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**MSc Economics & Business**  
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# **The Impact of Dutch Corporate Board Gender Quotas on Stock Prices and Firm Performance**

**An Event Study and Difference-in-Difference Analysis**

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## **ABSTRACT**

This thesis examines the effect of a newly imposed Dutch corporate board gender quota on stock prices and firm performance, measured as Tobin's Q. This is done by performing an event study using daily stock prices from firms active on the Euronext Amsterdam exchange, and by performing a Difference-in-Difference (DiD) analysis using company fundamental data. The control group taken is the Belgian stock market, as the Belgian and Dutch economy are much alike. The abnormal returns on the day the quota was announced were negative, but the DiD analysis did not lead to any significant results.

**Keywords:** Corporate Boards, Event Study, Gender Diversity

**JEL Classification:** G14, G18, G32, G34, J16

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## CHAPTER 1 Introduction

In recent decades, discussions surrounding gender equality and diversity within corporate leadership have gained significant traction across the globe. One of the main topics of interest is the integration of women in top executive positions, such as seats on corporate boards. The Netherlands is a very progressive country and commits to social equality. In 2021 the Dutch government accepted a gender quota law for corporate boards of NV's and large BV's (public and private firms, respectively). This thesis delves into the implications of the gender-quota law for corporate boards in the Netherlands, examining the impact on board composition across years, corporate governance practices, and firm performance.

The Netherlands is a frontrunner on gender equality: women perform well in education, and they have equal rights. There is unfortunately still a gender gap visible. Dutch women work less, have lower salaries and are less likely to be in management positions compared to other European countries. In 2018, women accounted for a meager 12.4 percent of seats on management boards and for 18.4 percent of seats on supervisory board of large companies, respectively. The underrepresented women in leadership positions have been a long matter of concern. Despite efforts of promoting gender diversity at executive positions, women continue to encounter barriers that hinder their advancement to top leadership roles. Ruth Mateos de Cabo et. al. (2019) investigate the effects of soft law board gender quotas and find that less than nine percent of targeted firms fully comply with the quota. Soft law quota's normative obligations do not trigger the adaptation of gender-balanced boards. Because there were some soft laws in place for gender diversity on corporate boards in the Netherlands, the Dutch government decided to act: on the 29th of September 2021, a quota to improve gender diversity on corporate boards was adopted. From the 1st of January 2022, new appointments of supervisory board members must work towards a 'balanced' board. With one-tier boards, the quota only applies to the non-executive board members. A balanced board would mean that men and women each hold at least one third of the seats. Another implementation is that large firms must set appropriate target ratios to improve gender diversity on their boards and on their senior management team.

Various studies have shown that having females on corporate boards contributes to improving financial performance – measured as return on sales, return on assets, and social or ethical compliance (Hazaea et. al., 2023). Gender diversity can enhance performance by bringing diverse skills, viewpoints, and knowledge to the decision-making of boards, improving stakeholder value and corporate governance practices, which ultimately leads to higher firm performance. In other words, the presence of women on corporate boards is believed to indirectly enhance firm performance. On the other hand, there are studies that show the opposite. For example, Fernández and Gaité (2020) find no evidence of a possible relationship between gender diversity on corporate boards and firm performance. This brings

us to the research question: How does the Dutch gender diversity quota for corporate boards affect firm performance?

To estimate the impact of the quota announcement on stock prices, I perform an event study and calculate the cumulative abnormal returns (CAR) for Dutch companies over a five-day period surrounding the quota announcement. The cumulative abnormal returns (CAR) over the five-day period serve as a metric for assessing the stock market impact of the announcement. Using a five-day window allows me to capture price movements of thinly traded stocks. I analyse two days prior to the announcement date to account for potential news leakage and/or insider trading. For the market return, the BEL20-index is used. Belgian firms are used as a comparison group, because the Dutch and Belgian economy are relatively similar. First, both countries have a big port in the port of Rotterdam and the port of Antwerp-Bruges. Second, the countries neighbor each other. And lastly, the GDP per capita of both countries is almost identical, with Belgium having 49,926.80 USD per capita and the Netherlands 57,025 USD per capita in 2022 according to the World Bank. Data on both Dutch and Belgian boards can be extracted from the BoardEx database on WRDS, whereas firm-specific data and daily stock prices can be found on Eikon at the Erasmus Data Service Centre (EDSC).

Moving forward, I will explore the long-term effects of the quota on firm value, which is measured as Tobin's Q. The implementation of the gender quota creates limitations for the firms' directorial choices. However, firms may have opted for strategies such as going private or relocating abroad to circumvent the law. Firms can also bend the Act. For example, Just Eat Take Away N.V. had an unbalanced board (four men, one woman). There were two new members on the shortlist for nomination, a man, and a woman. If both were added to the board simultaneously, the board would still be unbalanced (as the female representation would still be below one-third). What the firm did was first appoint the female, making the board balanced, and after appointing the male – which according to the quota does not make the firm unbalanced. Companies that already met the quota face less adjustment costs compared to firms that do not. Using the difference-in-difference method allows for an analysis of firms facing varying degrees of constraints due to the quota. Specifically, I examine the difference in stock price reaction between firms from the Netherlands and firms from Belgium. One assumption must be made here: investors in Belgian firms were not anticipating similar legislative actions. This assumption holds, since the same mandatory quota as imposed in the Netherlands was already in place in Belgium since 2011 (Loeff, 2023).

This thesis contributes to the ongoing discourse of gender quotas by analysing their impact within the context of the Dutch corporate landscape. By focusing on companies subject to the law, I will shed light on the mechanisms through which gender diversity initiatives influence board outcomes and firm value. The result of this thesis will offer insights into policymaking regarding the composition of corporate boards and contribute to the pursuit of gender equality in corporate leadership. My

expectations of the paper are that the announcement effect is positive, because the improvement to a balanced board gets rid of the so-called ‘old-boys’ club – as stated by Minister van Engelshoven – and makes organizations and companies focus on more than just half of the talent pool in the Netherlands – as stated by Minister Dekker, who ultimately introduced the quota (Ministerie van Justitie en Veiligheid, 2021).

This thesis is structured as follows. Chapter 2 summarizes various papers regarding board gender diversity, quotas, and firm performance. Chapter 3 discusses collected data and the methodology regarding the event study. Chapter 4 discusses the collected data and methodology regarding the difference-in-difference regression. Chapter 5 shows and discusses the results of both methods. Chapter 6 is a discussion regarding the relationship between previous studies and this study. Chapter 7 concludes the thesis.

## **CHAPTER 2 Theoretical Framework**

This chapter consists of three topics: Corporate Board Diversity, Empirical and Theoretical Studies, and Diversity Quotas. The first topic identifies the topic of interest, gives basic background information and introduces the subject on which an event study will be conducted. The second topic dives deeper into studies focused on identifying different theories regarding gender diversity on corporate boards, shedding light onto theoretical studies. The final topic summarizes various studies that have researched quotas and their impact on country- and firm-level.

### **2.1 Corporate Board Diversity**

This topic is split into two sections: first, the background on corporate board diversification is given. What did early studies identify, what have we learned over time, and what are the most notable findings. The second section focuses on corporate governance in the Netherlands and explains the quota of interest.

#### **2.1.1 Background**

Corporate boards are set in place to act as intermediaries between shareholders and managers, such that the interests of shareholders are protected (Fama and Jensen, 1983). For a long time, these boards only consisted of the same type of people – most directors were old, white, and/or retired top managers (Hillman, Cannella, and Harris, 2002). In the last two decades, governments and investors have tried to improve the diversity on boards. For example, there have been laws introduced like quotas, and institutional investors have adapted ESG measures into their investment strategies. But does diversity actually increase firm value?

Kim and Starks (2016) find that females offer specific functional expertise, which most male-dominated corporate boards are missing. This additional expertise can increase firm value. Adler (2001) shows that the inclusion of women in the executive suite for Fortune 500 firms leads to higher scores for profitability – measured as a percent of revenues, assets, and stockholder's equity, respectively. Carter, Simkins, and Simpson (2003) find a significant positive relationship between gender diversity on corporate boards and firm value – measured as Tobin's Q – for Fortune 1000 firms. Brahma, Nwafor, and Boateng (2021) also find a positive and significant relationship between the two, but they used a dataset containing FTSE 100 firms (in the UK). Kiliç and Kuzey (2016) also find a positive relationship for companies listed on the Borsa Istanbul, so there also seems to be evidence for the positive relationship in emerging economies. To finish, Post and Byron (2015) perform a meta-study, looking at 140 studies on board diversity, which in total have a sample of over 90,000 firms from over 30 countries. They find that female directors have higher accounting returns like return on assets and return on equity, the relationship between female representation on boards and market performance is near-zero but positive for countries with greater gender parity – like the Netherlands – and they find that females on boards are positively related to monitoring and strategy involvement.

However, not all studies find positive relationships between gender diversity on corporate boards and firm performance. For example, Marinova, Plantenga, and Remery (2016) do not find a significant relationship, based on evidence from the Netherlands and Denmark in 2007. Gruszczyński (2020) finds no significant relationship based on European firms in 2015, and Arvanitis, Varouchas, and Agiomirgianakis (2022) find an inverted U-shaped relationship between the gender diversity on corporate boards and firm performance. They claim that the optimal distribution of male-to-female on the corporate board is two-to-one and that gender quota's – like the 25 percent mandated by the Greek government – was not as productive as hoped.

### **2.1.2 Corporate Governance in the Netherlands and the Quota**

In the Netherlands there are two different forms of companies with limited liability stock. These are known as the 'besloten vennootschap' and 'naamloze vennootschap', respectively. The stocks of a besloten vennootschap (BV) cannot be traded freely – when someone wants to sell their shares in a BV, these shares must first be offered to existing shareholders. The stocks of a naamloze vennootschap (NV) can be traded freely on for example a stock exchange.

The female quota for supervisory boards and non-executives is in place for all NVs and BVs listed on the Euronext Amsterdam (a Dutch regulated market). To recall the female quota from the introduction: when appointing new board members for either supervisory or non-executive boards, the new appointment must contribute towards a balanced board. One-third of the members must be female, and one-third of the members must be male. To boards with a number of board members not dividable by three, the nearest higher number applies. See table A in the Appendix for some examples of the number of board members and the number of males and females the quota demands (Obenhuijsen, 2022). These rules do not apply to boards with only a single member.

A board that is unbalanced, meaning the board does not compose the minimum requirements, must work towards a balanced board. If there is a vacancy in an unbalanced board, The vacancy must be filled by a gender that works towards making the board balanced. The appointment of a supervisory or non-executive director in an unbalanced board that does not contribute to a balanced board is therefore null and void.

## **2.2 Empirical and Theoretical Studies**

This chapter explains four common theories used when examining diversity on corporate boards. These theories include the Resource Dependence Theory, Tokenism, the Upper Echelons Theory, and the well-known Agency Theory.

### **2.2.1 Resource Dependence Theory**

The resource dependence theory (RDC), developed by Pfeffer and Salancik (1978), says that organizational success is dependent on one's ability to manage dependencies on external resources.

Many papers (like Pfeffer and Salancik, 2003, and Hillman, Cannella, and Paetzold, 2000) argue that we can use the RDC to analyze boards. Members of boards can be categorized into four different members: business experts, internal members, social figures, and support specialists. Both papers argue that a well-diversified board provide better resources than an under-diversified board. For instance, diverse directors can bring new thoughts and different experiences to the conversation that may lead to better decision-making and a diverse board leads to positive signals being send out to labor markets, attracting more and better talent. However, these results can lead to boards tokenizing their next board member.

### **2.2.2 Tokenism**

Tokenism, as described by Kanter (1977), is defined as only making a symbolic effort to be inclusive to members of minority groups – in this case the female gender. Boards can recruit a small number of people from the underrepresented group to give an impression of gender equality within a workforce. These women are not given any substantial roles and have no impact on the board’s decision-making processes. Firms that tokenize will not benefit from the diversity on boards. If token members are not actively contributing, the effectiveness of the board declines, impacting the overall firm performance negatively.

When companies move beyond tokenism to embrace genuine gender diversity, they may benefit from better problem-solving capabilities and a variety of perspectives to improve firm performance. When not moving on from tokenism, firms may experience a lower job satisfaction and increased turnover from the token employees (International Monetary Fund, 2016).

### **2.2.3 Upper Echelons Theory**

The Upper Echelons Theory (UET) is pivotal for understanding how gender diversity on corporate boards impacts firm performance. The UET was designed to explore top management teams, but has been extended to boards, which are considered as superior management groups. This theory posits that directors’ diverse cognitive frameworks significantly influence corporate outcomes, as these frameworks shape how directors process and interpret information (Hambrick & Mason, 1984).

UET suggests that the perspective of directors – shaped by their experiences and insights – consequently influence a firm’s decisions and performance metrics. Female directors bring varied experiences and knowledge, which brings more depth to the board. Women on boards tend to have more and more advanced university degrees according to Hillman, Cannella, and Harris (2002). Female directors are also often non-nationals and come from non-business backgrounds, which gives the board new and fresh perspectives at certain situations (Singh et. al., 2008). All these results align with the UET’s claim that varied cognitive claims can lead to better corporate outcomes.

### **2.2.4 The Agency Theory**

The agency theory is defined as a theoretical perspective that focuses on the relationship between principals and agents in organizations (Eisenhardt, 1989). It addresses the challenges at hand when the principal (manager) delegates work to the agent (employee). The corporate board of directors has a vital role in supervising management and resolving disputes from agency (McColgan, 2001). Gender diversity at corporate boards can influence the monitoring and control mechanisms introduced by principals (shareholders) to align with the interest of the agents (board members), as gender diversity enhances competition. If a board solely focuses on attracting males, they miss out on halve the director pool. When also considering females, the decision-making and overall performance of the board spikes in effectiveness – more effectively overseeing management (Randøy, Thomsen and Oxelheim, 2006), mitigating agency costs (Schleifer and Vishny, 1997), and/or improving firm performance (previous studies are summarized in the next paragraph). As shown by Shleifer and Vishny (1997), gender diversity can lead to a reduction in conflict-related costs because of these agency problems. Another positive aspect of hiring a diverse director is the non-traditional approach they bring to the table when it comes to complex problem solving. This improves the quality of decision making (Anderson et. al., 2011). Khan, Suleman and Ali (2023) argue that board diversity is a strategic resource that can enhance firm performance (improved efficiency, innovation, and adaptability). These attributes of board members bring different perspectives, skills, and knowledge, which ultimately leads to better decision-making and a better understanding of different market segments and stakeholder groups. Lastly, a more diverse board can monitor the managers better because board diversity increases board independence (Adams, et. al., 2015). However, Carter, Simkins, and Simpson (2003) argue that there is no causal relationship between a more diverse board and better monitoring of management. Diversity does increase the activism of the board because of ‘true’ outsiders – directors with nontraditional characteristics – but that does not lead directly to more effective monitoring. All in all, these studies show that the agency theory is a great way of explaining the issues at hand when it comes to gender diversity in corporate boards.

### **2.3 Reaction of Investors to Gender Diversity Quotas**

Besides looking at the efficiency of the board composition due to the diversity, it is also important to investigate the immediate effects of such quota laws on the perception of investors. Groening (2019) performs an event study on the Italian Gender Diversity Law and finds that investors anticipate a higher level of future cash flows. Additionally, the stock prices of firms that did not meet the required threshold when the news broke increased significantly compared to the stock prices of firms that already met the threshold. Redor (2018) finds that investors react negatively to the departure of a female director when the number of women on the board left are below three, indicating that there is a critical mass necessary to maintain value for shareholders. Bertrand, Black, Jensen, and Lleras-Muney (2019) find mixed results when examining gender quotas across France, Italy and Spain – this could be

because of cultural differences or differences between the initial level of gender diversity. Weidler (2020) also finds mixed results when researching the efficacy of quotas across Europe. Every firm is unique – some firms can benefit from fresh perspectives and decision-making, but others could struggle with tokenism or change.

Based on the results from the studies discussed above, the background of corporate board diversity and the quota implementation in the Netherlands, especially the paper by Arvanitis, Varouchas, and Agiomirgianakis, who find an optimal at 33 percent – which is equal to the quota imposed by the Dutch government, the hypothesis for this paper is as follows:

*H1: The gender quota has a positive effect on firm performance.*

This hypothesis will be tested in two ways: with an event study focused only on firms listed on the Euronext Amsterdam exchange, and via a difference-in-difference (DiD) analysis, where Dutch firms are compared to their counterparts in Belgium.

A second hypothesis is formed based on results that suggest that diversified boards lead to an increase in firm performance:

*H2: The gender quota has a more positive effect on firm performance for non-diversified boards compared to their counterparts.*

This hypothesis is built on the fact that non-diverse boards will see an increase in their firm value compared to the firm value from already diversified boards, which will not see an increase in stock prices.

## **CHAPTER 3 Data & Method Event Study**

### **3.1 Event Study Data**

The dataset for the event study includes stock price information of firms listed on the Euronext.liffe Amsterdam exchange. This exchange represents the Dutch market. This dataset is retrieved from Datastream at the Erasmus Data Service Centre and covers a period of January 1st, 2020, to April 17th, 2024. The data is in EUR currency and includes 82 firms after cleaning up the data. The dataset does not include banks and/or insurance companies. Additionally, the dataset was transformed from a wide format to a long format for regression analysis in Stata, making it more suitable for analysis. To provide a benchmark for Dutch firms affected by events, daily price data on the BEL20 index was incorporated as a baseline for Belgian firms, serving as a control group unaffected by specific (Dutch) events. This allows for a comparison of the Dutch stock performance against the untreated Belgian firms – effectively isolating the event’s impact on the Dutch stock market. The BEL20 data is sourced from Google Finance. Returns for each firm are computed based on their daily closing prices. The returns are logarithmically transformed because logarithmic returns are additive over time. This property helps with time series modeling and financial analysis and logarithmic returns tend to be normally distributed – which helps when working with statistical models like Ordinary Least Squares (OLS).

The estimation and event windows are 180 days and 5 days, respectively. In tables B and C the values are tested on their robustness, by first adjusting the estimation window, then the event window, and finally adjusting both windows.

Lastly, to add an extra element to the event study, the gender ratio of Dutch corporate boards is included in the dataset. This information is retrieved from the BoardEx Organization Summary database, available on the Wharton Research Data Services (WRDS) website. This is a proportional variable which represents the proportion of male directors at the annual report date. Since this data is only available on the 31st of December every year, the proportions on the 31st of December 2020 are considered. A new dummy variable is created, which is equal to one when the board is underrepresented by women according to the gender quota. In other words, if a board has more than 66.7 percent men on the board, the value of the dummy variable is equal to one. For three firms, there was no data available on their corporate boards. These firms are excluded from the regression, leaving 80 observations.

### **3.2 Event Study Methodology**

The methodology used in this event study is based on the thesis by T. Rottier (2023), who investigates the impact of the Russian-Ukraine war on German stocks by looking at the abnormal returns.

To see what investors thought of the new imposed gender quota for corporate boards in the Netherlands, an event study is performed. The event in question is the day news broke out that the Dutch government was imposing a new gender quota for corporate boards, as mentioned in 2.1.2: Corporate Governance in the Netherlands and the Quota. How the act works is discussed in more detail there. The

event date is equal to the 29<sup>th</sup> of September 2021, with the quota actually being adopted on the 1<sup>st</sup> of January, 2022.

A return event study quantifies an event's economic impact by calculating abnormal returns. Abnormal returns are unrealized returns that would have been realized if the event had not happened. This is done by first calculating the so-called normal returns using the market model and subtracting the realized returns. The market model is primarily used for analyses of the relationship between security (in this case stock) returns and the market return:

$$E(R_{it}) = \alpha_i + \beta_i R_{mt} + \varepsilon_i$$

Where  $E(R_{it})$  is the expected normal return of stock  $i$  on day  $t$ , and  $R_{mt}$  is the realized return of the BEL 20 on day  $t$ . The return of the biggest Belgian firms is taken, as they serve as a proxy. As discussed in the introduction, the Belgian market is fairly similar to the Dutch market: the countries share a border, both countries have a large port, and the GDP per capita in 2022 is very similar: the Dutch GDP per capita is only 14 percent higher.

The beta of each firm  $i$  ( $\beta_i$ ) is calculated as follows:

$$\beta_i = \frac{\sum_{t=-18}^{-3} (R_{it} - \mu_i)(R_{mt} - \mu_m)}{\sum_{t=-18}^{-3} (R_{mt} - \mu_m)^2}$$

$$\text{where } \mu_i = \frac{1}{180} \sum_{t=-18}^{-3} R_{it}$$

$$\text{and } \mu_m = \frac{1}{180} \sum_{t=-180}^{-3} R_{mt}$$

Actual daily returns are calculated by performing a logarithmic transformation of the closing prices of stock  $i$  on day  $t$  and  $t - 1$ , also known as arithmetic returns:

$$R_{it} = \ln\left(\frac{P_{it}}{P_{it-1}}\right)$$

Where  $P_{it}$  is the closing price of stock  $i$  on day  $t$ , and  $P_{it-1}$  is the closing price of stock  $i$  on day  $t$ .

After calculating both the normal and realized returns, the abnormal returns are derived:

$$AR_{it} = R_{it} - E(R_{it})$$

Here,  $AR_{it}$  stands for the abnormal return of stock  $i$  on day  $t$ .

Next up is the sum of all abnormal returns of stock  $i$  over the event window, also known as the cumulative abnormal returns:

$$CAR_i = \sum_{t=-2}^2 AR_{it}$$

To eventually get to the cumulative aggregate abnormal return (CAAR), the aggregate abnormal returns must be calculated. This measurement shows the average reaction of all stocks in the dataset on day  $t$ :

$$AAR_t = \sum_{i=1}^N \frac{AR_{it}}{N}$$

Where  $N$  is equal to the total number of stocks in the dataset.

Finally, to see what the market's reaction was over the event window, we look at the  $CAAR$ .

$$CAAR = \sum_{t=-2}^2 AAR_t$$

The event window of  $(-2,2)$  is taken to account for potential insider information that got leaked prior to the first announcement, and to account for delayed market reactions. The choice for this event window is in line with the suggestions discussed in the paper by Campbell, Lo, and MacKinlay (1997). Various robustness checks are performed to make sure the results are not sensitive to the choice of the window.

### 3.2.1 Event Study Significance Tests

The significance tests used for this event study is known as the cross-sectional t-test, often used in other event studies to see if an event has had a significant effect on stock returns. The null hypothesis:  $H_0: E(AAR_t) = 0$  is as follows:

$$t_{AAR_t} = \sqrt{N} * \frac{AAR_t}{\sigma_{AAR_t}}$$

Here,  $\sigma_{AAR_t}$  is the standard deviation of all stocks in the dataset on day  $t$ . The variance is therefore equal to:

$$\sigma^2_{AAR_t} = \frac{1}{N-1} \sum_{i=1}^N (AR_{it} - AAR_t)^2$$

After finding the p-value per t-statistic, the null hypothesis can be tested, and conclusions can be made about the significance of the event on stock returns.

The null hypothesis over the entire event period  $H_0: E(CAAR) = 0$  is as follows:

$$t_{CAAR} = \sqrt{N} * \frac{CAAR}{\sigma_{CAAR}}$$

Where  $\sigma_{CAAR}$  is the standard deviation of all stocks in the dataset over the entire event window. The variance is equal to:

$$\sigma^2_{CAAR} = \sum_{t=-2}^2 \sigma^2_{AAR_t}$$

Because the  $CAAR$  for non-diverse and diverse boards are split in the last test, there is a third null hypothesis:  $H_0: E(CAAR_N) = 0$ , where the t-statistic calculation and the standard deviation are identical to the previous. Here,  $CAAR_N$  is equal to the  $CAAR$  of non-diverse boards.

## CHAPTER 4 Data & Method Regression

### 4.1 Data Difference-in-Difference

All variables considered in the difference-in-difference analysis are gathered from BoardEx on WRDS and from the Datastream database, available at the Erasmus Data Service Centre. The proportion of male board members per Belgian and Dutch company are extracted from BoardEx annual observations starting in 2015 and ending 2022. The variable *Female Board Representation*<sub>it</sub> is equal to  $1 - \text{Male Board Representation}_{it}$ . The variable *Pre Quota Male Representation*<sub>it</sub> are all observations between 2015 and 2020. The number of directors from a given board, the sector of the firm, and the country where the firm's stocks are exchanged are all extracted from the BoardEx database.

Most control variables are extracted from Datastream. *Tobin's Q* is calculated as follows:

$$\text{Tobin's } Q = \frac{\text{Market Value of Equity} + \text{Book Value of Total Debt}}{\text{Book Value of Total Assets}}$$

The codes for the variables used from Datastream are MV, WC03255, and WC02999, respectively. This formula has to be used since there is no direct variable like *Tobin's Q* available in Datastream, and there is also no variable similar to the replacement costs of assets. The market value of equity plus the value of total debt represents the market's valuation of the total assets. The total assets based on the balance sheet in the denominator is a proxy for the replacement costs of the firms' assets.

Firm size is equal to the logarithm of the enterprise value of a firm – the Datastream code is WC18100. Finally, the firm age was not available from either source, so this is added manually with data from sources like Wikipedia. After merging all databases and deleting measurement errors, the total sample size consists of 872 observations from 145 unique firms. In table 1 the summary statistics are shown. The mean enterprise value is around 8.3 billion per firm, with a standard deviation of 28 billion. The average gender ratio across the timeframe is equal to 0.73 and the average number of directors per board is equal to 9. So, the average board has eight to nine members with two to three females on them. The mean for Tobin's Q is equal to 1.04, which is a fair measurement, since with perfect market information the value of Tobin's Q should always be equal to 1.

**Table 1. summary statistics**

|                     | mean  | sd    | min   | max |
|---------------------|-------|-------|-------|-----|
| Firm size           | 20.86 | 2.11  | 14    | 26  |
| Gender Ratio        | 0.727 | 0.13  | 0     | 1   |
| Number of Directors | 8.86  | 2.94  | 1     | 22  |
| Years active        | 60.21 | 49.22 | 1     | 220 |
| Tobin's Q           | 1.04  | 1.45  | 0.001 | 18  |
| Observations        | 872   |       |       |     |

*Notes: firm size is the logarithm of the enterprise value. Gender ratio and tobin's Q are ratios. Number of directors and years active are in absolute numbers. "Sd" stands for the standard deviation.*

## 4.2 Difference-in-Difference Methodology

The methodology used in this section is based on the paper by Faccio, Marchica, and Mura (2014).

A difference-in-differences analysis is used in a non-experimental setting to estimate the average treatment effect on the treated (ATET). This is done by comparing the difference in outcomes over time for both the control as the treatment group. The idea of this application can be dated back almost 200 years ago to a paper on cholera written by John Snow (1849). In his second paper (1855), he collected data before and after the closure of a contaminated water pump in London and compared results from a treatment group with that of a control group.

Here, the treated group consists of Dutch stocks experiencing a change in the law, affecting their board composition. The control group consists of Belgian stocks, which are economically and geographically similar stocks. This group does not experience the same exposure to the quota. By analyzing time differences between the groups, the DiD estimator accounts for omitted variables that impact both the treated as the untreated group similarly. The DiD approach is based on estimating the following regression:

$$\text{Tobin's } Q_{it} = \beta_0 + \beta_1 \text{Dutch}_i + \beta_2 \text{Post}_{it} + \beta_3 \text{Dutch}_i * \text{Post}_{it} + \beta_4 X_{it} + \varepsilon_{it}$$

Where Tobin's Q is the outcome variable.  $\text{Dutch}_i$  is a dummy variable equal to 1 if the firm is Dutch and thus is assigned to the treatment group.  $\beta_1$  captures the difference in means between the treatment and control groups before the treatment takes place. Variable  $\text{Post}_{it}$  is a dummy equal to 1 when we enter the post-treatment period.  $\text{Dutch}_i * \text{Post}_{it}$  is an interaction effect between the two variables mentioned earlier. This coefficient of this interaction effect is considered the average treatment effect on the treated (ATET) and therefore the focus is on this value in the results section.  $X_{it}$  is a vector of control variables.  $\varepsilon_{it}$  is an idiosyncratic error term.

Standard errors for DiD estimates are inconsistent if not accounted for serial correlation according to Bertrand, Duflo, and Mullainathan (2004). When performing a DiD, group and time level vary, making it obvious to correct for serial correlation. This is done by using cluster-robust standard errors at the group level.

### 4.2.1 Robustness checks and Assumptions DiD

One of the assumptions that must be considered when performing a DiD is the parallel-trends assumption. In the case of this study, we assume that the Dutch (treatment) and Belgian (control) markets follow the same trends over time. There are multiple reasons to assume this assumption holds – as discussed in 3.2: Event Study Methodology – such as that the countries share a border, both have a large port, and have similar GDP's. This assumption is tested by a graphical representation and a parallel trend test. In the graphical representation, the paths of Tobin's Q should be parallel. The parallel-trends test adds two more terms to the main regression: a variable indicating pretreatment time periods, and a variable indicating posttreatment time periods. The interaction effect of interest here is the time before

treatment, whether the firm is in the treatment group, and the year. This slope is tested against zero using the Wald test. The null hypothesis is that the control and treatment group had similar trends before the treatment started.

## CHAPTER 5 Results

### 5.1 Event Study Results

In table 2, the results are shown for the one-sample t-test for abnormal returns across the event window (-2,2). Apart for the day of the event and two days after the event, all days are significant on the 10 percent level. When also excluding the day before the event, all days are significant on the 5 percent level. All significant results are negative, the average being 0.6 percent a day. This result can be explained in various ways. For example, these results could indicate that the event – introducing a female quota for Dutch corporate boards – was already introduced and accepted by the government prior to the formal introduction. Investors were also already aware of this. Secondly, on the day after the acceptance of the new quota, the standard errors were the highest, at 0.0030579. This could indicate that investors were not sure of the effect of this quota on corporate boards, and thus they did not know whether to buy or sell their shares.

**Table 2. One-sample t-test for Abnormal Returns across the Event Window (-2,2)**

| Day | Obs. | AAR        | St. Err.  | t-value    | p-value |
|-----|------|------------|-----------|------------|---------|
| -2  | 83   | -0.0079598 | 0.0020422 | -3.8976*** | 0.0002  |
| -1  | 83   | -0.0037876 | 0.0022250 | -1.7023*   | 0.0925  |
| 0   | 83   | 0.0019756  | 0.0014790 | 1.3358     | 0.1853  |
| 1   | 83   | -0.0063137 | 0.0030579 | -2.0647**  | 0.0421  |
| 2   | 83   | -0.0020669 | 0.0018629 | -1.1095    | 0.2704  |

*Notes: This table presents the aggregate abnormal returns (AAR) per day inside the event window. “Day” stands for the day(s) prior/after the event day (t=0). “Obs” stands for observations. “St. Err.” stands for the standard errors. T-value is the cross-sectional t-statistic; \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01*

In table 3, the results are clearer. Over the event window (-2,2), the one-sample t-test for cumulative average abnormal returns is negative and significantly different from zero at the one percent level. Therefore, the null hypothesis  $H_0: E(CAAR) = 0$  can be rejected. With the CAAR being at a value of -0.018524 for all companies throughout the event window, the event’s influence implies a negative effect on all firms’ returns. On average, Dutch companies experienced a 1.85 percent negative abnormal return around the event, ceteris paribus. Therefore, an assumption can be made that the introduction of a female quota for Dutch corporate boards has a negative effect on stock prices, negatively impacting investors’ assets and/or investments and negatively affecting firms’ opportunities to raise capital. These results could also be negative due to market perceptions of overregulation. To further explain these results, another variable has been introduced in the next table. Robustness checks are performed for both the event window and the estimation window and can be found in table B and C in the Appendix. The results stay significantly different from zero.

**Table 3. One-sample t test for CAAR with Event Window (-2,2)**

|      | obs | Mean      | St Err    | t-value  |
|------|-----|-----------|-----------|----------|
| CAAR | 83  | -0.018524 | 0.0051672 | -3.51*** |

Notes: this table presents the cumulative aggregate abnormal return (CAAR) over the entire event window (-2,2). "Obs" stands for observations. "St. Err." stands for the standard errors. T-value is the cross-sectional t-statistic; \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

To make the event study more insightful, it is interesting to differentiate boards that met the quota pre-event with boards that did not meet the quota pre-event. The results can be found in table 4. Interestingly, the results did not match the hypothesis. For non-diversified boards, the cumulative aggregate abnormal returns are not significantly different from zero, but for diversified boards it is significantly different from zero at the one percent level. All else equal, Dutch firms with an already diversified board experienced a negative abnormal return of around 1.6 percent on average. Therefore, the original null hypothesis  $H_0: E(CAAR_N) = 0$  cannot be rejected, but the null hypothesis  $H_0: E(CAAR_D) = 0$  can. Here,  $CAAR_D$  is equal to the CAAR for diversified boards. There are several possible explanations for these findings. First, firms with diversified boards get better ESG-ratings than under- or non-diversified boards, because well-diversified boards are a sign of good governance practices. When all companies have a diversified corporate board, these ratings will be the same for all companies. It is possible that some firms are not very profitable, but investors are namely interested in their good ESG-ratings. When also very profitable firms share the same ESG-scores – theoretically – all investors will buy shares from the latter. Second, for firms that were not diversified, the market might have adopted a "wait-and-see" approach, leading to no immediate significant reaction. A robustness check is performed for the event period and can be found in table D in the Appendix. The results show no significant differences.

**Table 4: One-sample t-test for CAAR over the Event Window (-2,2), separating under-diversified boards from diversified boards**

|                          |                          |
|--------------------------|--------------------------|
| Non-diverse board        | -0.00140<br>(0.00924)    |
| Constant (diverse board) | -0.01643***<br>(0.00535) |
| Observations             | 80                       |
| $R^2$                    | 0.00022                  |
| Adjusted $R^2$           | -0.01260                 |

Notes: CAAR stands for cumulative aggregate abnormal returns. Standard errors in parentheses, \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## 5.2 Difference-in-Difference Results

In table 5, the results of the Difference-in-Difference regression analysis are shown. This model was estimated using Ordinary Least Squares (OLS). Because Tobin's Q and most control variables are continuous variables, most variables can be interpreted in the following way: when "control variable X" changes by 1 unit, Tobin's Q changes by the coefficient value of said control variable. The first column (the main model) gives the regression with control variables, and the second column only looks at the dummies of being Dutch, the observation being in the year 2022, and their interaction effect. The main model has 870 observations, and the model's R-squared is equal to 0.71 – so 71 percent of the variance in Tobin's Q can be explained by all variables included in the model. A model without control variables only amounts to an R-squared of 1 percent.

The main variable of interest in table 5 is the interaction between being a Dutch firm and the year 2022 – the first year the board gender quota is active. When a firm is Dutch and the quota is in place, Tobin's Q increases by 0.2086 units. However, this value is insignificant. In conclusion, hypothesis 1 – which stated that the gender quota will have a positive effect on firm performance – is rejected based on these results. We cannot conclude that the Dutch board gender quota has a significant impact on Tobin's Q.

It might take time for the policy to show any impact on corporate performance metrics like Tobin's Q, as the first year of implementation might be too early to see any significant results. It is possible that firms that do not meet the criterium yet have not fully adapted to the regulation, which makes the effects of such a quota only notice when firms fully adapt.

Being a Dutch firm increases the measurement of Tobin's Q on average by 1.43, a significant increase at the 10 percent level, *ceteris paribus*. This is in line with expectations, as the AEX increased by 65 percent in the last five years, while the BEL20 only increased by 10 percent over the same time span.

A 1-percent increase in the enterprise value is associated with a 0.4246 percent increase in Tobin's Q on average, *ceteris paribus*. The constant cannot be interpreted, because a firm with no enterprise value would mean that said firm is worthless. All other control variables are insignificant and can therefore not be interpreted.

**Table 5. Difference-in-Difference regression.**

|                       | (1)<br>Tobin's Q | (2)<br>Tobin's Q |
|-----------------------|------------------|------------------|
| Dutch                 | 1.4296*          | 0.0560           |
|                       | (0.7773)         | (0.1843)         |
| 2022                  | 0.1231           | 0.0973           |
|                       | (0.1495)         | (0.1200)         |
| Dutch*2022            | 0.2086           | 0.3892*          |
|                       | (0.1977)         | (0.2233)         |
| Enterprise Value      | 0.4246*          |                  |
|                       | (0.2235)         |                  |
| Female Representation | 0.6154           |                  |
|                       | (0.6071)         |                  |
| Number of Directors   | 0.0062           |                  |
|                       | (0.0377)         |                  |
| Years Active          | -0.0362          |                  |
|                       | (0.0368)         |                  |
| Constant              | -8.7016*         | 0.9809***        |
|                       | (4.6011)         | (0.1387)         |
| Observations          | 870              | 872              |
| $R^2$                 | 0.7140           | 0.0082           |
| Adjusted $R^2$        | 0.6544           | 0.0048           |

*Standard errors are in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$*

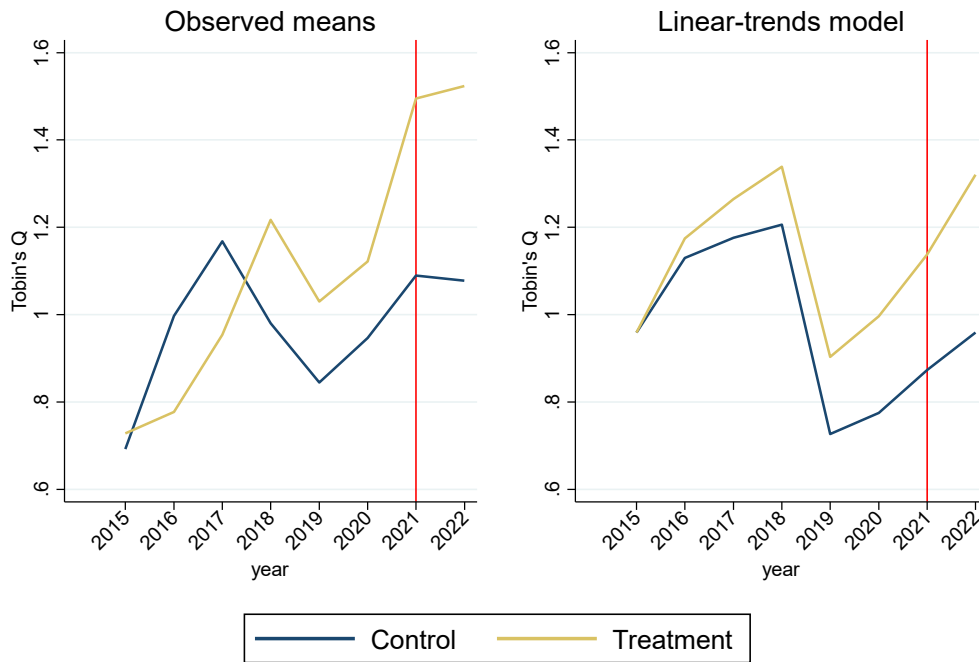
### 5.2.1 Robustness Checks and Assumptions

The results of the graphical representation related to the parallel trends assumption are presented in Figure 1. We can see that both the Belgian (control) as the Dutch (treatment) lines go fairly parallel, apart from 2017-2018, when the Dutch market increased but the Belgian market decreased in the average Tobin's Q. From 2020 to 2021, the Dutch market did increase by a lot, from a Tobin's Q of about 1.12 to 1.48, but the Belgian market also increased, from 0.93 to 1.09.

To further check for the robustness of the ATET being insignificant, a logit regression is performed. A logit regression is a nonlinear regression that forces the outcome variable to be binary. The results are in line with the OLS-regression, being non-significant. The results of the robustness check can be found in Table E in the Appendix.

For the parallel-trends test, we can accept the null-hypothesis, which states that the linear trends are parallel, as the  $F(1,144)$ -statistic is equal to 1.88, which gives us a p-value of 0.1725.

Figure 1. Graphical diagnostics for parallel trends



**Figure 1.** Graphical diagnostics for parallel trends. The observed means plot shows the outcome mean over time for the control and treatment groups, while the linear-trends model plot shows the DiD model with interaction effects and their predicted outcomes. The vertical red line shows the period when the treatment begins.

## CHAPTER 6 Discussion

Corporate board gender diversity is rich in literature and therefore there are many studies with positive, mixed, and negative findings. Marinova, Plantenga, and Remery (2016) also researched the relationship between gender diversity on corporate boards and firm performance for Dutch firms in 2007, approximately 12-year older data compared to this study. This paper further confirms their conclusion, so it can be assumed that changes in the board composition related to diversity does not affect Dutch firm performance. Gruszczynski (2020) researched the same relationship for various European markets in 2015, and also found no significant relationship between board gender diversity and firm performance. Arvanitis, Varouchas, and Agiomirgianakis (2022) found a U-shaped relationship with an optimal male-to-female distribution on corporate boards, being two-to-one, which cannot be confirmed by this paper. The Dutch quota aims to get all Dutch boards to have at least this ratio, but it does not increase firm performance.

Carter, Simkins, and Simpson (2003) find a significant positive relation between gender diversity on corporate boards for Fortune 1000 firms and Tobin's Q, which cannot be confirmed by this paper. The difference in datasets could be the difference, since they use a dataset from more than 20 years earlier, and they focus on another market. For the paper by Brahma, Nwafor, and Boateng (2021), the latter explanation is the same. Finally, Post and Byron (2015) performed a meta-study including over 140 different studies on this topic, and found a minimal positive but significant effect of female board representation on firm performance.

Regarding imposed quotas, Groening (2019) finds that the stocks of firms that did not meet the criterium prior to the quota increased significantly compared to the stocks of firms that already met the quota. In table 5, I find that the stocks of firms that were under diversified prior to the quota did not significantly increase nor decrease, while the stocks of firms with diversified boards significantly decreased in price.

## CHAPTER 7 Conclusion

In this thesis I looked at the effects of a Dutch quota on stock prices and firm performance, measured as Tobin's Q. Using stock prices, I perform an event study to see the immediate effects of the news breaking out. The latter is done by performing a Difference-in-Difference analysis, comparing the Dutch market to the Belgian market. The Belgian market serves as a great proxy, because there are many similarities between the two countries economically. They both have a large port, they neighbor each other, and their GDP per capita is almost identical. Previous research shows mixed effects, ranging from positive to negative associations between corporate board diversity and firm performance. No previous studies have researched the effects of the new Dutch quota on their stock prices and financial performance measures like Tobin's Q.

The main research question in this paper was "How does the Dutch gender diversity quota for corporate boards affect firm performance?" This question is answered using stock data from the Euronext Amsterdam exchange from 2021 and fundamental data from 2015 to 2022. The stock data showed a 1.85 percent negative abnormal return around the announcement of the board gender quota for all Dutch firms, and Dutch firms with an already diversified board in particular experienced a negative abnormal return of around 1.6 percent. The fundamental data showed that we cannot conclude that the Dutch board gender quota has a significant impact on Tobin's Q.

This study has mixed results and can therefore not give a single conclusion. Although the results of the event study are negative, the difference-in-difference analysis cannot confirm these findings. Future research should focus on performing this DiD analysis with more data post-treatment, as this study has data availability constraints. No company fundamental data was available past 2022.

Policymakers can use this research to justify implications of similar quotas in other regions. It might be beneficial to also include leadership development programs into the quota, to make sure newly appointed females on boards are supported in the right way. Investors could also include this paper into their research strategy – when a country imposes a similar quota, investors should short the stocks of firms that already have diversified boards, according to this paper.

Continuous efforts to improve gender diversity – not only on corporate boards – should remain crucial, even if this effects firm performance negatively.

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## APPENDIX

**Table A. Boards with multiple members and equal division.**

| Number of supervisory board members / non-executives | Quota                        |
|--|------------------------------|
| 2 or 3   | At least 1 male and 1 female |
| 4, 5 or 6  | At least 2 male and 2 female |
| 7, 8 or 9  | At least 3 male and 3 female |

*Notes: the first column gives the number of supervisory board members or non-executives. The second column gives the corresponding number of males and females a board must have according to the quota. This table is based on the table provided by Obenhuijsen (2022), in their blog on the “New act to improve gender diversity in boards of Dutch companies.”*

**Table B. Robustness checks for CAAR with various Event Windows**

|          | obs | Mean       | St Err    | t-value  |
|----------|-----|------------|-----------|----------|
| (-3,3)   | 83  | -0.0254869 | 0.0064445 | -3.95*** |
| (-5,5)   | 83  | -0.0267474 | 0.0069552 | -3.85*** |
| (-10,10) | 83  | -0.0423624 | 0.0089966 | -4.71*** |
| (-1,1)   | 83  | -0.0040198 | 0.0040198 | -2.02*** |

*Notes: CAAR stands for cumulative aggregate abnormal return. The first column gives various event windows around the event ( $t=0$ ), “obs” stands for the number of observations, the mean is the main coefficient of interest, “st. err.” stands for the standard error. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$*

**Table C. Different estimation windows for CAAR with Event Period (-2,2)**

|            | obs | Mean       | St Err    | t-value  |
|------------|-----|------------|-----------|----------|
| (-185,-5)  | 83  | -0.0164676 | 0.0050408 | -3.27*** |
| (-183,-3)  | 83  | -0.0156106 | 0.0050672 | -3.08*** |
| (-220,-10) | 83  | -0.0196796 | 0.0052264 | -3.77*** |
| (-95,-5)   | 83  | -0.0150381 | 0.0054169 | -2.78*** |

*Notes: CAAR stands for cumulative aggregate abnormal return. The first column gives various estimation windows before the event period (-2,2), “obs” stands for the number of observations, the mean is the main coefficient of interest, “st. err.” stands for the standard error. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$*

**Table D. Robustness checks CAAR for different Event Periods with non-diverse boards**

|                      | obs | Mean       | St Err    | t-value  |
|----------------------|-----|------------|-----------|----------|
| (-3,3) non-diverse   | 80  | -0.0051910 | 0.0122918 | -0.42    |
| (-3,3) diverse       | 80  | -0.0209031 | 0.0080873 | -2.58**  |
| (-5,5) non-diverse   | 80  | 0.0073205  | 0.1338760 | 0.55     |
| (-5,5) diverse       | 80  | -0.3151820 | 0.0096220 | -3.28*** |
| (-10,10) non-diverse | 80  | -0.0042003 | 0.1700790 | -0.25    |
| (-10,10) diverse     | 80  | -0.0351291 | 0.0119435 | -2.94*** |
| (-1,1) non-diverse   | 80  | -0.0011046 | 0.0075734 | -0.15    |
| (-1,1) diverse       | 80  | -0.0070501 | 0.0046955 | -1.5     |

Notes: CAAR stands for cumulative aggregate abnormal return. The first column gives various event windows around the event ( $t=0$ ) for both diverse as non-diverse boards, "obs" stands for the number of observations, the mean is the main coefficient of interest, "st. err." stands for the standard error. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Table E. Logit Regression – a Robustness check for ATET**

|      | obs | Coefficient | Rob. St. Err. | z-value |
|------|-----|-------------|---------------|---------|
| ATET | 870 | 0.2233334   | 0.2800695     | 0.80    |

Notes: ATET stands for the estimated average treatment effect on the treated. The number of matches per observation is 1.