jumbled up, so I have endeavoured to distinguish between them. I have therefore looked up all the countries present in the data and made sure that I am using the correct years. I will also only focus on quotas made to target publicly listed

[1] France first had a quota of 20% introduced in 2015 and then increased it to 40% in 2017.

[2] The Austrian quota only applies to companies with more than 1000 employees, but considering that I am looking at EuroTop100 companies I will assume that those companies have more than 1000 employees and that the quota applies to all the Austrian companies in my sample.

[3] I am using the dates presented in Prat et al. (2016), Zenou et al. (2017),Gabaldon and Giménez (2017), Kruisinga and Senden (2017), Bertrand et al. (2014), and the European Commission (2016)

companies.

I have decided to look at both the year of announcement and the year of implementation of the quota. There are several reasons for this, the most straight forward can be found looking at Table 4.1. Many of the quotas were implemented in 2018, and my data only spans to 2017. I am therefore not able to look at the aftermath of the quotas in those countries and find if they led to any changes or not. To use Norway as an example again, they did not meet the quota before one and a half year after it was made mandatory. As discussed by Ahern and Dittmar (2012), the Norwegian quota was meant to be implemented in 2005, without strict sanctions, but due to lack of compliance it was postponed to 2006 with a two year transition-period. I am unable to observe this for several other countries due to too short time-span for my data.

When a quota is first announced, many companies will take action and begin adjusting their board right away before they might get sanctioned for not having it done. The announcement of such a quota might therefore also make the companies aware of the lack of representation and work to promote diversity in the boardroom even when there are no formal quota or sanctions in place yet. Marking the year of the quota announcements will provide information on how companies react to the news of a coming quota. considering cases where the quota is without sanctions, it is interesting to see if the announcements led to an increase in female directorship. If so, it is likely that the quota had an effect due to the company's desire for fairness, and not for their fear of sanctions.

When dealing with large multinational companies it can be difficult to determine under which jurisdictions they fall. It is important to know which rules and quotas they follow regarding nominating directors. If a company is located in Norway it is safe to say that they are under Norwegian law and legislation and had to respond to the quota of 2006. But with big multinational companies it is not always so easy to tell whose laws they follow. For instance if a company is doing business in both Norway and Sweden it gets more difficult to distinguish if they follow Norwegian or Swedish regulations or both. Considering that all the companies in my sample are EuroTop100, which means they are big and frequently traded, many of them are also multinational. To determine which companies abide to which quotas I started looking at where the company's headquarters were located. However, I found that many had headquarters in British dependencies like Gibraltar, Isle of Man, British Virgin isles, Jersey, and Guernsey. These places are all known tax havens, so it is safe to assume the companies are not actually

located in these places. They are not doing any day-to-day business in these places, but keep their headquarter there for taxation reasons. In addition to relaxed rules in regard to taxation, these tax heavens also have no regulations on board composition.

Also, a company can only have one main headquarter, but might be registered for doing business in many countries, by tying a multinational company to only one country and set of regulations would be inaccurate and cost me lot of variation in the data.

To overcome the problem with inaccurate headquarter I use stock indices to determine what jurisdiction a company belongs to. I assume that a company listed with a Spanish index must follow Spanish rules. With this assumption I have made index specific dummies for all the companies in my data set and grouped them together by country, creating country dummies based on the indices. By doing this I can make sure that the company gets correctly labelled and I can take into consideration those companies that are multinational and operate under several jurisdictions.

This was, however, not completely without problem, as many companies were listed without any indices (nearly three quarters of the sample) or with non-national indices like EURONEXT and EuroStoxx. As I cannot surely tie these companies to any specific country, I have chosen to drop them from the sample. A reason why some companies may be listed without any national index is that they are not publicly traded, are under governmental ownership, or that they for some reason have chosen to be de-listed and only appear on non-national indices.

Doing this also creates an issue in that there are countries with a very high frequency of non-listed companies. All the companies in my sample with headquarters in Italy[4] or Denmark disappear when I remove the firms with indices that can not be linked to any single country. Losing data on these countries is unfortunate as both Denmark and Italy were early in introducing quotas, and would have given me the opportunity to study the aftermath of the quota over several years.

There might be a bias in which companies who chose to be listed and who chose to avoid national indices. Companies who dislike regulations might chose to be de-listed from the index rather than accepting a quota. If this happens in the real world is unsure. The only research on firms leaving the market due to quotas are by Bertrand et al. (2014) who says that many companies changed status in response to the quota, however, Eckbo et al. (2018) finds that

[4] A lot of Italian firms are family owned and not publicly listed, this might be the reason why they disappear from my sample. More on this in Bloom et al. (2015).

these market exits were natural variations. They both look at Norway, which had very strict sanctions for not meeting the quota. And as I look at countries with weak sanctions, I do not expect there to be many companies fleeing the market due to quotas. I therefore assume there should be no significant selection bias in my sample due to the treatment. Also, since I am investigating the gender composition of the companies' boards in response to quotas and not financial returns and business practices, a bias stemming from companies leaving the sample should be irrelevant. As the new ones that take their place also need to follow the quota the same way.

The countries still present in my sample are: Austria, Netherlands, Belgium, Ireland, Luxembourg, Norway, Finland, Sweden, Portugal, Russia, Switzerland, UK, Spain, Germany, and France. However, only a few of these countries have implemented quotas (see table 4.1). Some countries have only quotas for the boards of state-owned companies but considering that they are not publicly traded and therefore not present on any index I can not be assign them to the correct country with the method that I am using. I will therefore simply ignore quotas on state owned companies.

The sanctions for failing to meet the quotas vary a lot from country to country. Norway being the only country which could be said to have a strict sanction, as companies would get liquidated if they failed to recruit at least 40% female directors. They also proved the threat to be credible as several companies got shut down. I will refer to this as a binding quota like Smith (2018).

Table 4.2: Type of sanction for not meeting the quota.

Country	**Category of quota**	**Sanction**
Norway	Binding	Company gets dissolved
France	Soft	Voided nomination and fines
Spain	Soft	No sanction [5]
Netherlands	Soft	No sanction, but must outline their reason for not meeting the quota in their yearly report
Germany	Soft	Must leave the seat vacant
Austria	Soft	Must leave the seat vacant
Belgium	Soft	Must leave the seat vacant and pay fines
Portugal	Soft	Voided nomination

Other countries (as seen in table 4.2) have chosen other, milder sanctions to enforce the quota. Common sanctions are that if the company failed to reach the set share of female board members, they would have to leave the seats vacant, effectively shrinking the board size until the quota is met. Another common sanction is to void the nomination of the last director of the "wrong" gender and appoint a new one. An example would be if a board has 10 seats and needed to meet a quota of 40% of the underrepresented gender, they have 6 male and 3 female directors and one vacant seat. Then the nomination of the new director for the vacant seat will be voided until they nominate a woman. All of these are considered soft sanction and can also be accompanied with fines and the withdrawal of the directors' pay if they fail to meet the quota. In some countries, companies are also obligated to disclose in their yearly report why they failed to satisfy the quota and what measures they are taking to do better in the future. While in some countries, there are no sanctions whatsoever.

In the UK there is no official quota, but there is an initiative called the 30% Club where companies can join and pledge to work towards 30% female gender representation on their boards. This initiative started in 2010 and spread to Ireland in 2015. The 30% Club aims to increase gender diversity in the board room and provides resources to companies who wish to do better in the terms of increasing female representation. However, as the club is completely voluntary, there are, of course, no sanctions for not joining. Since this quota is not official and does not apply to all companies at the same time, I have not considered it further.

[5]In Spain, companies that meet the quota can get prioritised in providing public services in the events of a tender. However, according to Terjesen (2019), those who did meet the quota did not actually get picked to supply public goods more often than before the quota. So, the Spanish quota is effectively without sanctions.

5 | Data

This thesis uses data from BoardEx, a database on directors and companies from all over the world, but mostly Europe and North America. The data comes from publicly available sources such as yearly reports and company announcements which is compiled into an extensive database. I use data on the EuroTop100 companies, which are the hundred most traded companies in Europe. By doing this I can be sure that the data is up to date and without holes. I use the time span of year 1999 to 2017, and as I only have a few observations from 2018 this year is dropped. The data material is the same as used by Green and Homroy (2018).

The BoardEx data provides information down to an individual level, so I can observe the directors' age, gender, nationality, role on the board, time in role, amount of both current and past directorships, sector, salary, the size of their board, and much more. There are in total 73 initial variables per director. I have id tickers on all directors and all companies, allowing me to see which directors work for which company. I can also see the location of the company's headquarter and on which indices they are listed at.

I have observations on a director for each board they are on and for each year they appear there. So, if a director is employed at the boards of two separate EuropTop100 companies, for two years each, they will appear in my sample four times. This leads to a big data set, with initially over 325 000 observations on 54 000 directors in 4200 companies. However, after dropping non-publicly traded companies, companies not operating under any European index, and observations with missing data, I am left with 20 000 directors in 1000 companies. The biggest share of observations was dropped because the company was government owned (not listed under any index). As there are different rules on quotas for private and public companies they should not be mixed.

Table 5.1 presents a summary of my variables of interest that I will consider in this section.

Table 5.1: Summary statistics.

Variable	Mean	Std. Dev.	N
Female	0.13	0.336	130213
Share of female directors	0.13	0.124	130740
Non-executive directors	0.77	0.421	130740
Number of SDs on board	10.846	4.977	130740
Quota	0.071	0.256	130740
Quota announcement	0.309	0.462	130740
Age	56.76	9.434	117851

I have also included $Year$ as a continuous variable that goes from 1999 to 2017. The number of observation pr year is increasing over time, except for in the last year, 2017, where I only have half as many observations as the year before. I have therefore dropped this year when looking at the number of female directors, and other instances when the number of observations greatly effects the result. When looking at shares over time, this should not be an issue as long as the remaining observations are representative for the whole sample and there is no bias. However there might still a be kink in my graphs in year 2017. The country composition is also different in 2017 than in the previous years (See figure 5.1), with less French companies and more German ones. Both of these countries had quotas implemented by 2017, and both uses soft sanctions. But I will still take data from 2017 with a grain of salt.

$Non - executive$ is a dummy variable taking the value 1 if the director is a supervising director, and 0 if they are an executive. Out of the 20 000 directors in my sample, 77% are supervising directors. Which is on par with the average board composition of external and internal directors. As SDs are the focus of my analysis, I will for the most part drop the observations of EDs.

$Female$ is a dummy variable, taking on the value of 1 if the director is female and 0 if they are male. I use this to calculate $ShareofFemaleDirectors$, which is the share of female directors by company for each year. This will be my left-hand side variable of interest. Throughout the whole sample, there are 13% female directors. This makes for 3 072 distinct directors that are women, where 92.6% of those are supervising directors. The biggest share of them are, not surprisingly, from the more recent years. In 1999 5% of the directors in my sample were women, while in 2017 this had increased to 24%.

$Quota$ is a dummy indicating whether the company is present in a country where there is a quota on gender board representation. The quota is turned on the year a country is implementing

a quota and stays on for the rest of the time span. By 2017, 68% of the directors in the sample works for the board of a company affected by a quota. $Quotaannouncement$ is constructed in the same way but using the year of when the quota was announced. By constructing the variables in such a way as I have done, I can easily take into account multinational companies that are affected by a quota in one country of operation but not another. Their board of directors is the same in all places and need to accommodate the rules.

I have included the age of the directors in the variable Age. It has a min value of 13 and a max of 98 years. With this variable I can control for the average age of the board and see if younger boards are more likely to appoint female directors.

$NumberofSDsonboard$ is how many supervising directors there are on a board. I want to control for this, as it may be easier for bigger boards to fit more female directors. With this variable, I can also see if the board-size affects the share of female directors and if the board size is affected by quotas.

I have also made sector specific dummies to control for gender variance by sector. An overview of the 41 different sectors, the number of companies that belong to each, the share of companies per sector and the average share of female supervising directors by sector can be found in table 7.1 in the appendix.

I have used country dummies to account for national differences. Austria, Belgium and Portugal is not relevant when looking at the pure impact of the quota, as they all implemented the quota in 2018, which is a year I do not have sufficient data on. However, when looking at the effect of announcement of a quota on the share of female directors on a company board, these countries are useful. The rest of the countries in my sample (that at no point considered a quota) are used as references.

Figure 5.1 presents a visual overview of the frequency of countries hosting the companies in the sample. It is easy to see that France is hugely over-represented with around a third of the directors in my sample present on a board that is listed on a French index. The sample is very centred around western Europe, but so is the implementation of quotas, and this is important to keep in mind while thinking of how representative these findings are for other countries. The effects of a quota in western Europe might not be the same as the effects in eastern Europe, or elsewhere.

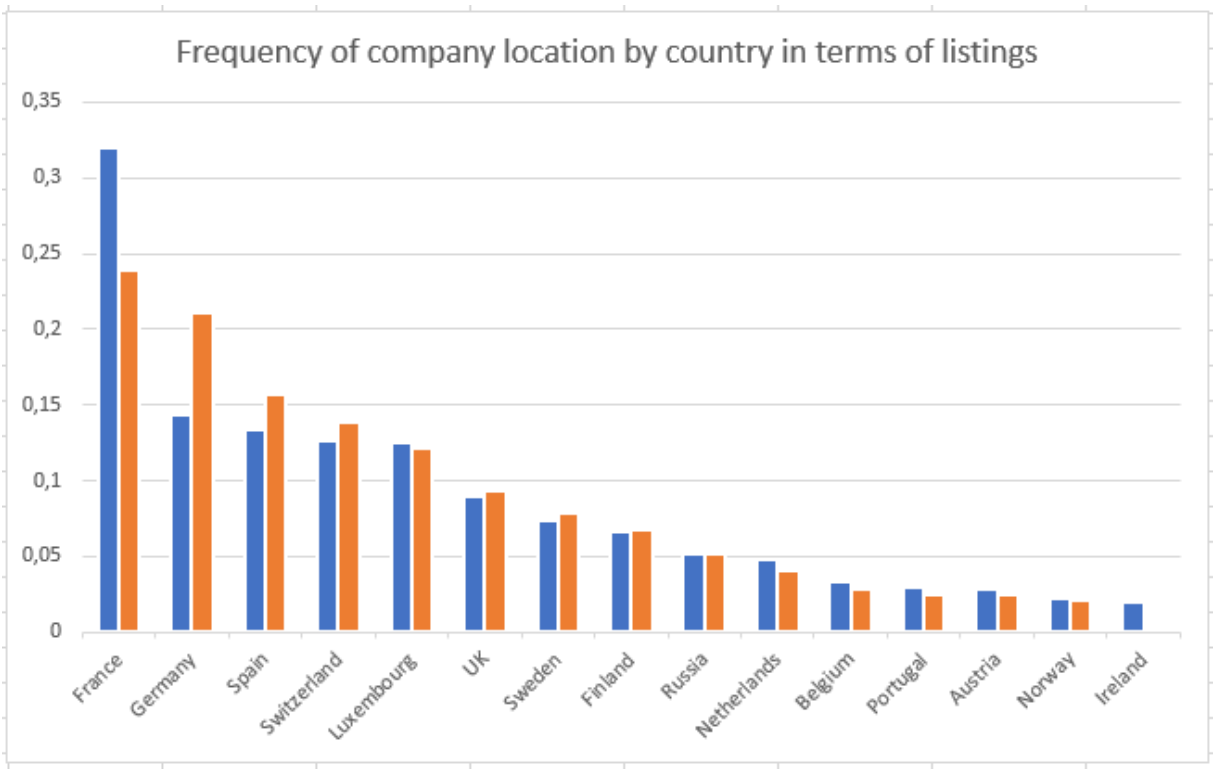

Figure 5.1: The frequency of directors being on a board of a company for each country. Blue (left bar) marks the average, Orange (right bar) is the distribution in year 2017.

Aggregating the shares of all the countries throughout the sample from figure 5.1 makes 1.31, meaning that up to 30% of companies in my sample are present in more than one country. And more than 30% of the observations in my sample comes from companies listed in France with Germany in on second place with less than half as many. Many of the countries with quotas are relatively poorly represented in my sample, except for France, Germany and Spain. Norway,Portugal, Belgium, or the Netherlands has less than 5% of the observations each.

2017 is a special year. As I have fewer observations from this year, it is important to make sure that the ones I have are representative. In 2017, the aggregated share of countries is 1.29, so this has not changed much; there are approximately as many directors working in multinational companies as the average. However, the uneven distribution of companies among countries is something to be aware of when interpreting the data. Figure 5.2 shows the change in board size over time, but due to the influx of observations from Germany in the last years this creates a spike in the curve around 2016. I have therefore also looked at the average board size with Germany removed from the sample and made figure 7.1 that can be found in the appendix. Considering that I have fewer observations in 2017 than in the years before, each observations

will have a bigger impact on the trends compared to earlier years. It is therefore important to know which countries are represented here.

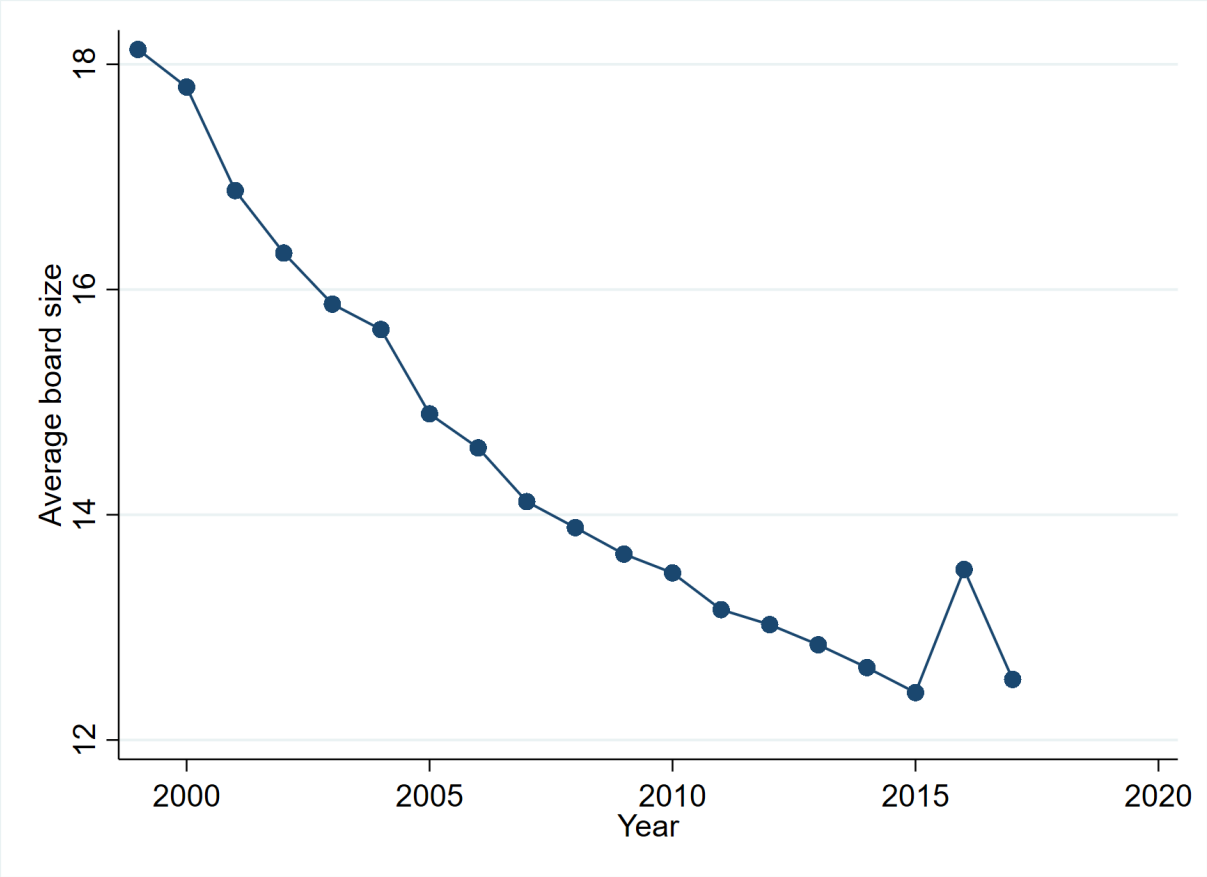

Figure 5.2: Average number of directors on a board over time.

Companies in Germany, Austria, and sometimes the Netherlands uses a two tier board system, which means each company has two boards and therefore also way more directors than companies with single tier board solutions. The boards operate in the same way as in the rest of Europe, so there should be no need to indicate which companies this applies for. I have not found any previous research warning me about precautions that should be taken when dealing with two tier board systems at the same as single tire ones. But when looking specifically on board size, it will have an impact. I have therefore included an overview of the changes in board size over time by country in figure 5.3 for the countries that has announced quotas at some point. Here every country is weighted equally, unlike in figure 5.2 where countries whit bigger boards and more EuroTop100 companies are creating the trend.

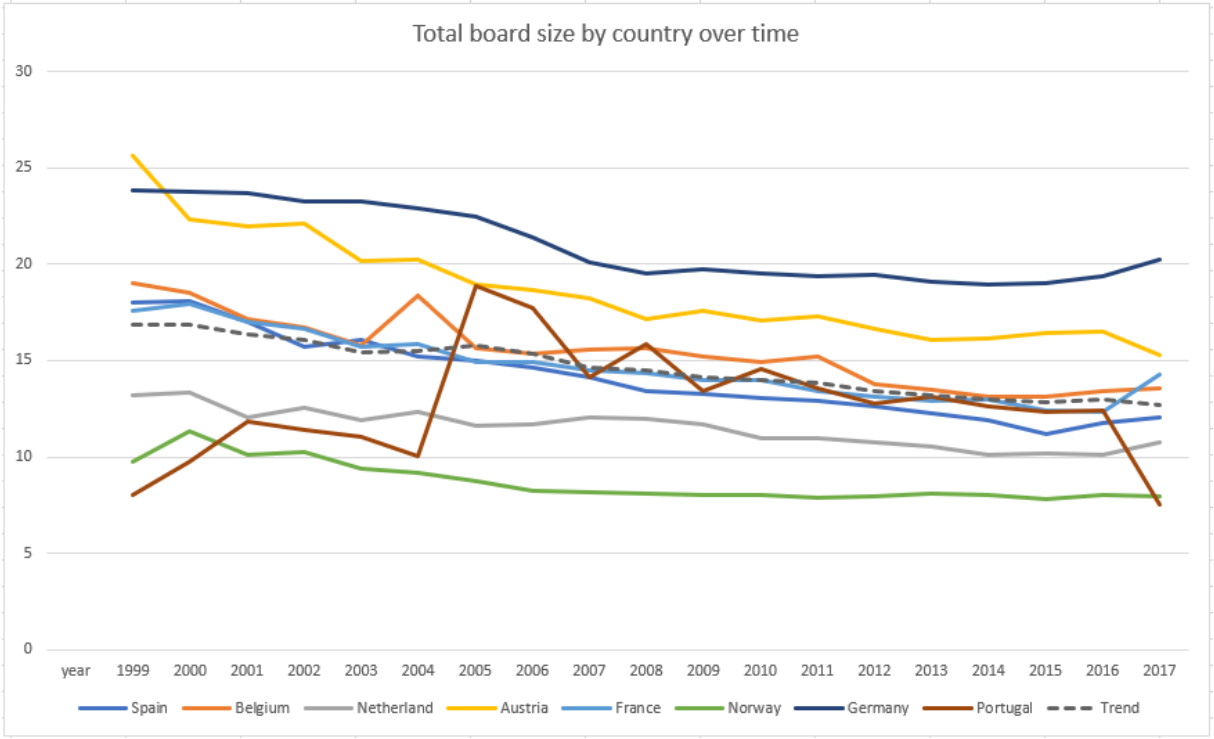

Figure 5.3: Average number of directors on a board by country over time.

By looking at the trend in figure 5.3 it is clear that the average board size in Europe is decreasing over time, just like in figure 5.2. But more importantly, the national differences in norms regarding board size can be seen. This graph shows how much larger the boards of the German-speaking countries are than the rest. I have only included the countries with quotas in figure 5.3 unlike in figure 5.2 which contains the whole sample. This allows me to look for breaks in the curve at the time of announcement or implementation of quotas for each country. Most notable is Germany where the trend in board size goes from decreasing to increasing in 2016, the year of the implementation. The same can be seen for Spain in 2015. And also for the Netherlands in 2010, which is the year of announcement for their quota. However, it must be pointed out that the breaks in the curves may not necessarily be due to quotas, it can be a coincidence with the composition of the sample, or it can be due to entirely different unobservable reasons. The changes I observe in board size for Norway are in line with those observed in Bertrand et al. (2014)[1], which means that, at least my data on the Norwegian firms are representative in the changes of board size. The reason why the board size in Portugal is so volatile is because there are very few observations from there, so a single company entering or leaving the sample might leave a big impact on the trend.

[1]Bertrand et al. (2014) also finds no effect of the quota on board size

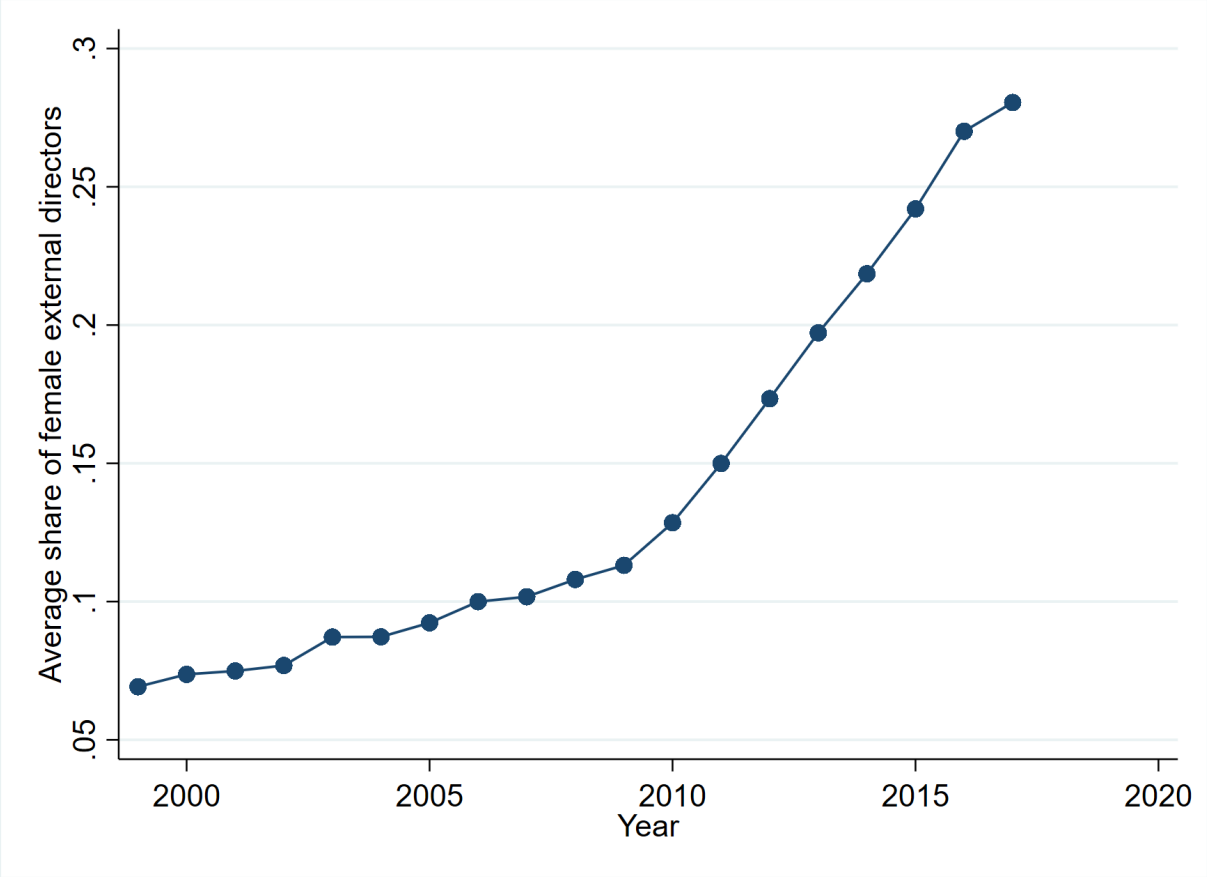

Figure 5.4: The share of supervising directors being women by year.

As board size, in general, has decreased over time, the share of female external directors has increased almost exponentially, as seen in figure 5.4. Around year 2010, the share started to increase faster than before. It is important to keep in mind that this figure does not control for individual directors, so the same director might be counted more than once if she is on the board of more than one company in the same year. However, it is clear that there has been an increase over time, but the graph does not show what causes the increase. If it is due to quotas or simply a time trend caused by more progressive views on women in leading positions is unclear.

Figure 5.5 shows the number of female directors in the sample over time. The dotted line shows the number of directors that are women and how this has increased over the years. The unbroken line show the number of directorships held by a woman, so the space between the lines indicates the number of female directors who are on two or more boards in the same year. The average number of directorships per female director for each year by country can be seen in figure 7.2 in the appendix.

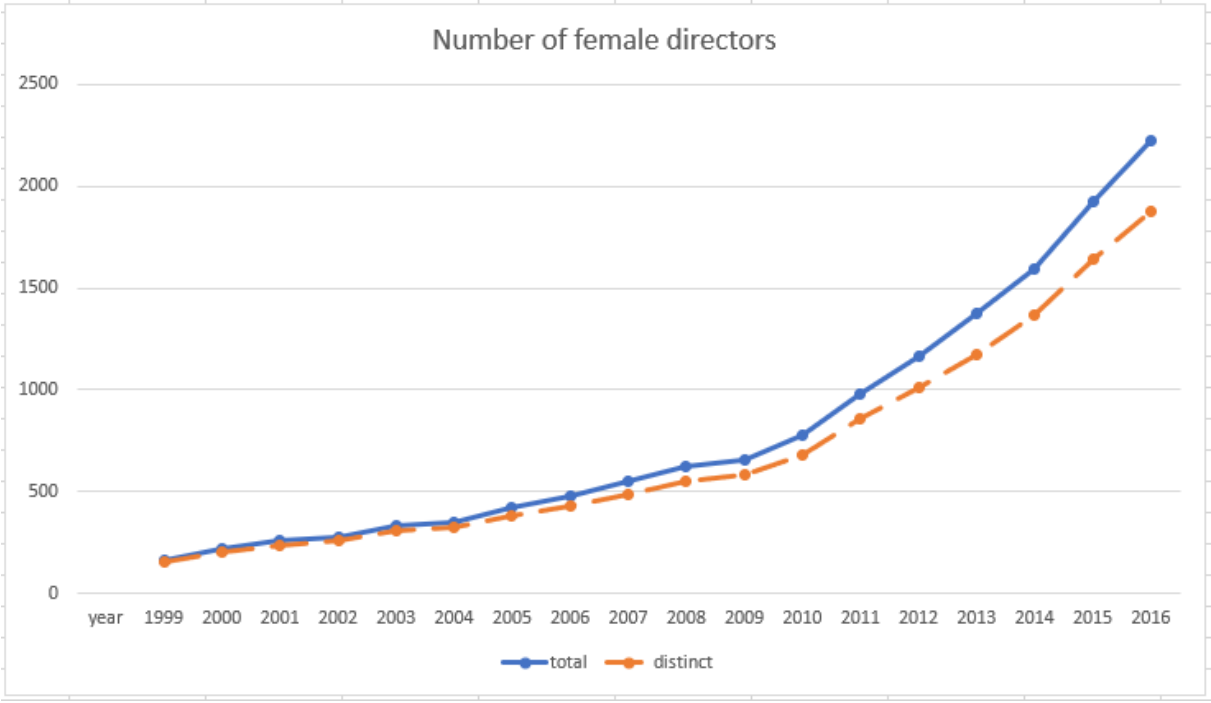

Figure 5.5: Blue is the number of directorships held by a woman. Orange (dotted line) is the number of female directors in the sample

The number of female directors have been increasing over the last decade, this might be because of the quota or because women have more access to education, work and there being more acceptance towards women in leadership positions now than before. But the trend observed in figure 5.4 and 5.5 could also very likely be caused by just a few countries that are over-represented in the sample.

Figure 5.6 displays the number of directorships held by a woman by country each year. The most interesting thing about this figure is that it is possible to look for kinks in the curve at the time of the countries quotas being announced or implemented. Here it is important to note that neither the countries' population nor its representation in the sample is taken into account. And comparing figure 5.5 to figure 5.6 it is clear that, at least, the countries presence in the sample has an impact. Norway, which has the highest share of all the countries' in my sample, does not have nearly as many female directors a Germany, France and Spain. France witnesses a sharp increase in 2011, which is the year their quota was announced, and Spain got an increase in 2015 that may be due to quotas.

Figure 5.7 shows how the gender diversity of boards has evolved over time. This figure considers the shares of female directors, this makes the over-representation of certain countries and population size not matter. The only issue that can give the wrong impression is the countries

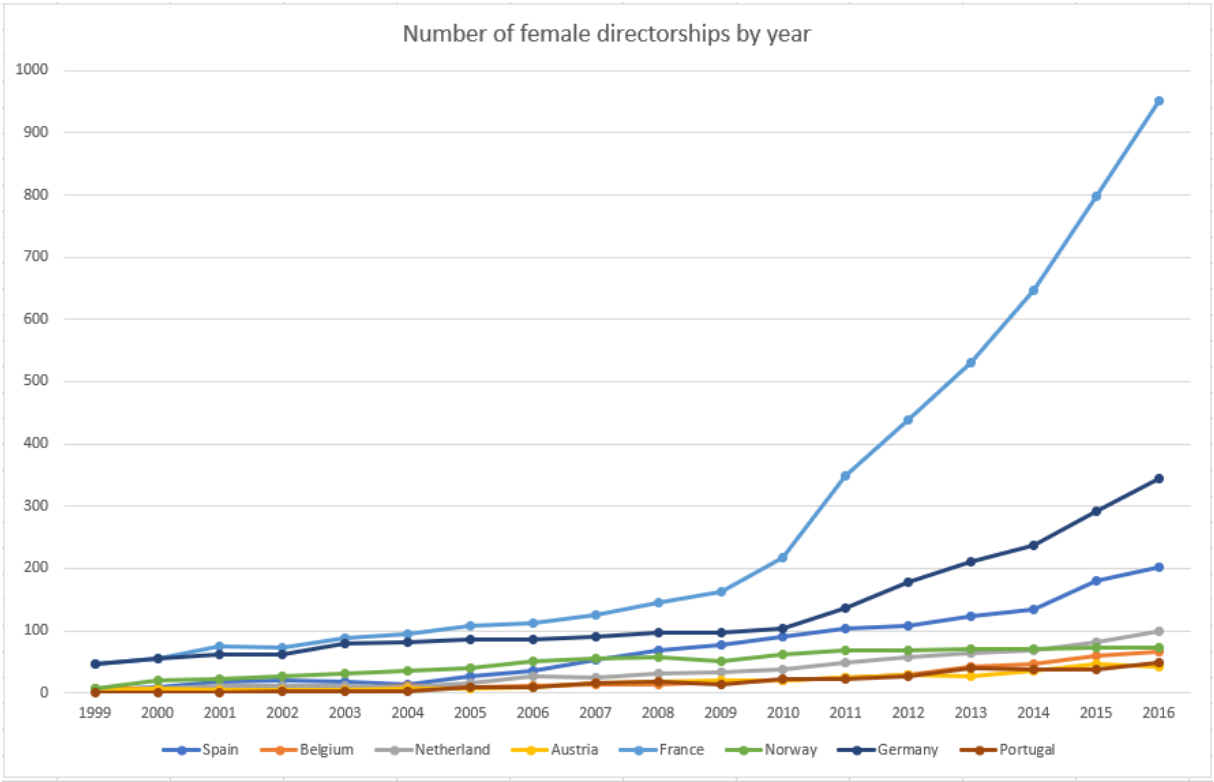

Figure 5.6: Number of board seats held by a woman by country by year.

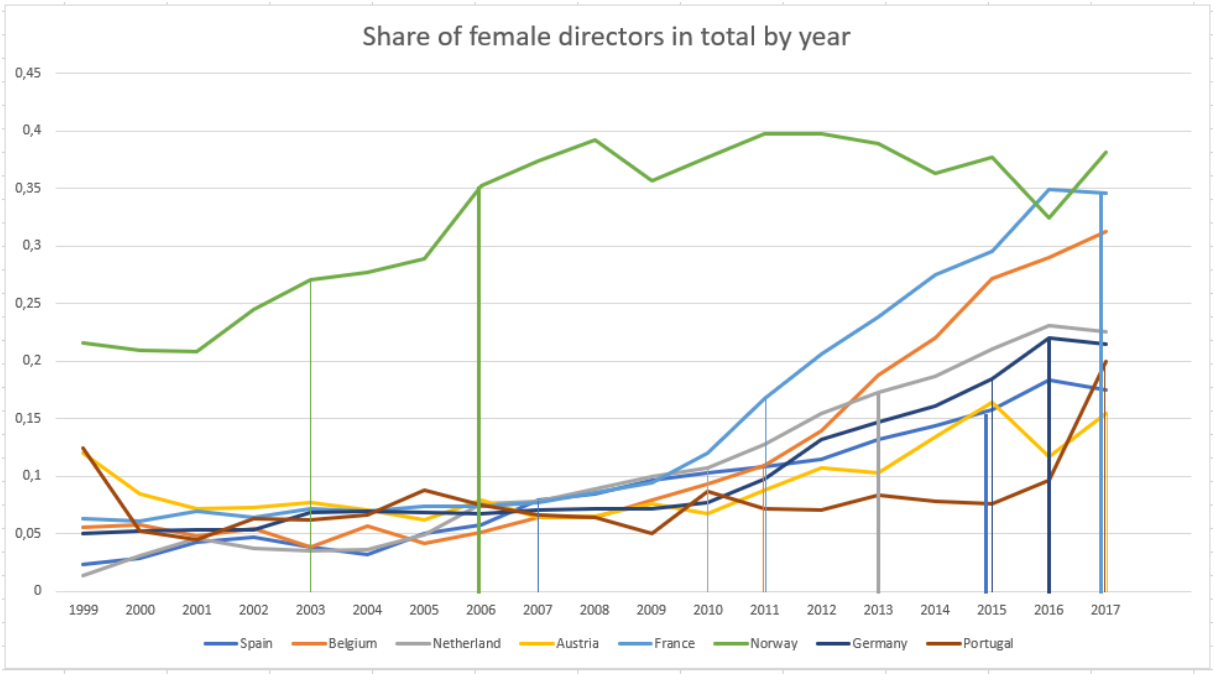

Figure 5.7: Share of directors on a board who are women by country by year. Vertical thin lines mark the year of announcement, vertical thick line mark the year of implementation.

that are under-represented if the companies in my sample are not representative of the country.

Norway has a bend in the curve first in 2003 (the year the quota was announced) and one more in 2006 (the year of implementation) taking the share up to 40% which is what the quota required. According to Bertrand et al. (2014) Norway reached a 40% median in 2007, in my sample it looks more like 2008, but this might reflect the composition of the companies in my sample. The later dips in the Norwegian curve might be due to changes in the composition of my data set or simply measurement errors. Because there are relatively few Norwegian based companies in my sample, this makes the measurements more volatile. However, Norway enforced strict sanctions on the companies that did not abide the quota and that is probably the reason there is such a visible effect. For the other countries there are really no striking effects to be seen, except for Germany, where a decrease in gender diversity is observed after the implementation of the quota. In the analysis part of my thesis in section 6, I investigate these effects more closely.

6 | Analysis

For the analysis I have collapsed my data set so that I am left with only one observation per company per year. This provides a panel data set for the period of 1999 to 2017, but removes all variation on an individual level. Age is now the mean age of the board and I observe the share of female directors in the company board, which I have named $Femshare$. By doing this I avoid the problem that some companies are over-represented in the sample due to bigger board size, which could have been a problem considering that board size is not random and varies heavily across countries. Collapsing the data set into panel data removes, for instance, the bias caused by the two-tier board system that many German-speaking countries use.

$$\begin{aligned} Femshare_{it} = \beta_1 Quota_{it} + \beta_2 Year_t + \beta_3 Age_{it} \\ + \beta_4 NumberofSDsonBoard_{it} + \gamma_i + \phi_i + \epsilon_{it} \end{aligned} \tag{6.1}$$

Initially I estimate equation (6.1), first without any controls to provide a baseline set of estimates to get the general idea of the direction of the effects in the model, and then I add the sets of controls one by one and compares the effects.

I look at time trends with both $Year$ as a continuous variable to pick up the average effect of time, and with yearly dummies that will control for time specific shocks. Using both at the same time pushes the data very hard, so I save the yearly dummies for the robustness checks later. γ_i represents the set of country dummies and ϕ_i is a set of sector specific dummies, and $\epsilon_i t$ represents residuals. For the analysis, I have removed all observations from Norway from the sample. I have done this because I want to know the effect of quotas with mild sanctions, and Norway used a binding quota. Including Norway would potentially bias the estimates and overestimate the effect of the quotas making them look more effective than they are. Considering that there are few Norwegian companies in EuroTop100, this cost me less than 300

observations. I have also removed all observations of executive directors, as previously stated in section 4 about data. I am then left with the data in table 6.1 in addition to all my control dummies. All regressions are done with cluster-robust standard errors. This is done to limit inference problems from heteroscedasticity and serial correlation.

Table 6.1: Summary statistics, 1999 - 2017 EuroTop100 companies.

Variable	Mean	Std. Dev.	Min.	Max.	N
Femshare	0.15	0.165	0	1	11058
Year	2009.971	4.88	1999	2017	11058
Quota	0.053	0.224	0	1	11058
Quota announcement	0.302	0.459	0	1	11058
Number of SDs on board	8.831	4.635	1	32	11058
Age	58.005	5.612	22	80.75	10970

Throughout the period of observance there are on average 15% women on corporate boards. And through the whole time frame only 5% of the companies are operating under a quota, while 30% operate in a place where a quota has been announced. There are 1015 distinct companies in the sample, and they are observed once each year as long as they remain in the sample.

6.1 Main results

First I am interested in understanding what effect, if any, a soft quota has on the share of female supervising directors in a company. I have first run an OLS regression and obtained the results reported in table 6.2. Column (1) shows the model without any controls, Column (2) contains country dummies to control for country variation in average female representation and column (3) contains both country and sector dummies. By gradually adding more controls, this will pick up some of the variation that earlier has been attributed to the other variables. This will give me cleaner estimations of my variables of interest and I can observe the robustness of the result. I will pursue further robustness checks in section 6.2.

All the columns of table 6.2 report a positive effect of the quota on the share of female directors on a corporate board. The effect is small, but statistically significant. The implementation of a quota leads to an increase in the share of female directors by $2 - 3$ percentage points. The effect is seemingly small and could be interpreted as after activating the quota, on average, one out of five boards appoints a female director, considering a mean board size of 8.83 supervising directors.

Table 6.2: Effect of implementation of quota, OLS, 1999 - 2017 EuroTop100 companies.

	(1) femshare	(2) femshare	(3) femshare
Quota	0.0245**	0.0333***	0.0331***
	(0.00870)	(0.00754)	(0.00753)
Year	0.0126***	0.0138***	0.0140***
	(0.000553)	(0.000552)	(0.000551)
NumberofSDsonboard	0.00417***	0.00131	0.000555
	(0.000994)	(0.00125)	(0.00120)
Age	-0.00331***	-0.00369***	-0.00386***
	(0.000874)	(0.000845)	(0.000852)
Country dummies	No	Yes	Yes
Sector dummies	No	No	Yes
Constant	-25.04***	-27.43***	-27.76***
	(1.105)	(1.098)	(1.094)
N	10970	10970	10970
R^2	0.151	0.277	0.299

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The time effect is highly statistically significant in every column and signifies that for each year there is an expected increase in the share of female directors of about 1.4 percentage points independent of quotas. There is also a small positive effect associated with board size, however, the effect is only statistically significant without controls for country-fixed effects. Lastly, there is a small, negative, but highly significant effect of the average age of the board. Each additional average year of age of the board members is associated with having slightly fewer female directors on the board.

Next, I investigate the effects of announcing a quota. Here the treatment effect is the announcement of the quota, which is a binary variable that equals one from the year the quota is first announced and stay like that through the rest of the sample period. 30% of the observations in my sample are of treated companies, meaning that they operate in a company where a quota has been announced. My motive for looking at this is to capture the effects the quotas has on

company boards before it is actually implemented. As previously seen in figure 5.7, Norwegian companies started increasing their share of female directors before the quota was implemented, and the increase were bigger in the years before the implementation than the years after. I use the equation (6.2) to estimate the effect of announcing a quota on the share of female directors.

$$\begin{aligned} Femshare_{it} = \beta_1 QuotaAnnounce_{it} + \beta_2 Year_t + \beta_3 NumberofSDsonBoard_{it} \\ + \beta_4 Age_{it} + \gamma_i + \phi_i + \epsilon_{it} \end{aligned} \tag{6.2}$$

This specification is identical to the one I used to look at the implementation of the quotas, except for $QuotaAnnounce$, which is replacing $Quota$. I estimate this model with OLS as earlier and the results are presented in table 6.3. Column (1) contains my base line model, and then I gradually add controls to it. Column (2) is the base line with country dummies and column (3) is the same as (2) but with added sector controls.

Table 6.3: Effect of announcement of quota, OLS, 1999 - 2017 EuroTop100 companies.

	(1) femshare	(2) femshare	(3) femshare
Quota announcement	0.0840***	0.0799***	0.0806***
	(0.00807)	(0.00724)	(0.00712)
Year	0.00907***	0.0104***	0.0105***
	(0.000649)	(0.000580)	(0.000580)
NumberofSDsonboard	0.00328***	0.00138	0.000610
	(0.000993)	(0.00124)	(0.00120)
Age	-0.00367***	-0.00356***	-0.00370***
	(0.000851)	(0.000835)	(0.000841)
Country dummies	No	Yes	Yes
Sector dummies	No	No	Yes
Constant	-17.93***	-20.44***	-20.68***
	(1.296)	(1.153)	(1.151)
N	10970	10970	10970
R^2	0.192	0.295	0.317

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The effect of announcing a quota is highly statistically significant, irrespective of controls. The effect is also very large compared to all other effects I have observed throughout the analyses. Announcing a quota on gender representation on corporate boards is associated with an increase of roughly 8%-points, this is about 2.5 times the size of the effects of the quota itself. Considering that the average share of female directors on a board is 15%, this means that the announcement of the quota leads to a roughly 50% increase in the share. The contrast with the results on the implementation suggests that companies reacts quickly to the announcement before the implementation of a quota. The estimates of the controls are, more or less, the same as observed in table 6.2. I will discuss possible reasons for the difference in the effects of announcing and implementing quotas later.

In table 6.4 I have estimated the same models but with a fixed effects estimator. When using fixed effects, all variation that does not change over time for a given company is removed. This means that the country-, sector-, and company-fixed effects are removed from the model and I am left with only the dynamic effects. This controls for a number of effects, for exam-

Table 6.4: Effect of announcement and implementation of quota, Fixed effects, 1999 - 2017 EuroTop100 companies.

	(1) femshare	(2) femshare	(3) femshare
Quota	0.0319***	–	0.0219***
	(0.00631)		(0.00633)
Quota announcement	–	0.0656***	0.0638***
		(0.00644)	(0.00646)
NumberofSDsonboard	-0.000199	-0.000257	-0.000202
	(0.00110)	(0.00110)	(0.00110)
Year	0.0157***	0.0128***	0.0126***
	(0.000528)	(0.000554)	(0.000566)
Age	-0.00553***	-0.00517***	-0.00517***
	(0.000772)	(0.000760)	(0.000760)
Constant	-31.03***	-25.33***	-24.85***
	(1.047)	(1.098)	(1.122)
N	10970	10970	10970
R^2	0.375	0.397	0.399

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

ple, perhaps the firms in countries which adopt quotas are more likely to have higher female representation anyway. When using a fixed effects estimator the average level of female representation is removed, so that I am left with only the changes in representation caused by the announcement or implementation of the quota. In column (1) and (2) I consider the base line models for announcement and implementation of quotas. Column (3) is mix of the previous two columns and works as a robustness check on the results in (1) and (2).

In this model, there are still positive and statistically significant effect associated with the quotas. Also because the fixed effects estimator compares the companies before and after the quota, it does not affect my estimates if a company de-list from the stock market in response to the quota. As fixed effect compares the companies before and after the quota, those who leave the stock market will simply not contribute to the estimates.

Table 6.4 shows that the effects of the quota are statistically significant, but slightly smaller than when estimated using OLS. The effects of mean age and time are also still significant. Column (3) includes both the announcement and implementation of the quota. Putting both treatments into the same model was done to control for overlapping effects of the announcement and implementation, and to see if the results are robust. It is interesting to see how the other effects are relatively consistent across the various estimation. This indicates that there are little to no correlation between my explanatory variables.

6.2 Robustness checks

To investigate how robust my results are, I have conducted a series of robustness checks. First I replace $Year_t$ with yearly dummies. These are expressed through τ_t in model (6.3). Yearly dummies can control for Europe wide shocks that affects both gender diversity and may happen to coincide with the quotas or quota announcement.

$$\begin{aligned} Femshare_{it} = \beta_1 Quota_{it} + \beta_2 NumberofSDsonBoard_{it} \\ + \beta_3 Age_{it} + \gamma_i + \tau_t + \phi_i + \epsilon_{it} \end{aligned} \tag{6.3}$$

As the development of more equal gender representation in boardrooms is heavily dependent on time, year specific effects might overlap with the effects earlier attributed to the quota. Adding

yearly dummies to the model stresses the model, and if the quota still carries a significant effect, it suggests the effect is robust. Simply put I want to see if the significance of the effects of the quota persists when controlling for year specific effects. I have done these tests both with the announcement and the implementation of the quota.

Table 6.5: Robustness check on implementation of the quota, 1999 - 2017 EuroTop100 companies.

	(1) femshare	(2) femshare	(3) femshare	(4) femshare
Quota	0.109***	-0.00730	0.00412	0.00494
	(0.00875)	(0.0102)	(0.00869)	(0.00861)
NumberofSDsonboard	0.00139	0.00374***	0.000767	0.0000535
	(0.000958)	(0.000987)	(0.00124)	(0.00120)
Age	-0.00241**	-0.00331***	-0.00367***	-0.00382***
	(0.000860)	(0.000872)	(0.000844)	(0.000851)
Yearly dummies	No	Yes	Yes	Yes
Country dummies	No	No	Yes	Yes
Sector dummies	No	No	No	Yes
Constant	0.271***	0.301***	0.377***	0.387***
	(0.0505)	(0.0512)	(0.0540)	(0.0662)
N	10970	10970	10970	10970
R^2	0.029	0.162	0.282	0.304

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6.5 presents the results of the robustness test on the results of the implementation of the quota. Column (1) is the base model without any time specific effects, column (2) has yearly dummies to account for year specific effects, column (3) has the same yearly dummies and also country dummies. Lastly, column (4) has year, country and sector dummies.

The effect of the implementation of the quota is only significant when I do not control for year- and company specific effects. This means that the effect is not robust and the statistical significance from the quota that I witnessed earlier were most likely due to year specific effects being picked up in the estimates quota.

Table 6.6 presents the same robustness check as in table 6.5, but done with the announce-

ment of the quota. Column (1) is the base line model without any time effects, (2) contains yearly dummies, (3) contains yearly dummies and country dummies, and (4) got year, country and sector dummies.

Table 6.6: Robustness check on announcement of the quota, 1999 - 2017 EuroTop100 companies.

	(1) femshare	(2) femshare	(3) femshare	(4) femshare
Quota announcement	0.130***	0.0855***	0.0867***	0.0875***
	(0.00675)	(0.00810)	(0.00709)	(0.00701)
NumberofSDsonboard	0.00130	0.00283**	0.000975	0.000238
	(0.000935)	(0.000983)	(0.00124)	(0.00119)
Age	-0.00325***	-0.00374***	-0.00355***	-0.00368***
	(0.000833)	(0.000850)	(0.000835)	(0.000841)
Yearly dummies	No	Yes	Yes	Yes
Country dummies	No	No	Yes	Yes
Sector dummies	No	No	No	Yes
Constant	0.288***	0.302***	0.356***	0.372***
	(0.0492)	(0.0503)	(0.0536)	(0.0655)
N	10970	10970	10970	10970
R^2	0.139	0.205	0.304	0.326

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The main result to take away from this robustness test is that the effect that the announcement of the quota has on the share of female directors are always highly significant and the size is unaffected by the year dummies. I can therefore conclude that these results are robust.

Next I have estimated the regressions while including country fixed time effects. $Country_i * Year_t$ is a set of interaction variables constructed by multiplying the variable $Year$ with each of the country dummies. This variable is meant to control for country specific rates of change in female representation that vary over time, like different paces in acceptance towards women in leadership positions. The results are presneted in table 6.7.

Including both $Country * Year$ and the country dummies controls for time invariant country differences in female representation, like how some countries, even whit the absence of a quota,

has more female board members than others and are more likely to introduce a quota, or at least to introduce it earlier. It also controls for the difference in time varying trends across countries, like how some countries are faster at including women into leadership positions or into the work force in general. Even when I control for these trends the effects of the quotas are still statistically significant and positive.

Table 6.7: The effect of implementation and announcement of quota with country specific time effects, 1999 - 2017 EuroTop100 companies.

	(1) femshare	(2) femshare
Quota	0.0496***	–
	(0.00724)	
Quota announcement	–	0.0575***
NumberofSDsonboard	0.000591	0.000658
	(0.00124)	(0.00124)
Age	-0.00329***	-0.00328***
	(0.000819)	(0.000819)
Country*Year	Yes	Yes
Country dummies	Yes	Yes
Constant	0.376***	0.371***
	(0.0522)	(0.0523)
N	10970	10970
R^2	0.304	0.307

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The announcement of the quotas has a highly significant positive effect across all estimates. I will therefore conclude that the effect of the announcement is robust and large. The implementation, on the other hand, loses its significance when I include yearly dummies to the equation. This implies that the quota previously has picked up year specific effects that coincide with the quotas. It is also interesting to note that the mean age of the board is always highly significant and has a constantly negative effect on the share of female directors.

6.3 Heterogeneity and mechanisms

In this section, I look at other effects in my model. It has been speculated that the quota would encourage companies to increase their board size to accommodate the quotas without letting any male directors go. I will use the following equation, (6.4), to investigate if the announcement or implementation of the quota has any effect on the number of supervising directors on the board:

$$\begin{aligned} NumberofSDsonboard_{it} = \beta_1 Quota_{it} + \beta_2 Quotaannounce_{it} \\ + \beta_3 Year_t + \beta_4 Age_{it} + \epsilon_{it} \end{aligned} \tag{6.4}$$

The results are presented in table 6.8 with column (1) looking at the effect of the quotas, column (2) looking at the effect of the announcement of the quotas, and column (3) including both treatments at the same time. As in all earlier estimates, I only consider the number of supervising directors.

Table 6.8: The effect of announcement and implementation of the quota on board size, OLS, 1999 - 2017 EuroTop100 companies.

	(1)	(2)	(3)
	Board size	Board size	Board size
Quota	2.300***	–	1.674***
	(0.234)		(0.228)
Quota announcement	–	1.526***	1.299***
		(0.214)	(0.219)
Year	-0.217***	-0.253***	-0.266***
	(0.0174)	(0.0198)	(0.0202)
Age	0.0362	0.0326	0.0305
	(0.0208)	(0.0209)	(0.0208)
Constant	443.7***	515.5***	541.6***
	(34.86)	(39.61)	(40.42)
N	10970	10970	10970
R^2	0.050	0.057	0.062

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Implementing the quotas is associated with an increase in the number of supervising directors on a board by 2.3, which means that they extend the board by, on average, two more

directors. When I also control for the effect of the announcement, this drops to 1.67, but the announcement is also associated with an increase of 1.3. Which means that all together the boards number of SDs is estimated to increase by 3 due to quotas. This highlights one of the ways that companies deals with the policy change.

Lastly, I have looked into heterogeneity by sector. I want to find out if companies in male dominated sectors experienced a bigger effect of the quotas. I have singled out seven sectors with fewer than average female directors (the average is 15%) and a big presence in my sample (more than 200 observations). The sectors I have chosen are mining, engineering and machinery, investment companies, oil and gas, real estate, speciality and other finance, and steel and other metals. These are all traditionally male dominated fields of work. There is an overview of all the sectors, number of observations and share of female supervising directors in table 7.1 in the appendix.

Table 6.9: The effect of a announcement and implementation of quota on male dominated sectors, 1999 - 2017 EuroTop100 companies.

	(1) femshare	(2) femshare	(3) femshare	(4) femshare
Quota	0.0500*	0.00966	–	–
	(0.0238)	(0.00918)		
Quota announcement	–	–	0.0877***	0.0690***
			(0.0172)	(0.00919)
Year	0.0117***	0.0133***	0.00965***	0.00987***
	(0.00106)	(0.000622)	(0.00103)	(0.000749)
NumberofSDsonboard	0.00776***	0.00192	0.00570***	0.00170
	(0.00159)	(0.00123)	(0.00161)	(0.00122)
Age	-0.00477***	-0.00263*	-0.00494***	-0.00304**
	(0.00123)	(0.00111)	(0.00118)	(0.00110)
Constant	-23.14***	-26.44***	-19.07***	-19.54***
	(2.119)	(1.245)	(2.054)	(1.495)
N	2881	8089	2881	8089
R^2	0.156	0.166	0.192	0.193

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6.9 presents the results of separating companies from selected male dominated sectors. There are 2900 observations of the male dominated sectors, compared to 8100 that belongs to other sectors. The regression in column (1) is done with only observations from the male

dominated sectors, and column (2) are done with every observation *but* the ones in those sectors. This gives me the opportunity to compare the effect of the quota on these two groups. Column (3) and (4) is the same but with the effect of the announcement of the quota. Where (3) contains the male dominated sectors and (4) the rest.

From table 6.9 it can be seen that the quota has a five times larger effect on the share of female directors in male dominated sectors. The implementation of the quota is, in the same sectors, associated with a 5%-points increase in female representation. Which is a $30 - 50\%$ increase, depending on the sector. It is also interesting to note that the mean age of the directors on the board has a twice as big effect in male dominated sectors and that the time effect is weaker. The sectors that traditionally attracts men witnessed a slower influx of female directors than other companies.

7 | Discussion and conclusion

To investigate the effects soft quotas has on the share of female directors in EuroTop100 companies I have examined the trends over time and conducted a series of regression. Through out my analysis I find a positive effect of both the announcement of quotas and the implementation on the share of female supervising directors on a board. But only the effect of the announcement is robust. This may indicate that the attention around the current situations of skewed gender representation in the boardrooms is what has the biggest effect on the companies. Or maybe the companies already increased their share of female directors after the announcement, so that when the quota was implemented there were no remaining effect. This might explain why there is a bigger effect of announcing the quota than implementing it. However, as shown in figure 5.7, no country with a soft quota reached their target. This implies that soft quotas do not have the desired effect of the policy makers. [1]

I observe an increase in gender diversity over time, and the shares I see match the numbers by Deloitte (2017), Fagan (2013), and Adams (2016). This suggests that my data is representative for the overall progress of increased diversity. However, Adams (2016) uses data from Fortune 500 companies, (it is not clear what companies Fagan (2013) and Deloitte (2017) use,) as well. And considering that I only look at EuroTop100 companies, the result need not be the same for the average company. Big companies might have more resources available to search for qualified female directors and are therefore able to increase their share of female directors quicker than smaller companies, and they may be more attractive to the scarce qualified female directors. But on the other hand, big companies can probably afford to pay potential fines for violating the quota, so a quota might not affect them the same way it does a smaller company. Also, bigger firms might want to try and please their shareholders which might include not appointing female directors if they suspect that their shareholders would disapprove of it, but this

[1] France reached their quota of 20% representation implemented in 2015, but has not yet reached the extended quota of 40% from 2017.

could also go the other way if the shareholders appreciate diversity. And as the companies in my sample are the hundred most traded in Europe, I assume they are very engaged in keeping their shareholders happy. This, combined with being able to afford to pay the sanctions, might lead to the quota having less effect for these companies than smaller ones. Further research comparing big and small companies and data on the effect of a quota considering the number of employees in a company is needed to determine if any of these tendencies happen.

There is a bigger effect of announcing the quota than of implementing it. This might be because of the weak sanctions accompanying the implementation, there is no real reason to follow the quota if you disagree with it. But for companies that care about diversity, hearing about the quota and the discussion around it in the media might motivate them to take action and appoint more women for director positions for egalitarian reasons. And those who are not swayed by those arguments will probably not change their mind when the quota becomes mandatory either.

It is important to keep in mind that the quota does not appear out of a vacuum. Perhaps the quotas are announced after wishes from the public and is an indication on increased focus on diversity, and not the reason for it. It is not unreasonable to think that there might be something unobserved that affects both the quota and the share of female directors. The quota might get announced because of increased consciousness around female board representation caused by something else. It would therefore be interesting to do an event study around the circumstances of which the quotas was announced. This could be combined with a lagged version of the announcement dummy to look at the developments the year before the announcement. If there is no effect, one could create a treatment variable that lags the other way, as if the announcement came as a shock and companies needed a year to start adjusting. In my model I do not consider this, and as the announcement of the treatment has such a stable and significant result, it might represent a combination of these lagged effects. The companies observe that there is debates on implementing a quota and expects that it will happen, so they have already made preparations by the time the announcement is official. If there is an unseen effects that affects both the quota and the share of female directors, on would need to find an instrument variable to solve the problem. So due to this being a potential problem with my analysis, I am hesitant to say that my results are causal.

In my analysis I have done my best to control for possible effects and biases that could affect the results. I hesitate to give my results a causal interpretation, but I have ruled out the following possible explanations:

- Countries who adopt quotas (early) are different in some way. Using country fixed effects should rule this out.
- Countries adopting quotas have a higher rate of increase in female representation. Using country fixed effects and country dummies controls for this.
- Companies more likely to have higher female representation are in countries that adopts quotas. Company fixed effects rules this out.
- Companies with lower female representation de-list to avoid the quotas. This is also ruled out by company fixed effects.
- Economic shocks influence both quotas, the likelihood of implementing a quota, and female representation. Using year fixed effects controls for this.

After controlling for all of these possibilities, the effect of announcing the quota is still robust, and I still see positive, but not robust, effects of implementing the quota.

Throughout the whole analysis, the mean age of the board has had a significant negative effect on the share of women on the board. This indicates that boards with older board members are less likely to appoint a female director than those with a lower average age. This might coincide with the time trend, that younger people have a more progressive attitude towards women in leadership positions and are therefore more inclined to appoint a female director. It could be interesting to look at this result over time and see if getting older makes people less progressive in the terms of gender equality. One could look at an interaction between age and $year$ and see if this effect is a sign of age in itself or that the residue of an outdated view of women in leadership positions brought on by old directors.

The time effect is also statistically significant throughout the whole analysis, this indicates that over time, companies become more likely to appoint a woman as director. This might correspond with a more modern view of women in leadership positions. However, the effect of one year is so small that, assuming the effect is continuous, it would take 31 years to go from the 2006 average to equal representation, *ceteris paribus*. While the quotas are more effective, the

time trend is slightly weaker than in the other sectors. This hints that intervention is necessary to ensure more equal representation, at least in these sectors.

A weakness of my analysis is that Austria, Belgium and Portugal implemented quotas in year 2018, while my data only spans to 2017. It can be speculated that I would get more robust findings on the effect of the quota if I had been able to study the development in those countries as well, in stead of only having data on five countries with implemented quotas. Better data for year 2017 would also be good considering it is the year of the French quota and the year before the Belgian, Austrian and Portuguese quota.

So to conclude, I find positive effects of quotas on the share of female directors and some of the effects are robust. Even though I control for a lot of variation across countries, sectors, and time, I cannot say that the quotas for sure are causal of the changes.

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Appendix

Table 7.1: Frequency of companies present in the various sectors and the share of female directors by sector, 1999 - 2017 EuroTop100 companies

Beginning of Table			
Sector	**Frequency**	**Percent of companies**	**Share of women**
Aerospace & Defence	96	0,85	0,1756478
Automobiles & Parts	218	1,92	0,1625161
Banks	653	5,76	0,1826498
Beverages	161	1,42	0,1724967
Business Services	312	2,75	0,1961658
Chemicals	348	3,07	0,1524442
Clothing, Leisure and Personal Products	281	2,48	0,2045868
Construction and Building Materials	624	5,5	0,1464284
Consumer Services	10	0,09	0,19
Containers & Packaging	48	0,42	0,2190596
Diversified Industrials	295	2,6	0,1408398
Electricity	179	1,58	0,1208108
Electronic & Electrical Equipment	318	2,8	0,1679296
Engineering & Machinery	385	3,4	0,1493624
Food & Drug Retailers	131	1,16	0,1189634
Food Producers & Processors	318	2,8	0,1620763
Forestry & Paper	123	1,08	0,1143731
General Retailers	170	1,5	0,1639839
Health	247	2,18	0,1744961
Household Products	105	0,93	0,2383706
Information Technology Hardware	228	2,01	0,1550543
Insurance	237	2,09	0,153275
Investment Companies	287	2,53	0,1193629
Leisure & Hotels	378	3,33	0,1296774
Life Assurance	78	0,69	0,1368199
Media & Entertainment	507	4,47	0,16496
Mining	355	3,13	0,0686199
Oil & Gas	663	5,85	0,1408594
Pharmaceuticals & Biotechnology	573	5,05	0,1674903

Continuation of Table 7.1			
Sector	**Frequency**	**Percent of companies**	**Share of women**
Private Equity	44	0,39	0,0852572
Publishing	6	0,05	0,3333333
Real Estate	650	5,73	0,1181747
Renewable Energy	175	1,54	0,0941047
Software & Computer Services	667	5,88	0,1876191
Speciality & Other Finance	406	3,58	0,0979174
Steel & Other Metals	231	2,04	0,1367921
Telecommunication Services	371	3,27	0,1731258
Tobacco	19	0,17	0,3246201
Transport	290	2,56	0,176268
Utilities - Other	134	1,18	0,1512007
Wholesale Trade	18	0,16	0,1123457

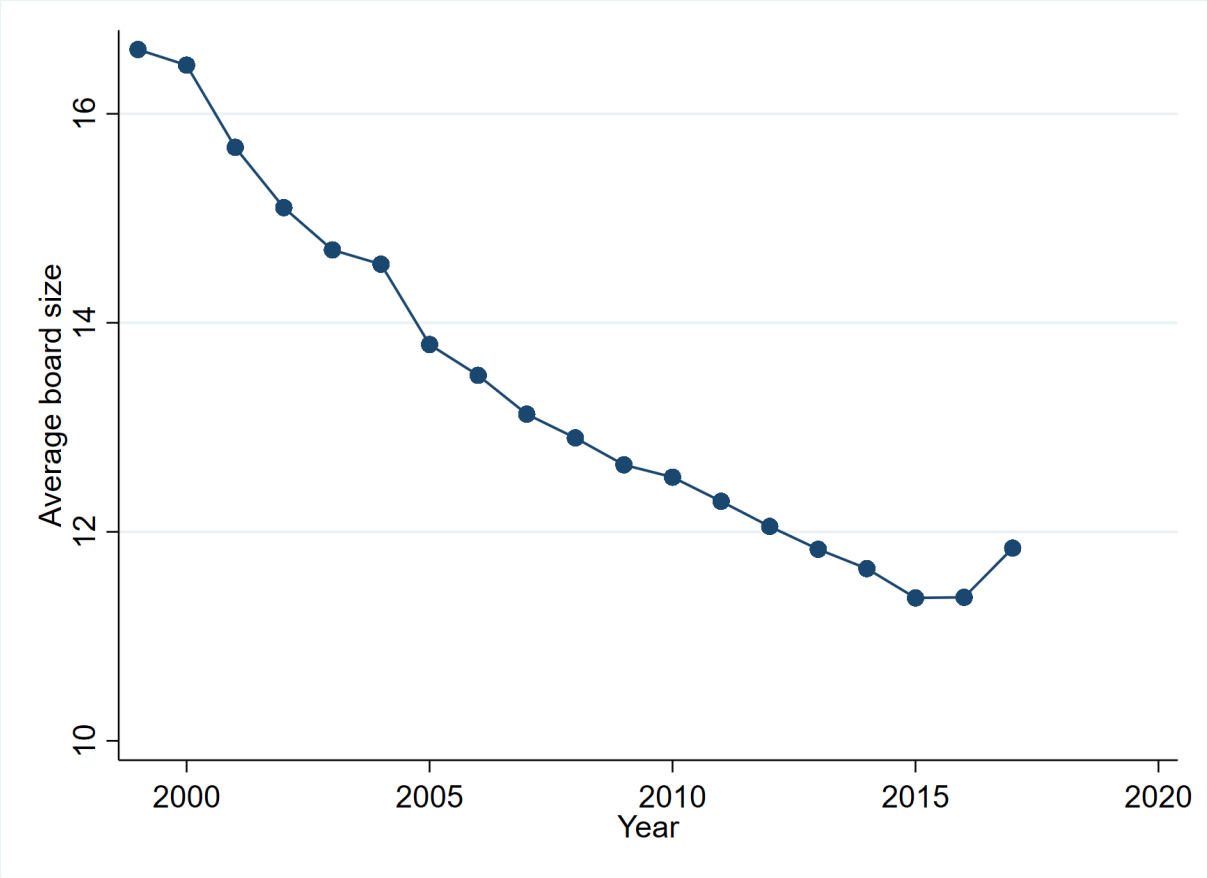

Figure 7.1: The average number of directors on a board each year with Germany excluded.

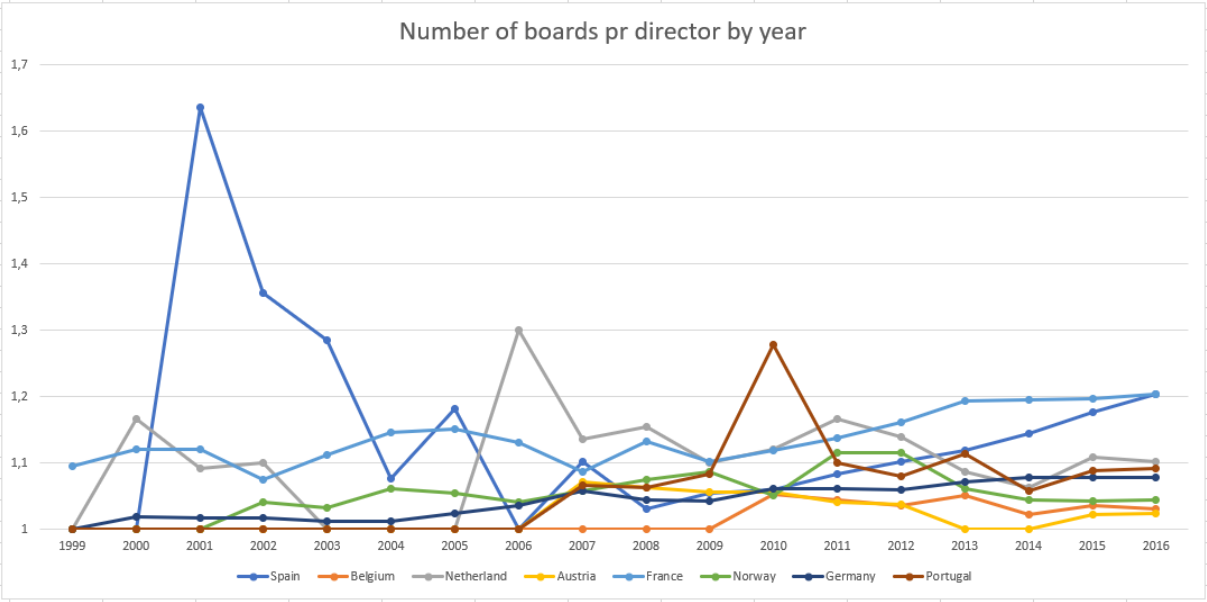

Figure 7.2: Number of boards by female director, by country by year.