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The Italian Gender Quota: is everyone on board?

The relationship between board-level characteristics and quota compliance.

Bachelor Thesis Economics and Business Economics

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Abstract

The purpose of this paper is to examine the influence of board-level characteristics on the probability of compliance of firms, with a mandatory gender quota. Previous research has solely been focussed on the effectiveness and influence on firm performance of these quotas. Evidence from the Italian gender quota is used, this quota sets a minimum of 33% of the least represented gender on the board of directors. Survival analysis is performed using data from 2012-2019, regarding 98 listed companies. A negative relationship exists between a board having a chairwoman in the past and the likelihood of compliance. No evidence exists for relationships between board size or the age of board members and the probability of meeting the minimum requirement.

Contents

Introduction

In the year 2020 there were more male CEO's named Peter (five), than female CEO's in total (four) among the 100 largest Dutch listed companies (Equileap, 2020). In addition, only three out of the 1000 largest Dutch companies currently have a top five of earners that is completely female, whilst 313 companies have a top that is completely male (CBS, 2021). The Dutch government is aware of the problem of corporate gender inequality, nevertheless it has experienced difficulties in taking action. The Dutch government is not the only one that is confronted with this issue. However, other European countries have been more successful in implementing measures that attempt to create balance between men and women in a corporate context. In 2011, the Italian Golf-Mosca Law was passed. Resulting in a required minimum of 33% of the least represented gender on the board of directors of listed companies, to be reached by 2015. Companies that did not comply on time, faced the risk of receiving monetary fines. This strong action taken by the Italian government appeared to be much needed. In 2013 the European Institute for Gender Equality ranked Italy as the bottom country in the European Union, in relation to the occupational domain, using 2010 data (EIGE, 2021).

Italy is not unique in creating gender quota regulations and the implementation of the quotas has not been uncontroversial. Consequently, the quota laws are a frequently studied subject. The main focus of previous studies has been on both the effectiveness of the quota regulations as well as the consequences of the quotas in terms of company performance. For instance, strong compliance has been found with the Norwegian quota, however with little evidence for voluntary spill-over to non-listed companies (Seierstad et al., 2020). Furthermore, stricter quotas with monetary fines are found to be more effective compared to softer laws (Bennouri et al., 2020). Regarding firm performance, no significant influence of the gender quota in Norway exists (Dale-Olsen et al., 2013). For France and Spain, negative or no effect on different measures of firm performance has been found. In Italy, a positive relationship of the quota on productivity is discovered (Comi et al., 2020).

Little or no attention has been directed to the question of which type of companies are more likely to comply with a gender quota. Nonetheless, literature on the sort of companies that have more female board members in general does exist. Firm-level characteristics that influence the percentage of women on the board of directors are for example firm size, firm age and the industry that a company is in (Kirsch, 2018). In addition, whether a company is family-owned (Nekhili & Gatfaoui, 2013) or successful or not (Martin-Ugedo & Minguiz-Vera, 2014) also plays a role. The purpose of this study is to go beyond the existing literature on firm-level characteristics,

and instead focus on the boards of the companies. Data from the Italian gender quota will be used, to establish a link between board-level characteristics and compliance with the quota law.

This leads to the following research question:

"What is the relationship between board-level characteristics and the probability of Italian companies to comply with the mandatory gender quota?"

The features of the board that the study examines are board size, age of the board members and whether the board has ever had a female chair or not.

This paper adds to the existing literature on multiple levels. First, the gender quota literature will be expanded, by asking a question that does not concern the effectiveness of the quotas or their influence on firm performance. The evidence from Italy will also broaden this literature due to the fact that the Italian quota has been researched less than for instance the quotas from Norway and France. Second, the literature on the influence of firm- and board-level characteristics on gender diversity in general will also be developed, by studying the features in the context of a gender quota. Furthermore, the features defined in this general literature are not yet based on evidence from Italy. Finally, the influence of the age of board members has not been studied thoroughly before and the influence of having a chairwoman had yet to be examined. This study is not only scientifically relevant, it is also important socially. The answer to the research question is relevant to the authorities of countries with existing and future gender quotas, because it enables them to predict for which companies the law might become problematic. The knowledge of which companies are less or more likely to comply with gender quotas is also interesting to the general public that is passionate about gender equality. Finally, the case of Italy is not only relevant because it has been studied less than other quotas, it also spikes interest due to the bottom position of Italy on the Gender Equality Index related to occupation.

The data for this study is derived from BoardEx and Orbis. In the period of 2012 till 2019, the required data is available for 98 companies. Survival analysis is applied on these firms, for which the failure event is defined by compliance with the required 33% minimum. With the use of a Cox proportional hazards model, it is possible to examine the influence of the board-level characteristics on the likelihood that a company will start to comply within the studied period.

The remainder of this paper is structured as follows. First, theoretical background will be provided on gender quotas in Europe, the specific case of the Italian quota and on previously established relationships between board features and the number of women on the board. After this, the data collection will be elaborated on, the variables will be described and the Cox proportional hazards model will be discussed. Thirdly, the results of the model will be presented.

After this, sensitivity analysis will be applied on the results. Finally, the study will be concluded and discussed.

Theoretical background

This chapter consists of three sections. First, background will be provided on gender quotas in Europe. Second, the details and effects of the Italian gender quota law will be discussed. Finally, different relationships between board-level characteristics and gender diversity of the boards of firms are described. Based on these relationships, the hypotheses that serve to answer the research question will be stated.

Gender quotas in Europe

In the period of 2005 until 2011, multiple European countries have passed gender quota regulations, which require firms to appoint a minimum percentage of the least represented gender on the board of directors (Bennouri et al., 2020). Although the laws formally concern 'the least represented gender' in practice this involves women. The required minimums can naturally be defended from a political and ethical perspective, however economist might also be in favour of the quotas. This is due to the fact that board diversity can be linked to higher firm value. Boards that have a higher proportion of women and minorities are believed to do better in terms of understanding the marketplace, creativeness and innovativeness, problem solving, corporate leadership and building more effective global relationships (Carter et al., 2003). Fears do exist however, that mandatory diversity will lead to a board of lower quality. Board member selection can either be based on economic or social reasons. Economic reasons are explained as decisions based on expected expertise and perceived value added. Economical decision making could be disrupted however, by social processes. The effect of a gender quota on the quality of the board, then depends on which selection process the quota affects. When it cancels out social processes and allows for economical reasoning, the quality of the board is expected to increase. When the quota causes firms to select women despite economical reasoning however, this will not be beneficial for the quality of the board (Lending & Vähämaa, 2017).

The first gender quota law of Europe was passed in Norway and became effective in 2008. The minimum percentage of the least represented gender on the board of directors as required for this regulation is 40% (Lending & Vähämaa, 2017). The Norwegian law is classified as a 'hard' gender quota, since monetary sanctions can be the consequence of non-compliance. Other countries that make use of this hard approach are Italy and France, in chronological order of implementation. Examples of countries that apply a so called 'soft' quota are the United Kingdom (Bennouri et al., 2020) and the Spain (Gabaldon & Giminez, 2017). Study into the regulations

shows overall effectiveness in increasing the percentage of women on boards, however the stricter quota laws are more effective compared to the softer regulations (Bennouri et al., 2020). Furthermore, the same study shows that the quality of the boards in countries with quota regulations improves on multiple levels. This could be prove for the fact that gender quotas eliminate the social processes in appointing board members, and do not disrupt economic considerations as described by Lending & Vähämaa (2017).

The Italian gender quota

The law that implemented the gender quota in Italy is named the Golf-Mosca Law (Rigolini & Huse, 2017). The law was passed in 2011 and became effective in August 2012. Prior to this, only 6% of the directors of listed company boards in Italy were women. Below the details of the gender quota law are discussed, as well as its effects according to other studies.

Details

In Italy, the main corporate governance structure is the dualistic horizontal system (Rigolini & Huse, 2017). This system consists of both a board of directors as well as a board of statuary auditors. The former has a managing task and the latter one is of a controlling kind. The managing duties of the board of directors are very broad and the board consequently is crucial in day-to-day business. The composition of the board is solely determined by the shareholders' meeting.

The Golf-Mosca Law requires that at least 33% of directors on the board is of the least represented gender (Rigolini & Huse, 2017). This is the case for listed companies and state companies, for both the board of directors as well as the board of statuary auditors. Italy has one stock exchange named Borsa. At the time of writing 236 companies are listed on Borsa (Borsa, 2021).

Italian companies were not required to comply with the quota immediately after the 1st of August 2012 (Rigolini & Huse, 2017). The companies had until 2015 to implement the law, but were not completely free to determine when in this timeframe they would appoint the necessary number of women. This is due to the fact that the authorities started to check for compliance from the first change of board composition after August 2012. For this first change 20% was still accepted, but the second change of board composition had to result in at least 33% of women. If this board change did not lead to compliance, the company received a warning and the instruction to comply within four months. After this, the companies risked receiving a monetary fine of one million euros maximum. If this still did not lead to compliance, the authorities had the power to remove the board of directors.

Effects

A few studies have been conducted in order to investigate the effects of the Italian quota law on board composition. In the period from 2011 to 2014, the percentage of listed companies that met the 33% minimum went up from 2% to 12% (Magnanelli et al, 2017). In the same period family-owned companies are found to have a higher percentage of women on boards. Moreover, Rigolini and Huse (2017) show that in June 2015 the percentage of total women on listed company boards was approximately 28%.[1] This indicates that in the period from 2011 to 2015 the percentage increased from 6 to 28.

It is clear that the Golf-Mosca law affected corporate gender diversity in a positive manner. Nevertheless, no research has been done to examine which type of boards are more likely to comply and thus become more gender diverse. In the next section board-level characteristics that might influence this will be identified.

Board-level characteristics and women on boards

The relationship between firm-level characteristics and the percentage of women on the board of directors has been examined frequently outside the context of a quota law. Nonetheless, board-level characteristics are a less studied topic. Therefore for this study, the influence of board-level characteristics on the probability of compliance with the Italian gender quota will be examined.

De Cabo et al. (2011) describe the situation in which less women are appointed as board members because of an underestimation of their skills. This could for example be caused by the costs incurred with gaining information about a particular female candidate, as a result of which a profit maximizing company rather exploits observable differences between candidates such as gender. Furthermore, these underestimations could also solely be based on personal beliefs regarding women's performances that are shaped by prejudices in society. This could then lead to mistake-based discrimination, which is a decision based on biased knowledge formed by stereotyped profiles. An example of a stereotype regarding women in a corporate context is that they are more risk averse. Johnson & Powell (1994) prove however, that women make decisions that are of equal risk and quality as those of men. The underestimation of women's skills might be offset by interaction with women already on the board and the information that is gathered from this. De Cabo et al. (2011) find prove for this in Spain, in the form of a positive relationship between the fact that there is already a woman on the board, and the probability of the election of a new female. However, a problem with this theory is that if by coincidence a board has a negative

[1] They also claim that at this point in time 85% of the companies complies with the regulation. This is not very useful however because they do not specify if this is measured against the 20% or 33% minimum.

experience with a woman already on the board, the stereotype will only become stronger. In addition, Farrel & Hersch (2005) suggest that there is a negative relationship between a female already being on the board and the probability of appointing another woman, due to the fact that the first woman was only added because of diversity reasons. Therefore, a new approach is chosen, in which the fact that a board has had a previous chairwoman is used to examine the relationship with the proportion of women on the board. This cancels out the mentioned problems, because it is not likely that a woman that confirms negative stereotypes will be appointed as chair. It is also seems unlikely that a woman that is only added for diversity reasons will be made chair, since her skills are not considered. In the situation that a female member that was only appointed for the sake of diversity does become chair however, the described negative relationship is expected to be eliminated. This is due to the fact that the chairwoman now has unexpectedly created positive believes on female performance. These considerations lead to first hypothesis.

Hypothesis 1 Companies with a board that has had a chairwoman previous to the research period, are more likely to comply with the 33% gender-minimum requirement within the studied period.

Studies have shown a positive relationship between a company's board size and the number of women on the same board. This relationship has been proven to exist for Canadian companies (Burke, 1999), French companies (Nekhili & Gatfaoui, 2013) and companies from the United Kingdom (Brammer et al., 2007). Considering the absolute number of women on a board, the explanation for more female members on larger boards is not complicated. The larger boards simply have more seats available. Prove for this explanation exists in the form of multiple studies from the UK that show that often women are added to the board as extra members, instead of as replacement members (Conyon & Mallin, 1997) (Singh et al., 2001). In addition, often these women are not appointed to executive positions. This relationship between board size and the absolute number of women on a board is on its own not useful in the context of a gender quota. This is because a larger board has more seats available, however it also has to appoint more women to reach the quota minimum. Nevertheless, as de Cabo et al. (2011) prove, a woman already on the board could influence the chances of a new woman being appointed. This is why it is expected that the probability of compliance with the gender quota is higher for companies with larger boards. It will be easier for a larger board to appoint their first female member. This woman can then prevent mistake-based discrimination that is based on stereotypes of women's performance. This leads to the second hypothesis of this study.

Hypothesis 2 Companies with larger boards are more likely to comply with the 33% gender-minimum requirement within the studied period.

Apart from the composition of the board in terms of the gender of the chair and size, a characteristic of the board members themselves can also influence the proportion of women. The Italian Companies and Exchange commission (CONSOB) shows that when the average age of board members is lower, the probability of having women on the board increases (Bianco et al., 2011). No explanation for this relationship is provided in the literature, this might be because the explanation is rather intuitive. Older board members might be more conservative and resistant to having women as directors, because they grew up in times with different believes for social gender roles. To illustrate, research into the British society shows that older people are more likely to agree with the statement that it is a men's job only to provide income (Scott & Clery, 2012). In addition, when grouping birth years into generations, a decline of support for this statement can be seen in the newer generations. Because the relationship between the age of board members and women on the board has not been studied frequently and is also not explained thoroughly, this study examines the relationship once more. The findings from CONSOB lead to the final hypothesis.

Hypothesis 3 Companies with a higher average age of board members are less likely to comply with the 33% gender-minimum requirement within the studied period.

Data and Methodology

In this chapter the data and estimation technique used for this study will be described. First, it will be set out how the data is collected and to which sample selection this leads. Second, the variables that will be used are presented. Finally, the method for estimation will be set out.

Data collection and sample selection

The main data sources for this research are BoardEx and Orbis. BoardEx contains data on board members of publicly listed companies from all over the world, along with the main features of these companies. The Orbis database consists of data that is extracted from company's balance sheets and other financial statements, and contains data on almost 80 million companies worldwide. The availability of this data leads to the first sample selection choice for this study. Only boards of directors of listed companies are considered, the board of statutory auditors and state-owned companies are thus neglected. Different smaller datasets within Boardex are used to collect the data. BoardEx's 'Organization Summary Analytics' is searched by the ISIN numbers of firms that are listed on the Italian stock exchange. This search is used to obtain company names by ISIN and the country of headquarters of the firms. From the search of 236 Borsa listed firms,

BoardEx data is available for 163 Italian companies. For these 163 companies, BoardEx's 'Composition of Officers Directors and Senior Managers' is used to obtain a list of directors on the board of the firms in the research period 2012-2019, together with the start- and end-dates of each director and function title. BoardEx's 'Individual Profile Details' is then used to obtain the gender and current age of the directors. Missing values for gender are handled by adding gender manually based on director names. BoardEx's 'Organization Summary Analytics' is also used to obtain data on board size. Of the 163 remaining firms, director data for the research period is available for 117. Finally, 3 of the 117 firms are not useful for research because they already complied with the 33% minimum before 2012.

Orbis is used for the majority of firm-level characteristics. With a search of the remaining 114 companies' ISIN numbers, it is possible to retrieve data for 98 companies on ownership, region in country, turnover and profit, number of employees, assets, founding year, geographical markets and sector expressed in US SIC primary codes. This caused some missing values for region in country and company age, these are solved for manually by conducting internet searches. Finally, Statista is used to find GDP per capita of the different regions in Italy.

Variables

The depended variable of the model used in this study is the hazard rate, this will be further elaborated on in the next section.

The independent variables for the analysis consist of three board-level characteristics. Since a duration format is chosen for survival analysis, the observations in the data consist of periods that end with the start-date of a new board member. The independent variables are added to every period. From the function title in the gathered directors data, it can be determined whether the firms have had a chairwoman previous to the research period. The dummy variable for chairwoman equals 1 when this is true. Average board size is a time-invariant variable. It is measured over the years 2012-2019 in number of directors on the board. The average age of board members is calculated at the end of every period, and therefore is a time-varying variable.

To mitigate the risk of the model being exposed to omitted variable bias, control variables are added to the model. The variables that have to be added are defined by examining existing literature. The first control variable is a dummy variable that equals 1 if a company is family-owned. A study into the boards of directors of French companies shows that the number of female directors on a company's board is strongly related to family ownership of that company (Nekhili & Gatfaoui, 2013). This can be explained by the fact that the female directors of family-owned companies are recruited within the families. The fact that the woman that will be appointed is

known amongst existing members of the board is a reassurance for the selecting shareholders and to the CEO. The same is also proven to be true for the boards of directors of Spanish SME's (Martin-Ugedo & Minguez Vera, 2014). Also as noted before, in the years 2011-2014 the percentage of women on boards was higher for family-owned companies in Italy.

Company size is also related to the number of women that is present on the board of directors. This is found to be true for Canadian companies (Burke, 1999), companies from the United Kingdom (Singh et al., 2001) and also from China and India (De Jonge, 2014). The relationship between company size and the proportion of female board members is positive, where size is often defined in number of employees, turnover or profit. There are two reasons for this relationship. First, larger companies are more focussed on overall diversity due to the attention that is focused on them by the public (De Jonge, 2014). Second, companies that are larger and more successful gain ability to appoint women. The absence of women on boards can partly be explained by the lack of qualified women. When there is a limited pool of suitable female directors, companies must compete (Martin-Ugedo & Minguiz-Vera, 2014), which will be easier for larger and successful firms. The first explanation of the positive relationship between company size and women on the boards of directors is still expected to hold in a situation in which a gender quota is in place. The quota law will probably direct even more public attention the companies. That is why it is expected that larger companies will be more focussed on meeting the minimum requirement. The variables turnover, profit, asset and number of employees are all added to each duration period for different models, and are determined at the end of each period. The variables are therefore time-varying. Profit and turnover are presented in euros and measured in millions. Assets is measured in 10 millions. Employees is the number of employees in the company in a given year, measured in thousands. The second explanation, in which a company is more capable of appointing female directors when it becomes more successful, is also interesting to research. In order to separate size and success so both explanations can be studied, the measure for success will be the variable profit per employee. This variable is computed by dividing the firm's profit by the number of employees, and is presented in thousands.

Multiple efforts have been made in order to establish the relationship between certain sectors and the number of women on boards of directors. The results of these studies however, do not point in one direction. Singh et al. (2001) find more women to be present on the board of directors of the retail-, health-, and media and utility sector. De Jonghe (2014) describes the same relationship for the financial service-, health and media and utilities sector. Adams and Kickmaier (2016) however, find a negative influence of the finance sector on the presence of women on boards. Despite the fact that the existing studies are not conclusive, there is reason to believe that

the sector in which a company operates is related to the number of women on its board. For this study the sector of a company is determined by the first two digits of the US SIC primary codes. Table 1 shows the division of the firms per sector in the sample.

Table 1: Division of firms per sector

Sector	Number of firms
Mining	2
Construction	4
Manufacturing	43
Transportation, Communications, Electric, Gas, And Sanitary Services	16
Wholesale Trade	1
Retail Trade	2
Finance, Insurance, And Real Estate	22
Services	9
Public Administration	0

The uneven spread of firms over sectors makes it impossible to add each sector to the model separately. Therefore, aggregation of the sectors is applied. First, a distinction is made based on the fact whether a sector is goods-producing or service-providing. In the resulting two groups, the labour intensity ratio is used to finally create four categories. The labour intensity ratio is computed by dividing total industry labour costs by the industry's value added, which are derived from Istat. The industries within one group that have an above average labour intensity ratio are aggregated. This creates the following four categories (1) Manufacturing, (2) Mining and Construction (3) Transportation, Communications, Electric, Gas, and Sanitary Services, Finance, Insurance and Real Estate and Whole- and Resale Trade and (4) Services.

Skaggs et al. (2012) prove that older US companies are less likely to appoint women on their board. It is believed that since historical founding conditions play an important role in today's workplace structures of companies, differences in company age lead to different company attitudes. Older companies are therefore expected to find more difficulty in complying with the gender quota. This relationship seems paradoxical to the one that describes more women to be present in larger companies, since company size and age are expected to be related. However, the relationships work through different mechanism. While the relationship with size can be explained by external conditions such as public attention and availability of female candidates, the relationship with age is explained by the internal structure of a company. Additionally, not all older companies are by definition large and vice versa. If in a sample the correlation between size and age is not dominant, both relationships can be examined. The age of a company is measured at 2012 in years, and added to the model as a time-invariant variable.

Intuitively there might also be differences in the culture of Italian companies, based on the other global regions they engage in business with. Since gender diversity is in a worse shape in Asia compared to Europe (d'Hoop-Azar et al., 2017), companies that do business with Asia might be reluctant to appoint more women on their board. From the data on geographical markets a dummy variable is created that equals 1 if Asia is among the geographical sales markets.

Finally, because of the large differences in GDP per capita in different regions of Italy, the GDP per capita of the region of a firm's headquarter will be used as a control variable. GDP per capita is derived from Statista and presented in euros, measured in thousands.

Table 2: Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Chairwoman	3307	0.068	0.2524	0	1
Board size	3307	12.4862	3.993	5.5	23.875
Age board members	3307	54.9846	3.6165	43.3333	67.0625
Family-owned	3307	0.1427	0.3498	0	1
Profit	3307	350.207	2771.3720	-15200.211	16605
Turnover	3307	10928.24	19404.11	2209	131369
Assets	3307	13268.89	26773.44	2.7914	92682.75
Employees	3307	26.8659	39.4767	12	160.851
Profit per employee	3307	60.0341	262.1056	-1984.1087	4770.4667
Age company	3307	65.3296	79.8300	5	529
Sales market Asia	3307	0.1883	0.3910	0	1
Regional GDP	3307	36.1529	3.9818	21.3	39.7

The variables are displayed in table 2. It appears that 6.8% of the observations are form companies that have had a chairwoman before, 20% are from those that are family-owned and 22% from those that have Asia among their sales markets.[2] Furthermore, the size of the companies in terms of profit, turnover and assets are widespread. The same is true for the age of the companies, with a difference of over 500 years between the oldest and youngest company. The correlation between all the discussed variables is shown in the Table 3.

[2] Since not all companies have an equal number of observations, these percentages cannot be interpreted as number of companies. In fact, 6 out of the 98 companies have had a chairwoman before. 20 are family-owned, and 21 have a sales market in Asia.

Table 3: Correlation and significance

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1)Chairwoman	1.0000												
(2)Board size	0.2300*	1.0000											
(3)Age board members	0.1275*	0.2417*	1.0000										
(4)Family-owned	0.0476*	0.0470*	0.1039*	1.0000									
(5)Profit	0.0310	-0.0632*	0.0016	-0.0228	1.0000								
(6)Turnover	-0.0288	0.0938*	-0.1630*	-0.1480*	0.3472*	1.0000							
(7)Assets	0.2050*	0.5684*	-0.0929*	-0.1808*	-0.0681*	0.4143*	1.0000						
(8)Employees	0.1135*	0.4929*	-0.1675*	-0.2279*	-0.0876*	0.5514*	0.9029*	1.0000					
(9)Profit per employee	0.2379*	-0.1051*	-0.1631*	-0.0733*	0.1504*	-0.0168	-0.0887*	-0.1226*	1.0000				
(10)Sector	-0.0179	0.3493*	-0.1628*	-0.1479*	-0.0020	0.1451*	0.2787*	0.2320*	-0.0132	1.0000			
(11)Age company	-0.0970*	0.0036	0.1620*	-0.0377*	-0.0958*	-0.0167	-0.1022*	-0.1463*	-0.1135*	0.0454*	1.0000		
(12)Sales market Asia	0.0945*	-0.3633*	0.0339*	0.0821*	0.1245*	0.1839*	-0.1756*	-0.1463*	-0.0286	-0.3682*	-0.0615*	1.0000	
(13)Regional GDP	-0.0383*	0.0955*	0.0503*	0.0205	-0.0752*	-0.0879*	0.0938*	0.1345*	0.1002*	0.0430*	-0.2258*	-0.0462*	1.0000

**** p<0.01, ** p<0.05, * p<0.1*

The highest correlation exists between assets and number of employees, the other size variables also correlate. This is not problematic since the model wills be estimated with one size measure at a time. Moreover, a high correlation is present between board size and both assets and number of employees, this has to be taken into consideration in the estimation of the models that use assets or number of employees as a measure for size. Firm age and firm size are not strongly correlated. Furthermore, profit per employee is not strongly correlated with either profit or number of employees.

Estimation technique

In order to test the hypotheses of this study, survival analysis will be used. More specifically a Cox proportional hazards model will be estimated. In this section both survival analysis and this model will be described, as well as the specific model for this study.

Survival analysis

Survival analysis is a type of estimation that uses the time that passes before a subject engages in a certain event (Cleves et al, 2010). Engaging in the event is classified as the failure. Time could be on the scale of seconds, minutes, days, etc. In this study this concerns the time in days until a firm complies with the 33% minimum. In the dataset the 33% minimum is eventually met by 37 of the 98 companies. Time in days could also be used as an independent variable in a regression analysis. The advantage of survival analysis over that approach however, is the fact that survival analysis models do not assume the residuals to be distributed normally. The dependent variable of a survival analysis model is often the hazard rate, which has units 1/t, where t is the used measure for time. For this study since the time is measured in days, the hazard rate is measured in X/days. This hazard rate can be interpreted as follows, when this rate continues for a day, X number of failures (or companies complying) are expected. A higher hazard rate thus means a higher chance of observing one failure in the studied period.

Cox proportional hazards model

One of the models that can be estimated with survival analysis is the Cox proportional hazards model. The advantage of this model compared to other survival analysis models, is the fact that it does not assume the hazard rate to have a certain shape over time (Cleves et al, 2010). The hazard rate does therefore not have to be solely increasing or decreasing nor has it to be constant. Instead, the main assumption of the model is that the hazard rates of the subjects are proportional. In other words, that the ratio between the hazard rates of different subjects is constant over time. This is also known as the proportional hazard assumption. The model estimates a hazard rate for a

certain subject, based on a baseline hazard rate and various coefficients that are estimated from the data.

The Cox model looks like this:

$$h(t,x) = h(0)e^{(\beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 Y_1 + \cdots + \beta_n Y_n)}$$

Where

h = the hazard rate in 1/t

$h(0)$ = the baseline hazard

β = the coefficient of the corresponding variable, determined from the data

X_{1-3} = the independent variables

Y_{1-n}= the control variables

The baseline interpretation of the coefficients goes as follows. When taking the exponent of the coefficient, the number that this results in shows the percentage change on the hazard rate caused by the corresponding variable.

Results

The results of the estimation of the Cox proportional hazards model as described in the previous chapter ('model 1') are shown in the Table 4. Preliminary to the specification of these results, it is important to take note of the proportional hazard assumption. A test for this assumption shows that it holds for model 1 as a whole, however it is violated for the individual variables of turnover, regional GDP and age of board members. [3] Four outliers that influence the coefficient of the turnover and regional GDP variable are therefore identified and removed from the model. The results of model 1 with this altered dataset ('model 1.2') are presented in table 4. The additional models of this study are all estimated with the dataset for which the removal of the outliers is applied.

The values that correspond with the variables are displayed in terms of hazard rates, since reporting the values as coefficients is not useful for the consideration of the magnitude of the effects of the variables. Hazard rates take values that are either between 0 and 1 or larger than 1. A value of 1.1 indicates that the corresponding variable causes the hazard rate to increase with 10%, a value of 0.9 implicates a decrease of 10%.

[3] The results of the proportional hazard test and the determination of outliers are provided in the appendix.

Table 4 : Cox proportional hazards model estimations

Variables	1 Haz. Ratio	1.2 Haz. Ratio
Chairwoman	0.1527***	0.0507***
	(0.1010)	(0.0413)
Board size	0.9456	0.9935
	(0.0846)	(0.0910)
Age board members	1.0082	1.0328
	(0.0524)	(0.0610)
Family-owned	1.3246	1.5408
	(0.6702)	(0.8456)
Turnover	0.9997**	0.9993***
	(0.0001)	(0.0002)
Profit per employee	1.0029***	1.0036***
	(0.0005)	(0.0007)
Mining and construction	0.2083**	0.1339**
	(0.1460)	(0.1207)
Transportation, Finance and Trade	1.3502	0.9113
	(0.5584)	(0.4552)
Services	1.6103	1.7264
	(0.9490)	(0.9811)
Age company	1.0059***	1.0064***
	(0.0016)	(0.0018)
Sales market Asia	0.8602	1.5988
	(0.4472)	(0.8482)
Regional GDP	1.0701	1.1855***
	(0.0508)	(0.0738)
Observations	2,940	2792

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

Model 1.2 is the most appropriate to test the hypotheses with. Hypothesis 1 states that the fact that a company has had a female chair of the board before the research period, will have a positive effect on the likelihood of compliance. The variable of chairwomen that tests this hypothesis is significant (HR=0.0507, p<0.05). The hazard rate of firms that have had a chairwoman before is on average 94.93% lower than that of companies for which this is not true, everything else remaining equal. This indicates that the relationship between having a chairwoman in the past and the likelihood of compliance with the gender quota is negative.

Hypothesis 2 expresses that a larger size of the board will have a positive effect on the likelihood of compliance with the 33% minimum in the research period. Hypothesis 3 states that companies with a board with a higher average age are less likely to comply with the minimum. The variables that test these hypotheses are both insignificant (HR=0.9435, p>0.05 & HR=1.0328, p>0.05). The hypotheses are rejected.

The variables of turnover and profit per employee are both significant (HR=0.9993, p<0.05 & HR=1.0036, p<0.05). This confirms the relationship found in previous literature that indicates that successful firms are more likely to comply with the gender quota. Nonetheless, the nature of the relationship between size and the probability of compliance is negative, which is the

opposite of what was expected. Both coefficients are close to one which implies a very small effect. However, this is not strange when considering the magnitude of the variables. An increase of one million euros in turnover decreases the hazard rate with 0.07%, thus an increase of 100 million indicates a decrease of 7%. A difference of 100 million is not considered to be extreme, given the standard deviation of the variable. Since profit per employee is measured in thousands, an increase of 10.000 euros in profit per employee leads to a hazard rate that is 3.6% higher. The relationship between age of the company and the likelihood of compliance also works in the other direction than expected, since firms that are one year older have a hazard rate that is on average 0.64% higher (HR=1.0064, P<0.05). A difference of 10 years would lead to an increase of 6.4%. Again, this effect is not considered to be abnormally small given the standard deviation of the age variable. Sectoral differences are only confirmed for operating in mining or construction instead of manufacturing, since the p-value of the mining and construction group is smaller than 0.05. In addition, the results show a significant positive influence of regional GDP on the probability of compliance (HR= 1.1855, P<0.05). No evidence has been found for relationships between companies being family-owned or having a sales market in Asia and the probability of reaching the 33% minimum.

Sensitivity analysis

To check for the robustness of the estimated Cox model, various sensitivity checks are performed. First, the starting date of the model will be adjusted in order to examine the consequences of this on the results. After this, two variables as used in model 1.2 will be replaced by other variables that examine the same relationship.

Starting date

As described before, the law implementing the gender quota in Italy entered into force on the 1st of August of 2012, nevertheless companies did not have to comply immediately. With their first board change after this date, they had to reach 20% of the least represented gender. The 33% became required after the second board change. In model 1.2 the number of days that it takes companies to comply is calculated with respect to the 1st of August of 2012. In model 2 and model 3 the first and second board changes are used as starting points respectively. The results of the estimations of these models are shown in Table 5.

Table 5: Estimations with first- and second board change as starting points

Variables	2 Haz. Ratio	3 Haz. Ratio
Chairwoman	0.0503***	0.0590***
	(0.0393)	(0.0485)
Board size	0.9728	0.9569
	(0.0945)	(0.0913)
Age board members	1.0401	1.0626
	(0.0624)	(0.0616)
Family-owned	1.4715	1.2472
	(0.8294)	(0.6231)
Turnover	0.9994***	0.9993***
	(0.0003)	(0.0003)
Profit per employee	1.0037***	1.0038***
	(0.0007)	(0.0008)
Mining and construction	0.1197**	0.0893**
	(0.1105)	(0.1023)
Transportation, Finance and Trade	0.9481	0.8854
	(0.4810)	(0.4363)
Services	2.1414	1.5203
	(1.4956)	(0.8458)
Age company	1.0067***	1.0037*
	(0.0018)	(0.0020)
Sales market Asia	1.6415	1.3646
	(0.8492)	(0.7044)
Regional GDP	1.1660***	1.1424*
	(0.0692)	(0.0788)
Observations	2792	2792

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

The relationships for model 1.2 as established in the previous chapter remain almost equal when changing the starting date for survival analysis to the first board change as in model 2. The effect of being in mining and construction instead of manufacturing increases for model 3. Age of the company and regional GDP are not considered to be of influence on the probability of compliance in model 3 (P>0.05).

Variable measures

Some of the variables in the model that are considered to be of influence on compliance can be measured in another way than in model 1.2. First of all, turnover is included in the model as representation of firm size. Other common measures of firm size are profit, assets and number of employees. In model 4, 5 and 6 respectively, these variables are added to the estimation to replace the turnover variable and check for the robustness of the outcomes. In model 5 and 6 the variable for board size has been left out, since it has been established that a high correlation exists between this variable and both assets and number of employees. It is uncommon to include both profit per employee and either profit or number of employees in one model. However, it is been established that no strong correlation exists between those variables. Therefore, it was decided to also

replicate model 1.2 with profit and number of employees as size measures, in order to check for the robustness of the results. The results of model 4, 5 and 6 are shown in table 6.

Table 6: Estimations with alternative measures for size

Variables	4 Haz. Ratio	5 Haz. Ratio	6 Haz. Ratio
Chairwoman	0.0820*** (0.0626)	0.1190*** (0.0802)	0.1069*** (0.0728)
Board size	0.8621 (0.0824)		
Age board members	1.1095* (0.0617)	1.0845 (0.0584)	1.0896 (0.0621)
Family-owned	1.0991 (0.5765)	0.7575 (0.3811)	0.8072 (0.4125)
Profit per employee	1.0043*** (0.0008)	1.0037*** (0.0006)	1.0035*** (0.0007)
Mining and construction	0.0359*** (0.0316)	0.0683*** (0.0582)	0.0425*** (0.0429)
Transportation, Finance and Trade	0.6954 (0.3485)	1.1227 (0.5426)	0.5299 (0.2300)
Services	1.5249 (0.9213)	1.4741 (0.8524)	0.8354 (0.4815)
Age company	1.0038* (0.0021)	1.0044** (0.0023)	1.0051*** (0.0019)
Sales market Asia	0.8678 (0.4477)	1.0195 (0.4545)	1.7576 (0.7817)
Regional GDP	1.1075* (0.0657)	1.1519** (0.0760)	1.1730** (0.0819)
Profit	0.9998*** (0.0001)		
Assets		0.9995** (0.0002)	
Employees			0.7651*** (0.0605)
Observations	2792	2792	2792

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

The relationships between the alternative measures of size and the likelihood of appointing at least 33% of female directors are similar to the relationships in model 1.2. However, assets are measured in 10 millions and the effect of number of employees is larger than that of the other size measures. Moreover, when using profit as a size measure, the variables of company age and regional GDP are not significant (P>0.05). In addition, the nature of the remaining relationships as established in the previous chapter remains equal. The magnitude of the effects of having a chairwoman in the past on the hazard rate is smaller in model 4, 5 and 6 compared to model 1.2. The magnitude of the effect of operating in mining or construction instead of manufacturing is larger in models 4,5 and 6.

Additional to alternative size variables, a different grouping of sectors is examined. The original groups are created by a first distinction of goods-producing versus service providing and secondly by using the average labour intensity. The group of transportation, finance and trade contains the most different sectors. The labour intensity of the transportation sector is very close

to the average, therefore it will be added to the above average group to check for robustness of the groupings of model 1.2. The results of this new model are shown in table 7.

Table 7: Estimations with alternative sector grouping

Variables	7 Haz. Ratio
Chairwoman	0.0633***
	(0.0511)
Board size	0.9575
	(0.0922)
Age board members	1.0624
	(0.0619)
Family-owned	1.2828
	(0.6292)
Turnover	0.9992***
	(0.0003)
Profit per employee	1.0037***
	(0.0007)
Mining and construction	0.1001**
	(0.1121)
Finance and Trade	0.9162
	(0.4599)
Services and Transportation	1.3848
	(0.7651)
Age company	1.0036*
	(0.0020)
Sales market Asia	1.4137
	(0.7356)
Regional GDP	1.1430**
	(0.0775)
Observations	2,792

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

Changing the sector grouping results in an insignificant company age variable (HR=1.0036, p>0.05). There are no other noteworthy differences that are the consequence of changing the sector groups.

Conclusion and discussion

This paper provides an answer to the question what the relationship is between board-level characteristics and the probability of compliance of a company with the Italian gender quota. Gender quotas are a frequently studied subject, nonetheless the focus of previous literature has remained on the effectiveness of the quotas and their influence on firm performance. A Cox proportional hazards model has been estimated, using data from 98 Italian listed companies, in the period of 2012-2019. The examined board features are the fact whether a board has ever had a female chair in the past, board size and age of the board members. It was expected that the presence of a chairwoman in the past would eliminate negative stereotypes of women, and would therefore make it less challenging for a company to comply with the 33% minimum. However, evidence for a negative relationship between having a chairwoman previously and the likelihood

of compliance with the gender quota has been found. Second, the board size of a company was anticipated to affect the probability of meeting the required minimum positively. More available board seats could make it easier to appoint the first female, this board member can then remove any stereotypes that might exist. Finally, younger board members are presumed to be less conservative and thus less hesitant to appoint women. Nonetheless it must be concluded that no evidence has been found for the existence of these two relationships. These results are robust to the change of the start date of the Cox model, and changes in the use of control variables such as alternative measures for firm size and different groupings of sectors.

Conclusions can also be made regarding the influence of firm-level characteristics that has been established by previous literature. Adding control variables representing these relationships has confirmed the positive relationship between firm success and the likelihood of compliance. It can also be concluded that the sector a firm is operating in does matter for the chance that the firm complies with the gender quota. The influence of firm size and firm age functions in the opposite direction than was predicted. Furthermore, it can be concluded that the regional GDP of a company is of influence on compliance. Finally, no evidence for the effects of family-ownership and having a sales market in Asia has been found.

This study and therefore the conclusions of this paper have several limitations. First, although control variables are added to the model, it is not possible to control for all existing relationships. Consequently, chances are high that an omitted variable bias remains. In addition, data limitations caused the fact that only 98 Italian firms were included in the study. A larger sample would lead to more reliable results, and would also create opportunities to examine more relationships. A recommendation for future research is to expand this study by using more firms, this would make it possible to include the influence per individual sector for example. It is also recommended to research explanations for the fact that two of the hypotheses are rejected, and that firm-level relationships based on earlier research are not confirmed.

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Appendix

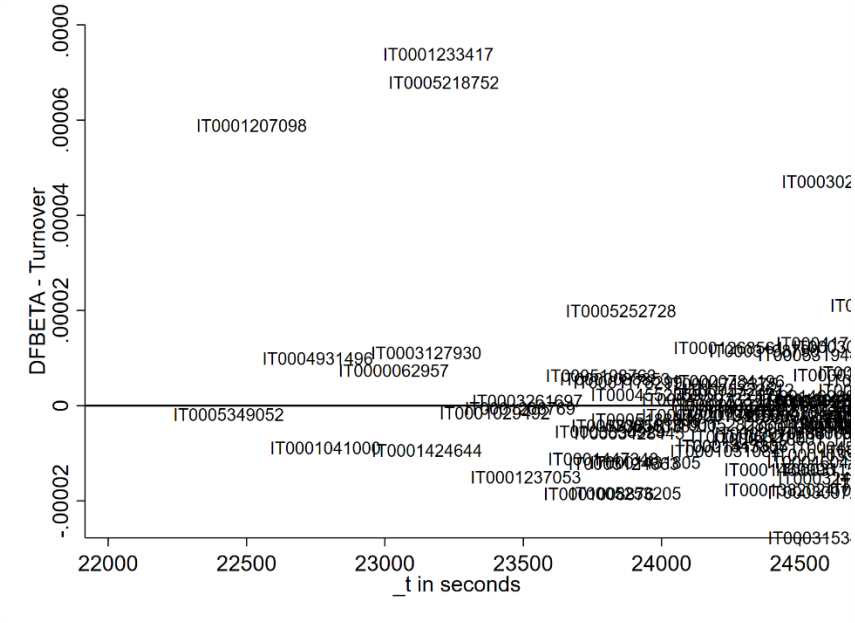
Testing proportional hazard

The proportional hazard assumption is tested for model 1, the results are presented in the table below.

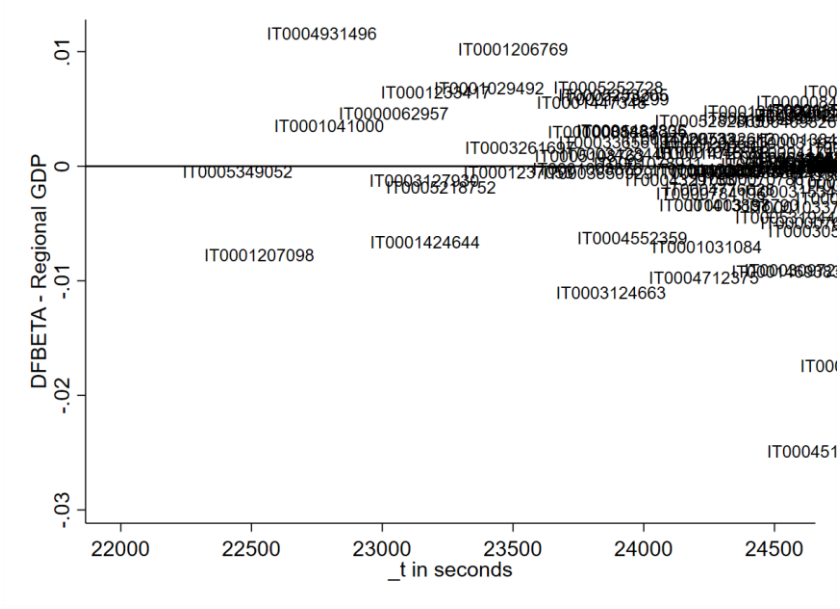
Appendix Table 1: Test of the proportional hazard assumption for model 1

Variables	Rho	Chi2	Prob>chi2
Chairwoman	-0.1565	0.65	0.4217
Board size	-0.1851	3.05	0.0807
Age board members	0.2737	5.72	0.0168
Family-owned	-0.0716	0.29	0.5887
Turnover	-0.3194	8.08	0.0045
Profit per employee	0.1483	0.60	0.4383
Mining and construction	0.0545	0.03	0.8530
Finance, trade and transportation	0.2276	2.47	0.1164
Services	0.0906	0.40	0.5270
Age company	-0.1675	1.64	0.2004
Sales market Asia	0.0389	0.12	0.7248
Regional GDP	-0.3283	7.75	0.0054
Global		19.32	0.0811

It can be seen from the global test that the proportional hazard assumption holds for the model overall because 0.0811>0.05. However, this is not true for the individual variables of turnover, board age and regional GDP. A graphical approach can be used to identify outliers that influence the turnover and regional GDP variables.



Appendix figure 1: DFBETA for Turnover



Appendix figure 2: DFBETA for regional GDP

Four outliers are A2A S.P.A. (IT0001233417), Banca Monte Dei Paschi Di Siena S.P.A. (IT0005218752), ACSM-AGAM S.P.A. (IT0001207098) and Tiscali S.P.A. (IT0004513666).

The new dataset without the four identified outlier subjects leads to the following results of the proportional hazard test with the same variables and starting point as model 1.

Appendix table 2: test of the proportional hazard assumption for model 1 without outliers

Variables	Rho	Chi2	Prob>chi2
Chairwoman	-0.0365	0.04	0.8476
Board size	-0.1711	1.66	0.1978
Age board members	0.0941	0.52	0.4690
Family-owned	-0.0991	0.55	0.4573
Turnover	-0.0864	0.47	0.4945
Profit per employee	0.0528	0.06	0.8092
Mining and construction	0.0251	0.01	0.9127
Finance, trade and transportation	0.2257	1.73	0.1885
Services	0.0415	0.08	0.7784
Age company	-0.0659	0.23	0.6299
Sales market Asia	0.0283	0.05	0.8305
Regional GDP	-0.2340	2.83	0.0925
Global		6.08	0.9122

For the adapted dataset, model 1 meets the proportional hazard assumption. Also, all the individual variables of model 1 meet the assumption. The removal of the outliers influencing turnover and regional GDP thus solved for the violation of the proportional hazard assumption for the variables turnover and average board age.