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Stock market reactions to women being announced to the board, in a context of binding and non-binding gender quotas

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Table of Contents

1.1 Introduction.

There has been an ongoing trend of trying to improve the position of women in society. However as of yet, female representation is still rather low within the boardrooms of companies. This is problematic since firms fail to recognize the additional benefits of having women present in the boardroom. One example of such an advantage is that Chen et al. (2016) notice a reduction in male CEO overconfidence when its board is partially constructed of women. Even though companies could greatly benefit from having women on the board, gender[1] diversity remains to be low. One way of introducing more women onto a board is with a quota on the minimum required percentage of women to be present on said board (Contreras & Burzynska, 2020). This policy tool has been used in multiple different countries and has been proven to be successful in adding female representation to the board Gender quotas are based on the positive ideas of diversity. In the most standard formulation, a quota based on gender legally requires a boardroom to have a certain percentage of males and females represented in the board (Dahlerup, 2005). The problematic low rates of women on the board have tried to be changed through the implementation of gender quotas. Many countries keep introducing different types of gender quotas in different sectors of the economy, which causes the affected companies to announce and hire many more women to their board. There remains to be a problem with a lack of understanding what drives the market reaction when women are announced, within the context of either mandatory or non-mandatory quota. If the market reaction is better understood, academics and policymakers have a better understanding on how the market views the appointment of women to the board. Better insight might provide indications of different biases still present among investors.

This thesis will also try to provide empirical support for claims made about the added value of women to boardrooms. In order to analyze whether the market acknowledges the added value of women in the boardroom, stock market reactions will be measured via abnormal returns. The abnormal returns from companies on the announcement dates will offer insight on the market reaction. The cumulative abnormal returns will be taken from two days following the announcement of a women to a company's board. If there is no market reaction following the announcement, abnormal returns should randomly fluctuate around zero. Academic literature seems to be divided and conflicted about the true short term and long-term effects of appointing women on boardrooms. Therefore, this thesis will provide concrete evidence on the short-term market sentiment of the appointment of women in the board, with the main goal of filling in the gap in the existing and conflicting literature. Uncertainty about the actual results of the introduction of quotas is problematic, since more quotas are being introduced. A better understanding of the different effects from varying quotas reduces that uncertainty. Gender quotas are either mandatory or non-mandatory, each having

[1] Although there are a multitude of different genders, this research only focuses on binary male and female genders.

different short-term market reactions. Therefore, this research will answer the question whether stock markets react positively or negatively to women being announced to the boardroom, in the context of different quotas.

Many different European countries have started to adopt quota regulation in order to make an effort to reduce the discrepancy between male and female presence in the boardroom. Common legislation states that representation of both genders should be at 40% minimum, with the European Union (EU) making efforts to pass this legislation throughout the whole of the EU (Seierstad, Gabaldon, Mensi-Klarbach, 2017). In 2003, Norway became the first country to implement a board gender quota, with initial stock market reactions being negative. Nygaard (2011) argues that short-term reactions were negative due to the sudden increase in demand for female directors, which therefore caused boards to be suboptimal constructed, which in turn led to an increase in monitoring costs. Even though initial market reactions were negative, after a couple of years many countries followed, which could have been because Norway did succeed in increasing women percentages in boardrooms to 40% (Seierstad, Gabaldon, Mensi-Klarbach, 2017). Countries such as Iceland introduced mandatory gender quotas for boardrooms, whilst Sweden conducted policy on non-mandatory gender quotas. Because different types of policies lead to different market reactions, it is important to research how stock markets react to female board members being announced in countries with different quota settings. Information on the market reaction will provide an indication on how the market perceives the policy. The implementation of gender quotas can be reinforced by social arguments. Brammer et al. (2007) argue that female representation in the boardroom should be an independent goal of a company. Adding gender quotas has proven to have a positive effect on education, aspiration, and public opinion by women and girls alike (Franceshet, Piscopo, 2013). Even though quotas might not always lead to the most optimal economic outcomes, they are important to reduce gender bias in society (Koenig et al, 2011). By introducing gender quota, women will be better represented on the demand side of the labour market, since the demand for female board members increases. Secondly, these quotas will improve the willingness to enter different sectors or apply for jobs (Niederle, Segal & Vesterlund, 2012). This has a positive effect on the supply side of the labour market, due to the removal of psychological barriers which prohibits women from applying for high positions.

Existing research has predominantly analyzed stock market reactions in single countries one at a time (Campbell & Minguez Vera, 2010; Kang et al, 2010), and it has mainly focussed on countries with mandatory quotas. Other research has focussed on the market reaction at the announcement of the quota itself (Greene, Intintoli & Kahle; 2020). The study by Greene, Intintoli and Kahle (2010) found a significant negative market reaction when the quota law passed, signalling the negative sentiment from the market. Since the quota was mandatory, efficiency costs were expected to rise in the market, which the stocks reacted to. The negative market reaction reflects the market sentiment on mandatory quota. Stock markets are a reliable reflection of how the market feels

about short-term developments within a company. If news is perceived as 'good' by the markets, this will have positive effects on share prices (Suleman, 2012). This means that if we see market reactions at the announcement date of board members, the reaction can provide an indication of how this announcement is perceived in the market. Furthermore, Contreras and Burzysnka (2020) conducted research on network effects for women, whilst comparing binding and non-binding quota settings. Contreras and Burzysnka (2020) in turn provided claims about the difference between binding and non-binding quota However, little current research focuses on the comparison in stock market reactions between countries with different types of quotas. This has left a gap in academic research, which this thesis aims to contribute towards. This thesis uses similar methods used by Kang et al. (2010) by calculating stock market reactions through cumulative abnormal returns and combines this with ideas from Contreras and Burzynska (2020) by finally comparing effects from binding and non-binding quotas. By choosing this method, this thesis tries to provide a more through understanding of the market reaction to women being announced, in markets which deal with several types of quotas. A better understanding of the financial effects of implementing board gender quota will improve the quality of future research on topics surrounding gender quota. This thesis will focus on multiple countries with either mandatory or non-mandatory quota. Varying results and conclusions from existing research have resulted in a lack of consensus about the financial consequences of implementing board gender quota. By conducting analyzes on cumulative abnormal returns on the moment that women are announced to the board, in countries with different quota settings, this thesis will try to reduce the lack of consensus. This paper will generate insight which might be useful for policymakers, since this thesis will analyze the different reaction of stock markets in countries with either mandatory or non-mandatory quotas. A better understanding of the workings and reactions to different policies will provide policymakers with the right tools to construct the best possible legislation. Furthermore, results will contribute to the ongoing political debate and will provide solid empirical evidence for different claims being made in this political debate.

Furthermore, this thesis might provide evidence on present gender biases among investors. Literature suggests that board diversity will be beneficial for companies. Thus, if markets overall react poorly to the addition of women to a company's board, we might be able to conclude that gender bias is very much at play. More knowledge and research on present gender biases might contribute towards the decrease of these biases, thus strengthening the position of women in society.

In countries with non-mandatory quota, there is no artificially created excess demand for women being added to the boardroom, yet the benefits will remain. As a result, abnormal returns will be positive when women are announced as board members. With regard to countries with a mandatory quota, there will be an instantaneous increase in demand for female board members. However, supply of well-qualified women to the board may not be able to match the sudden increase, resulting in a disequilibrium within the market. Even though Niederle, Segal and Vesterlund (2012) argue that quota can lead to an increase in the supply of women, the increase of supply will not be

able to match the greater demand for female directors. Firms must lower standards of hire in order to meet the quota, resulting in more costs for the company. The efficiency costs and welfare costs related to disequilibrium in the market exceed the benefits of adding women to the board. Abnormal returns will be negative for these companies.

The stock market reaction will be calculated using the abnormal returns surrounding days of announcement. These CARs (cumulative abnormal returns) will be obtained through Refentiv Eikons, whilst the rest of the dataset will be obtained through BoardEx. An event study will show whether market reactions differ for countries with mandatory or non-mandatory quota. OLS regressions will provide empirical evidence on 694 unique abnormal returns, or separate market reactions. If abnormal returns do not randomly fluctuate around zero, there is an indication of markets reacting to the female appointments. The market reaction will be calculated with the usage of the abnormal returns. Summary statistics on the CARs will provide an early indication on this market reaction. After this, multiple OLS regressions will be run, with age, experience, average amount of board positions and a Hofstede masculinity score as added variables. A quota dummy will determine whether the type of quota has effect on the CARs. Additional checks will be run in order to analyze whether individual countries or yearly effects have effect on the market reaction.

At first glance, abnormal returns appear to be negative when women are announced. The size of the board shows positive statistical significance, which might be due to the fact that bigger boards see relatively less change when women are announced to the board. The Hofstede cultural dimension variable on societal masculinity versus femininity has the strongest statistical significance. The degree to which a country is feminine or masculine is of great importance, with companies in masculine societies showing positive abnormal returns. It appears that cultural effects from countries have great effect on the market reaction when women are announced. Furthermore, the type of quota becomes significant and relevant. In countries with mandatory quota, the abnormal returns will be more strongly be negative. This is in line with literature. When controlling for individual countries, Denmark appears to have a positive influence on the abnormal returns, again providing evidence that cultural and country specific factors are important in determining the abnormal returns. When keeping yearly effects fixed, only the Hofstede masculinity score and average amount of board positions remain statistically significant. Overall, we can conclude that the type of quota a country adopts does have effect on the market reaction, and cultural biases and views might be a key factor which drives abnormal returns.

2.1 Theoretical framework & hypothesis development

Having a high-quality board is a necessity in order for a firm to perform sufficiently, since there is a positive relation between the quality of a firm's board and that specific firm's market performance (Dowen, 1995). An element of creating an optimal board is about having diversity within the board. According to Abdullah et al. (2016), functioning of a board improves when gender diversity is higher. Company performance is also positively related to the diversity within the firm's board (Anderson et al., 2011). Gender is an important factor in diversifying a board, however it remains to be the case that male board members initially look at their male counterparts when hiring. One's network has a profound impact on the assignment of board positions (Contreras & Burzynska, 2020). Having an extensive network will raise chances of being offered a board position, since people often turn to people in their own network first. Generally, this results in more males being assigned board positions, which leaves diversity within the board inadequate. If boards only assign positions to other males, the board misses out on many talented women, which are not considered due to gender.

There are two major theories which describe different consequences on board composition. The two major theories are agency theory, first introduced by Jensen and Meckling (1976), and resource dependency theory (Pfeffer & Salancik, 2003). Both theories describe the particular effects of a specific type of board structure, and these effects change when women are added into the boardroom. In order to contribute towards the existing research on the effect of gender quotas, these two theories are linked to a particular market reaction, in a context of mandatory quota and non-mandatory quota.

Agency theory is a core theory in economic behavioral literature. Agency theory deals with problems which arise between principles and agents within organizations (Panda & Leepsa, 2017). Managers, or agents, will act on their own behalf, and will act in accordance with their own self-interest. They will act in manners which maximizes their personal goals. Furthermore, agency theory is associated with three types of additional costs (Jensen & Meckling, 1976). First, monitoring costs are the costs which are incurred when the principal monitors the performance and quality of the principal. Secondly, bonding costs are the costs made to ensure that the agent acts in accordance with the principal, and not contrary to the principal's goals. Finally, there are residual costs. Residual costs are incurred due to the welfare loss derived from the agent which acts suboptimal towards the final objective. The consequences of this theory change when women are added to the board, and the mechanisms from agency theory which influence market reactions change as well. There is evidence that gender diversity in positions of power is associated with a decrease in agency costs (Vitolla et al., 2020). Agency theory states that agents are inclined to take increased risks, since they have little personal harm when projects or risks fail. The addition of women in the boardroom might be beneficial, due to the fact that women are stated to be more risk-averse than men (Jianakoplos & Bernasek, 1998). This means that female board members might take less risk, aligning the company

better with the risk-preferences of shareholders. Rahmand and Zahid (2021) provide claims that having women in the board reduces the volatility of the company's stocks. Again, this might reduce the problems between principals and agents, since this is in the principal's interest. Thus, the mechanisms of agency theory might lead to an indication for a positive market reaction, as a result of the adjustments of alignments between the principal's and agent's goals.

The second important theory is resource dependency theory. Resource dependence theory tries to analyze the link between the company and its environment, with a special focus on the external resources on which a company is dependent (Lückerath-Rovers, 2009). Whilst the original theory mainly focuses on the power dynamic within mergers from companies, the applications of the theory have been greatly expanded upon. Company boards are the most important link between a company's required external resources, and the company's business of choice, therefore the board of directors will act as a linking mechanism between these two (Lückerath-Rovers, 2009). Values and ideals of the companies will be legitimized through the linkage of the board and the external resources. Pfeffer and Salancik (2003) explain this by stating that when people who represent an organization are perceived as legitimate, it sends a message to the outside world that they comply with the ideals and values of the company. As a result, when women are introduced to a board, the company legitimizes and signals different ideals and values to the market, which will result in a change in the perception of that company. Furthermore, improving the position of women in society might be viewed as corporate social responsibility, since the two concepts are thoroughly linked (Dawar & Singh, 2016). Brammer et al. (2006) find evidence for a positive reaction from stakeholders when companies engage in corporate social responsibility. Engaging in corporate social responsibility will in turn lead to more positive values signalled by the company. The positive effect on reputation will probably lead to positive market reactions. Resource dependency theory thus provides a mechanism which indicates that the stock market will react positively to the announcement of women to the board. Both agency theory and resource dependency theory provide mechanisms through which we can hypothesize the stock market reactions when women are announced to a company's board.

When gender quotas are introduced in a country, the effects and mechanisms of these theories change compared to the mechanisms which apply for men. As a result of implementing gender quota policies, the demand for women as board members will increase, since companies will have to comply with a gender quota. The effect on the supply side of the market will be much smaller. The supply of women as board members will only slightly increase. Niederle, Segal and Vesterlund (2012) find evidence of increased job applications from women due to gender quota. If women have experienced years of not being selected for boardrooms, they will have less willingness to apply for board positions. If regulation improves the chances of being selected, more women will apply who did not do so in the first case. However, the increase of supply will be smaller, and less instantaneous than the decrease in demand. A disturbance of the current market equilibrium will follow, which means that the effects of agency theory and resource dependency theory will change. The disequilibrium will

result in demand for women capable of filling board positions exceeding the supply. It is expected that the market will react to this market disruption, regardless of the type of quota.

The reaction is expected to differ between binding-and non-binding quotas. In the case of non-binding quotas, the demand for women will increase, however not as much in the case of binding quotas. In countries with non-mandatory quotas, all publicly listed firms have to comply with a certain percentage of gender diversity, yet there are no consequences for non-compliance. The demand for women fulfilling board positions will increase, but not as strongly in a mandatory quota country. Some companies will choose not to adhere to the quota, and will not face any repercussions, resulting in an overall lower increase of demand. In the context of a non-mandatory quota, there are multiple reasons to expect a positive market reaction. Increasing diversity within the boardroom allows for a better understanding of diversity in the client base. Consumers themselves are diverse, and a better understanding of the clientele could improve sales and firm performance (Campbell & Minguez Vera, 2010). Furthermore, when women are added to the boardroom, it signals positive values of equality to the market, explained via resource dependency theory. The mechanisms provided by agency theory also hypothesize a positive market reaction, since the goals from principals and agents will be better aligned when women are added to the board. Due to the fact that failure to comply with non-mandatory quota will not result in any penalties, the potential advantages of adding women to the board will outweigh the efficiency costs associated with restructuring the boardroom. Both agency theory and resource dependency theory provide mechanisms which explain why a positive market reaction can be hypothesized, regardless of the market disturbance caused by the addition of the quota. Formally:

Hypothesis 1: In countries with a non-mandatory quota, women being announced as an addition to the board will result in a positive market reaction.

In the context of a mandatory quota, the expected increase in demand will be much higher, due to the fact that all publicly listed companies have to meet a certain percentage of gender diversity in the board. When this percentage is not met, penalties will follow. In this case, it is likely to assume that the demand for qualified women will strongly exceed the supply. Even though agency theory and resource dependency theory might indicate positive market reactions, the market disturbance will be too great. The market will react negatively, partially due to the excessive costs of replacing many current board members for new female board members. Different efficiency costs are related to replacing board members, since they require very firm specific knowledge and skills, and therefore need time and money to start performing at sufficient levels (Defond, Hann & Hu, 2005). Furthermore, direct costs of adding additional board members are estimated to be 0.0007% of total share value for large companies, whilst smaller companies deal with costs as high as 0.76% of market capitalization (Greene, Intintoli, Kahle, 2020). Many firms will incur direct costs, since all firms have

to comply with the quota. Overall, the prior optimally constructed board will undergo many changes in countries with mandatory quota. These costs will also be incurred in countries with non-mandatory quota, however the benefits will most likely outweigh the costs. Not all firms will comply with the quota, therefore there is a smaller increase in demand, and more time to change the board. Even though resource dependency theory and agency theory lead to a positive hypothesis, there are too many costs associated with replacing or adding board members, as well as efficiency costs with disturbing the prior board composition. Many changes happening in the board will result in stress and turmoil within the country. The results will differ between mandatory quota, and non-binding quota since the increase in demand for qualified women will be much higher in countries with mandatory quota, resulting in more strong consequences for the company and stronger equilibria shocks. Therefore, negative abnormal returns can be expected in countries with a non-mandatory quota. Formally:

Hypothesis 2: In countries with a mandatory quota, women being announced as additions to the board will lead to a negative stock market reaction.

3.1 Data & methods:

In order to study the market reactions in different quota contexts, this thesis uses a dataset with abnormal returns from companies and multiple other variables. The data comes from different databases, with information about board announcements, board members etc. coming from BoardEx. The BoardEx database is a commonly used source for this type of information (Contreras & Burzynska, 2020). The abnormal returns are provided by Refentiv Eikon datastream. In order to create a sample of 1.219 individual announcements, from which 1.111 cumulative abnormal returns (CARs) could be derived, multiple different datasets from BoardEx and Refentiv Eikon had to be merged, which was successfully done through the usage of ISIN codes. However, the many observations had missing data, in which case the observations were dropped. This left the final sample with 694 observations. To obtain the values for masculine societies, the Hofstede Masculinity cultural dimensions, were obtained from a global database called data.world. Statistical analysis will be done with STATA-17. Only publicly listed companies and firms are being used in the sample, because of two major reasons. Firstly, publicly listed firms have stocks, which are actively being traded. The ability of a firm's stock being actively traded is fundamental in order to calculate market returns. Secondly, publicly traded firms offer the big advantage that information is publicly available, and announcements dates are available in BoardEx. The research analyzes a time period between 2010 and 2016. In the years following 2010, most European countries started to adapt the quota legislation, therefore by starting in 2010 announcements possible influence from time factors will be smaller than with a longer time period. Views on female board membership may change over time. In order to reduce possible change in biases, a time period between 2010 and 2016 is chosen. Secondly, the time period ends at period 2016 due to the fact that after the deadline for the quota, companies should have achieved internal gender diversity. In order to determine the stock market reaction, abnormal returns are used. If the cumulative abnormal returns (CARs) fluctuate randomly around zero, we can conclude that there is no market reaction. If the CARs are negative, the market has a negative reaction. Inversely when the CARs are positive, the market has a positive reaction.

The included countries in the research are thus; Belgium, France, Italy, the Netherlands, Germany, Denmark. Iceland, Ireland, UK, Greece and Poland could have been added to this selection, but it was impossible to calculate Icelandic CARs, since no companies were present in any indexes. As a result, the Icelandic observations were dropped. Furthermore, the same case was present for Greece and Poland, therefore these countries were dropped from the dataset. Ireland and the UK were also eligible, however due to missings in the observations these had to be dropped. Even though there were some countries qualified to be added into the dataset, when observations were incomplete, or lacking they had to be dropped in order to obtain a clean and solid dataset. As a result, some countries with very little observations dropped out entirely.

The remaining. countries are selected because they passed quota regulation between 2010 and 2016 (Arndt & Wrohlich, 2019). Only announcements are included from the moment the quota legislation has passed until 2016. For example, the Netherlands passed legislation in 2013 (Arndt & Wrohlich, 2019), therefore only Dutch announcements between 2013 and 2016 are included. This research uses a similar definition on mandatory quota as used by Contreras and Burzynska (2020). In countries with mandatory quotas, when the targets are not met, sanctions will follow. For non-mandatory quotas, failure to comply with targets will not lead to sanctioning. Formally, the Netherlands has a mandatory quota, however failure to meet targets does not lead to sanctioning. Based on criteria from Contreras and Burzynska (2020) and data from Arndt and Wrohlich (2019), this results in the following distribution of countries with quota. Countries with mandatory quota are: Italy, France, Belgium and Germany. Countries with non-mandatory quota in this sample are: the Netherlands, Denmark. This leads to the following distribution of announcements per country.

Tabulation of COUNTRY

COUNTRY	Freq.	Percent	Cum.
Belgium	55	7.93	7.93
Denmark	59	8.50	16.43
France	406	58.50	74.93
Germany	63	9.08	84.01
Italy	32	4.61	88.62
Netherlands	79	11.38	100.00
Total	694	100.00	

Table 1, the distribution of announcements per country.

In order to research the stock market reaction, this paper will make use of abnormal returns as the dependent variable. Using abnormal returns will provide two main advantages. First, they can be easily calculated, and secondly abnormal returns provide a solid impression on how the market reacts to news. The only drawback is that abnormal returns are influenced by all news in the market. Therefore, some random noise might be included in these returns. The process of calculating abnormal returns is described below.

$$AR_{i,t} = R_{i,t} - E(R_{i,t}) \qquad (1)$$

The abnormal return is calculated by subtracting the expected return of company i on day from the real return of company i on day t. Using this method, it is possible to analyze whether the stock market views an appointment as positive or negative. This is mathematically shown in formula 1. The expected returns are calculated according to the following formula:

$$E(R_{i,t}) = \alpha_i + \beta_i R_m + \varepsilon_{i,t} \quad (2)$$

The formula is based on a specified market portfolio, which is in accordance with a method used by Kang et al. (2010). The alpha in formula two represents a stable return for company i at any specific time. The beta represents a firm-specific risk, which is multiplied times the return in the market (R_m). Finally, the formula uses an additional error term to capture random errors. In order to calculate whether firms show positive market reactions, we use formulas 1 and 2 to calculate the abnormal returns for each company. If both hypotheses 1 and 2 are rejected, and there is no reaction from investors in the market, the abnormal returns throughout the market should be randomly distributed around zero. In this case, announcements of women to a board result in no market reaction, or a market which is indifferent with the prospects of the new board member.

Even if the same firm announces women to the board on different periods in time, the different announcements are viewed as independent observations. In order to measure the immediate reaction from investors, similar to Kang et al. (2010), a two-day event window is chosen. Within the first two days, the immediate market reaction will show. Furthermore, it is important to note that the cumulative average abnormal return (CAR) will analyze the returns at day 0 (t=0) and day 1 (t=1) of the announcement made. Major announcements are often made at the end of the day, and therefore day 0 will not be able to capture the full immediate reaction, since slower reactions will happen after day 0, at day 1. To capture both the AR for day 0 and the AR for day 1, the following formula is used:

$$CAR_{(T_0,T_1)} = \sum_{t=T0}^{T1} AR_t = AR_{t=0} + AR_{t=1} \quad (3)$$

The CARs will capture the total abnormal returns for day 0 and day 1 in the two-day period for each individual observation. The CAR will act as the dependent variable and will interchangeably be called the stock market reaction (SMR). If the CAR turns out to be positively significant, results implicate a positive stock market reaction to announcements of women to the board. If there is no effect, and the hypotheses can be rejected, the CAR will randomly fluctuate around zero. Summary statistics provide an early indication whether the overall market reaction is positive, negative or indifferent.

As a result of combining data from different databases, the acquired dataset will contain a list from every woman who is announced to participate to a board in the aforementioned European countries, between 01-01-2010 and 31-12-2016. Each announced person has a specific code (DirectorID) and is linked to a company through the ISIN code. The DirectorID and ISIN codes make it possible to link the control variables age, experience, average board size to the correct observation. Secondly, in order to calculate the CARs, the process above is done in Excel, with data from Refentiv Eikon datastream. The final CARs can be linked to the correct observation via the ISIN codes. Combining all this different data results in a dataset in which 1.219 announcements are combined

with company data, director specific data, and finally the matching CARs. After this, observations with missing data were dropped, resulting in a dataset of 694 observations.

The dataset contains 694 observations for the CARs. Some announcements were done by companies from which index data was absent. Formula 3 shows that in order to calculate expected returns, a possible market return is multiplied by a market beta. However, if companies are not included in any indexes, it is impossible to obtain the market return. Other control variables are added in order to analyze whether these have an effect on the abnormal returns. These independent variables are age, experience and average size of the board. The age is taken at the moment of the announcement. Experience is calculated as the total number of board positions an announced woman holds at the moment of the announcement. Finally, the average size of the board is calculated as the average board size between 2010 and 2016 for companies. The addition of the control variables is further explained in section 3.2.

3.2 Research design & statistical analyses

This study uses an event study as the basis for the research design. Similar to Kang et al. (2010), this research uses a two-day event window. Furthermore, according to MacKinlay (1997) common financial and economic studies use estimation window of (-120, -10) days prior to the event window in order to calculate normal returns. This means that the 120 days prior and stopping at 10 days prior to the event window, are used in order to calculate expected returns. As a result, the dataset resembles a pooled cross-sectional dataset. All observations are seen as independent, regardless of whether observations are made in different years, or within the same company. The first indication of the market reaction on female board announcements will come from summary statistics. The mean, and the median will provide an indication on the fluctuation of the CARs, and whether these randomly fluctuate around zero. In order to better understand the market reaction in different quota contexts, different summary statistics will be provided for observation which are recorded in countries with a mandatory quota, and a non-mandatory quota. To facilitate this, a quota dummy is added. The dummy will take value 1 for countries with a mandatory quota, and value 0 for non-mandatory quota. After the summary statistics, an OLS regression will provide more concrete empirical evidence on the market reaction, and the statistical significance of control variables. The control variables concern the individual qualifications and information on the women being announced on the board. Equation 4, based on similar research done by Campbell and Minguez Vera (2010), will thus provide empirical results. Equation 4 shows how the dependent variable (CAR) is influenced by different variables, and provides a visualisation on how the variables and coefficients of the variables influence the CAR. The betas represent the possible coefficients which the different variables have in the equation. If variables turn out to be significant, they have a statistically significant effect on the CARs of the two days following the announcement of a woman.

$$CAR = \beta_0 + \beta_1 Experience + \beta_2 Age + \beta_3 AverageBP + \beta_4 QuotaDummy + \varepsilon_i \quad (4)$$

If QuotaDummy is statistically significant, having a mandatory quota has a significant effect on the CARs. The coefficient will provide information on whether the effect is negative or positive. The efficient market hypothesis (EMH) analyzes the availability of information, and the reflection of different types of information in the stock market. Markets are said to be efficient and optimal when all relevant information which determines a price, is represented in that price (Malkiel, 1989). New information will be reflected in the stock price, thus the efficient market hypothesis provides an argument as to why announcements will result in a market reaction. This argument makes the statistical approach a valid manner of researching the market sentiment on female board announcements.

The different control variables will provide an indication whether other possible variables can explain results. Experience is calculated by taking the number of board positions an announced woman already possesses. It is stated that total number of board positions which a person being announced to a board has, is positively related to the market reaction (Ismail & Manaf, 2016). According to resource dependency theory, when a person holds multiple board positions, it allows for a better linkage of external required resources from these companies. Ferris et al. (2003) find evidence to support this claim, stating that when multiple announcements are made by a firm, the market will react positively. Another individual characteristics is age. Ismail and Manaf (2016) argue that when a person grows older, their experience in life grows. This experience allows them to improve their decision-making, and therefore have a positive effect as a board director. Therefore, a positive market reaction to age is to be expected. Even though this research has chosen to solely focus on individual director characteristics with regards to control variables, it is important to add the average amount of board positions (AverageBP) per firm. This research analyzes female board announcements in different quota settings, and as a result of these quotas boards may increase in size. One manner of increasing the relative number of women to the board, is by adding extra female members to this board. In order to analyze the market reaction to this manner of complying with the quota, average amount of board positions in a firm is added as a control variable. The amount of average board positions is a firm specific variable, which is calculated by taking the average number of board positions firms have between 2010 and 2016. Kathuria and Dash (1999) find evidence to claim that board size is positively related to firm performance. This claim can be supported by resource dependency theory, in which case more directors will have more links to external resources. Furthermore, as board size increases, diversity in the firm increases, which would be beneficial as mentioned before. Therefore, a positive relation can be expected. This research has chosen to mainly focus on director-based control variables, and not on firm-based control variables. Much research in the field has already focused on the effect of market capitalization, return on assets etc. or other firm characteristics (Smith & Chown, 2021; Adams et al., 2012). The priority of this research lies with analyzing the market reaction on an individual being announced, in different quota contexts. The market reaction based on firm size etc. is separate from the market reaction caused by an individual. Therefore, it is chosen to focus on the relevant individual director characteristics, with an exception for AverageBP.

Hofstede developed an index in order to be able to give numeric values to specific cultural dimensions of different countries (Hofstede, 2011). One aspect of the dimensions is about masculinity versus femininity in society. The score reflected to what degree certain ‘masculine’ emotions are prominent in society versus more ‘feminine’ emotions. This led to a score for different countries, with a high value being assigned to more masculine societies. This score will be used in order to control for the influence of masculine or feminine societies. Formula 5 as the regression estimation.

$$CAR = \beta_0 + \beta_1 Experience + \beta_2 Age + \beta_3 AverageBP + \beta_4 HofstedeManscore + \varepsilon_i \quad (5)$$

The final regression will be run with formula 5, since this will provide the most insight. Many factors influence market reactions, therefore the research might be vulnerable to omitted variable bias. As a result, the internal validity of this research is possible to scrutiny. However, results still provide valuable insight into the market reactions on female board announcements in different policy contexts.

4.1 Results

The dataset contains 694 individual observations for the cumulative abnormal returns (CARs). 556 Observations were recorded in countries with mandatory quota, whilst 138 observations were recorded for countries with non-mandatory quota. This is due to the fact that data was less available for countries with non-mandatory gender quota. These countries are smaller, with smaller economies, or have generally less data available.

Variable	n	Mean	S.D.	Min	0.25	Median	0.75	Max
CAR	694	-0.01	4.38	-19.35	-2.07	-0.20	1.55	42.33
Mandatory CAR	556	0.03	4.44	-19.35	-2.08	-0.18	1.58	42.33
Non-mandatory CAR	138	-0.18	4.17	-14.44	-2.06	-0.46	1.34	14.85

Table 2, descriptive statistics on CAR

In table 2 it is possible to see how the total value for CAR has a negative mean of -0.01 and a median value of -0.20. This means that overall, when women are announced to the board, the abnormal returns are slightly lower than the normal market returns. The market will not recognize the added benefits of having women added to the board. However, in order to analyze the differences between types of quotas, it is important to analyze the different means for the CARs in the different quota settings.

Table 2 above shows the CARs for countries with mandatory quotas the mean abnormal returns are positive with a value of 0.03. Even though the mean is only slightly positive, the median is negative small and negative with a value of -0.18. This suggests that the effect is really small, and the abnormal returns could fluctuate around zero. Overall, there is too little evidence for an added market reaction when women are announced to the board in countries with a mandatory quota. For countries with non-mandatory quota, the mean and the median of the abnormal returns are respectively -0.18 and -0.46. This shows that when women are being announced to the board, on average, companies are projected to have a negative abnormal return of -0.18. These findings contradict the literature, which would suggest that companies in non-mandatory quota settings should obtain a positive market reaction.

An OLS regression with multiple control variables is run in order to analyze whether these variables have effect on the abnormal returns achieved, from which the results are presented in table 2.

Linear regression

CAR	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Age	.017	.022	0.77	.442	-.026	.06	
Experience	.033	.065	0.51	.611	-.094	.159	
AverageBP	.082	.042	1.95	.052	-.001	.165	*
QuotaDummy	-1.442	.785	-1.84	.067	-2.983	.099	*
HofstedeManscore	.043	.021	2.09	.037	.003	.083	**
Constant	-2.723	1.259	-2.16	.031	-5.194	-.251	**

Mean dependent var	-0.012	SD dependent var	4.384
R-squared	0.018	Number of obs	694.000
F-test	2.532	Prob > F	0.028
Akaike crit. (AIC)	4019.217	Bayesian crit. (BIC)	4046.472

*** $p<.01$, ** $p<.05$, * $p<.1$

Table 3, OLS regression CAR

Table 3 shows the significance and coefficients from every variable in equation 5. To start off, we can see that the AverageBP, QuotaDummy, HofstedeManscore and constant variable are statistically significant. The Hofstede cultural dimension score shows the highest level of statistical significance, with a $p<0.05$. The others are slightly negative with p-values below 0.1 The R-squared value of the model is less than 2%. First, the Hofstede score shows significance, with a positive coefficient. When countries score higher on the masculinity score, the CARs following the announcement will be higher, since there is a positive relation. This might be due to the fact that markets in masculine societies value the additional benefits of women higher. Secondly, the QuotaDummy now has a significant negative coefficient. This means that when the value of the dummy increases, the value of the CARs decreases. Furthermore, we see that experience and age do not appear to be statistically significant. Only the average amount of board positions a company has, also shows levels of statistical significance.

The most interesting results come from the significance of the Hofstede masculinity dimension. This is the case because it has the highest level of significance and appears to have influence on the CARs. Descriptive statistics are offered on the CARs in countries with a Hofstede score greater than 50. These countries would be more masculine. Furthermore, statistics are also presented on countries with a Hofstede score smaller than 50, thus being more feminine societies. The descriptive statistics present an extra indication of the effect of the Hofstede cultural dimensions.

Variable	**n**	**Mean**	**S.D.**	**Min**	**0.25**	**Median**	**0.75**	**Max**
CAR Hofstede score >50	150	0.71	5.65	-13.09	-1.74	0.18	2.03	36.54
CAR Hofstede score <50	544	-0.21	3.95	-19.35	-2.21	-0.29	1.31	42.33

Table 4, descriptive statistics on CAR

Table 4 offers specified information about the CARs, which is in line with results from table. It is visible that there are big differences between countries which are feminine or masculine. First, the mean and median CARs are both positive in masculine countries, whilst the mean and median are both negative in feminine countries. This might suggest a positive market reaction in masculine countries when women are announced, and a negative market reaction in feminine countries. As was seen in table 2, when the value of the Hofstede masculinity scores increases, the abnormal returns in these markets will be higher as well.

4.2 Additional tests

Even within Europe, cultural differences remain present between countries, part of this effect will be captured by the Hofstede Masculinity score. However, it in order to analyze results for countries specific, a country dummy is introduced. If these dummies show statistical significance, there are country specific effects present. When controlling for country specifics, it is not required to also control for company fixed effects. The companies are located in specific countries and are thus submitted to a country's values and culture. If the individual countries themselves have effect, we can assume that companies within these countries show similar effects. Formula 6 shows the regression estimation which includes the individual country effects. This formula includes a vector δ in order to specify the different coefficients for the country dummies. Formula 6 presents a visualization of the statistical equation that will be run in order to analyze whether individual countries have influence on the cumulative abnormal returns (CARs).

$$CAR = \beta_0 + \beta_1 Experience + \beta_2 Age + \beta_3 AverageBP + \delta_i CountryDummy + \varepsilon_i \quad (6)$$

The table below shows different effects with dummies for countries with mandatory quotas. As is visible, all variables lose their statistical significance. No country dummy is significant, which means that there is no difference between the countries.

Linear regression

CAR	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Age	.018	.022	0.84	.401	-.025	.062	
Experience	.036	.065	0.54	.586	-.092	.163	
AverageBP	.071	.045	1.60	.11	-.016	.159	
HofstedeManscore	.312	.38	0.82	.411	-.434	1.058	
BelgiumDummy	-12.2	14.888	-0.82	.413	-41.432	17.031	
FranceDummy	-8.985	10.691	-0.84	.401	-29.976	12.006	
GermanyDummy	-14.997	19.407	-0.77	.44	-53.101	23.108	
ItalyDummy	-16.41	20.957	-0.78	.434	-57.557	24.737	
Constant	-6.698	5.77	-1.16	.246	-18.027	4.632	
Mean dependent var		-0.012	SD dependent var			4.384	
R-squared		0.019	Number of obs			694.000	
F-test		1.673	Prob > F			0.101	
Akaike crit. (AIC)		4024.438	Bayesian crit. (BIC)			4065.320	

*** $p<.01$, ** $p<.05$, * $p<.1$

Table 5, OLS regression with mandatory quota country dummies

It might be the case that the dummies cause multicollinearity in the dataset. This is due to the fact that all other variables lose significance when the dummies are added. In order to check this, we make use of the Variance Inflation Factor (VIF). If VIF values are high, we can state that we have

multicollinearity present in the sample. Multicollinearity is only present when the individual country dummies are added. The table for multicollinearity form table 5 is visible in appendix A.

Due to problems with collinearity, the dummies for the countries with non-binding quota are added in another regression. The results are visible in table 6 below. In this case, we do not have elevated levels of multicollinearity, since the average VIF from the OLS in table 7 is 2.18. The dummy for Denmark turns positive, which shows that the abnormal returns when women are announced in Denmark are higher than in other countries. This shows that within Europe, countries show different biases towards women.

Linear regression

CAR	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Experience	.043	.063	0.69	.492	-.08	.167	
AverageBP	.08	.042	1.89	.059	-.003	.163	*
HofstedeManscore	.043	.021	2.09	.037	.003	.083	**
NetherlandsDummy	1.225	.861	1.42	.155	-.465	2.914	
DenmarkDummy	1.716	.883	1.94	.052	-.017	3.449	*
Constant	-3.277	1.052	-3.11	.002	-5.342	-1.211	***

Mean dependent var	-0.012	SD dependent var	4.384
R-squared	0.018	Number of obs	694.000
F-test	2.497	Prob > F	0.030
Akaike crit. (AIC)	4019.390	Bayesian crit. (BIC)	4046.645

*** $p<.01$, ** $p<.05$, * $p<.1$

Table 6, OLS regression with non-mandatory quota country dummies

It could be possible that year effects are present. We often view cases in which specific effects caused by the time period is present. STATA-17 allows the possibility to check this. When controlling for yearly fixed effects, the results are shown in table 7 below. With a yearly fixed effects regression, we keep the individual effects from the different years constant. Table 7 shows that when controlled for yearly effects, all years turn out to be significant. This indicates that the year in which the CARs are obtained has a profound effect on the CARs. Yearly effects can be common in market reactions, since the reactions of the markets are greatly influenced by the state of the economy. The state in the economy changes between the years, and therefore the yearly effects are constant. The Hofstede masculinity variable and the average amount of board positions within a company remain statistically significant. The R-squared value also greatly increases compared to the OLS regression from table 3. This means that more variance from table 7 is explained than table 3.

Linear regression

CAR	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Age	.016	.022	0.73	.466	-.027	.059	
Experience	.018	.065	0.27	.788	-.11	.146	
AverageBP	.079	.042	1.87	.062	-.004	.163	*
HofstedeManscore	.04	.021	1.90	.058	-.001	.081	*
QuotaDummy	-1.259	.799	-1.58	.115	-2.827	.309	
2010b.YEAR	0	.	.	.	.	.	
2011.YEAR	-3.631	2.024	-1.79	.073	-7.605	.343	*
2012.YEAR	-3.555	2.041	-1.74	.082	-7.562	.453	*
2013.YEAR	-4.007	2.014	-1.99	.047	-7.962	-.053	**
2014.YEAR	-4.469	2.024	-2.21	.028	-8.443	-.496	**
2015.YEAR	-3.686	2.008	-1.84	.067	-7.629	.257	*
2016.YEAR	-4.049	1.999	-2.03	.043	-7.974	-.124	**
Constant	1.282	2.325	0.55	.581	-3.282	5.846	

Mean dependent var	-0.012	SD dependent var	4.384
R-squared	0.028	Number of obs	694.000
F-test	1.783	Prob > F	0.053
Akaike crit. (AIC)	4024.199	Bayesian crit. (BIC)	4078.709

*** $p<.01$, ** $p<.05$, * $p<.1$

Table 7, OLS regression with yearly fixed effects

5.1 Findings

The position of women in the boardroom remains to be in need of improvement, as was intended by the introduction of different quotas in European countries. Stock markets have reacted negatively to these quotas, even though the addition of more women to boardrooms is advantageous. As the different tables in section 4.2 show, at first glance, we can assume that cumulative abnormal returns (CARs) on the days following announcements of women to the boardroom are slightly negative. This suggests that the stock market reaction is negative when women are announced to the boardroom, regardless of the type of quota. Table 2 shows that in a mandatory quota setting, returns most likely fluctuate around zero, since the CARs show a small positive average, whilst having a small negative median. Table 2 also shows negative CARs for countries with a non-binding quota. Furthermore, OLS regressions show that the quota dummy is significant. It is important to understand why the market does not react as expected. Different literature and theories suggest that countries with non-mandatory quota would experience positive abnormal returns, whilst companies who announce women to the board in a mandatory quota context would see negative abnormal returns. We observe that in general, announcements of women seem to result in low and negative abnormal returns for a company.

This observation can be explained by the current biases that investors have against women in positions of power. Even though literature and empirical evidence shows the many advantages of having women in the company and present in the boardroom, Niessen-Ruenzi and Ruenzi (2019) report similar findings of gender bias throughout the financial sector, which has negative influences on the women being effected. As mentioned in the literature overview, social identity theory might be able to explain the origin of the gender biases. Women receive less recognition, and skills are undervalued by men in the sector. Therefore, when women are announced to obtain a place in the board of a company, the positive aspects of the announcement will not be recognized. The gender biases will arise, resulting in a negative market reaction from investors. This explains why in both quota settings countries show no positive abnormal returns when women are announced to the board.

Table 3 includes a Hofstede cultural dimension variable which shows the highest levels of significance. The Hofstede cultural dimension is introduced in order to analyze the differences between countries. Using country dummies did not provide enough insight into differences between countries. Only Denmark appears to have an individual positive effect on the CARs. The Hofstede score has a positive coefficient, which means that CARs are higher in more masculine societies. For countries with higher values on the Hofstede score, the CARs will be positive, while for countries with lower scores, the CARs will be negative. These findings suggest that the degree of masculinity in a country might have a moderating effect between quota variable and the market reaction. There is an intuitive explanation for these empirical results. When countries score higher on masculinity scores, the additional benefits of having women on the board will be much greater than countries with higher feminine scores. The added value of having women in the boardroom will be much higher in

masculine societies, than more feminine societies. Therefore, the CARs will be positive for countries which are seen as more masculine. In more feminine societies, the added value of women to the boardroom will be lower, since the views and advantages that women offer might already be better integrated in the society. The quota dummy also shows significance, yet the coefficient is negative. This means that countries with value 0 for the dummy will have higher CARs than countries with value 1 for the dummy. Value 0 is assigned to countries with non-binding quotas, whilst value 1 is assigned to countries with a mandatory quota. As a result, we can state that for countries with a non-mandatory quota, the CARs will be higher. Thus, when controlled for individual country effects, we see that non-mandatory quota contexts offer higher abnormal returns. This is in line with literature, which suggests that the benefits of having women on the board outweighs the negatives. Due to the quota being non-binding, companies have less restrictions in assigning the right women in the industry, in order to maintain the optimal board composition.

Almost all tables show significance for the average board position control variable shows levels of significance. In every table, this variable has a positive coefficient, which means that there is a positive relation between the average size of the board and the positive CARs on the date of announcement. This finding can be explained via the usage of the optimal board construction theory, which states that boards are optimally constructed, and that it is costly to change the composition of a board. We can assume that boards are constructed in order to optimize shareholder value. However, if due to gender quota being introduced, board compositions have to change, it is more optimal to have a bigger average board size. If the board consists of more people, new additions to the board will result in relatively fewer changes. Inversely, if changes take place in boardrooms constructed with fewer changes, replacements or additions will have a relatively higher impact. When the board is larger, the change has less impact, and the board remains relatively more similarly constructed to the situation before the quota. As a result, there is more continuity in the organization, and the new board more closely resembles the prior optimally constructed board.

In section 4.2, additional checks are done in order to provide an indication of whether other variables or effects are at play. Dummies for countries are introduced, however due to multicollinearity some dummies do not provide insight. Table 6 shows that the Denmark dummy is significant. This means that Denmark has country specific effects on the CARs when women are announced to the board. The significant dummy provides evidence for the differences between European countries, and provides even more evidence that cultural specifics have a major influence on how women are perceived when announced to the board. This is similar to the evidence shown by the Hofstede masculinity value, cultural aspects of a society appear to have a great influence on the market reaction. Furthermore, when controlled for yearly effects, only the average amount of board positions and the Hofstede score remain to be significant. All the different years become significant, which shows that the CARs are greatly influenced by the year in which they are recorded. Overall masculinity and average amount of board positions remain the most significant variables.

5.2 Conclusion & discussion

Concluding, we have evidence to reject hypothesis 1: in countries with a non-mandatory quota, women being announced as an addition to the board will result in a positive market reaction. Even though we have evidence that the CARs are higher in countries with non-mandatory quota. Table 2 still shows that the CARs are below zero. Furthermore, we can accept hypothesis 2: in countries with a mandatory quota, women being announced as additions to the board will lead to a negative stock market reaction. Table 2 provides indication of a slightly negative market reaction, or a random fluctuating around zero for the abnormal returns. Furthermore, the OLS regression that the CARs provide further support for the acceptance of hypothesis 2.

Future research can best focus on the findings surrounding the Hofstede cultural dimensions, or the country specific effects shown by Denmark. It appears that the degree to which a country is known or seen as 'masculine' or 'feminine' has the greatest impact on CARs surrounding female board announcements. Countries which already have more feminine societies will benefit less from the benefits of having women in the boardroom, in comparison with more masculine countries. The cultural aspects from a company or country appears to have a significant effect on the market reaction. In order to improve future research, it is important to include different control variables which look at the prior presence of women in the company's board or different commissions for example. Other research might focus on the present investor biases against women, since these biases remain to have influence on the stock market reactions.

This research has limitations, which future research can improve upon. To start, this thesis makes use of market performance as an indicator. Market performance will be influenced greatly by these biases, whilst accounting performance might be a more objective measurement. Biases will remain to have a substantial impact on the reaction as women are being announced to the board. As long as these biases are present, women will remain to face more struggles to obtain positions of power within companies, even though there are many advantages to having women in the boardroom. Secondly, this thesis mainly focuses on individual characteristics as control variables. In order to present a bigger or more varied view on what drives CARs when women are announced to the board, firm control variables can be included as well. Finally, only European countries were used between 01-01-2010 and 31-12-2016. As was shown by the different Hofstede masculinity scores, all these countries are still very different. In order to have more specific and detailed research, it might be beneficial to reduce the number of countries which are analyzed. This allows for more thorough research, and the reduction of cultural biases against women.

There remains to be a continuing debate on the implementation of even more gender quota, with the EU contemplating gender quota policies throughout the union. Some might argue that gender quotas are unfair, however they remain to be a necessary evil in order to improve the position of

women in society. This thesis has tried to provide insight into the effect of gender quotas on market reactions, and provides indication of current biases among investors.

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6.2 Appendix A:

Variable	**VIF**	**1/VIF**
HofstedeManscore	1297.90	0.000770
GermanyDummy	1131.26	0.000884
FranceDummy	1009.80	0.000990
ItalyDummy	702.96	0.001423
BelgiumDummy	588.60	0.001699
AverageBP	1.28	0.780553
Age	1.07	0.933974
Experience	1.09	0.917128
Mean VIF	591.75	

Table with values for VIF for OLS regression in table 5.