Announcement of Female CEOs and Stock Market Reaction

Erasmus School of Economics, Erasmus University Rotterdam

M.Sc. Financial Economics

Author: Tsekou Anastasia

Student ID number: 444532

Supervisor: dr. R. de Bliek

Second assessor: dr. R. Barahova

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Abstract

The purpose of this research paper is to examine how the stock market reacts to the announcement of a female CEO, and whether this effect is persistent in the long run. Following the increasing number of female appointments in the recent years, this empirical analysis focuses on CEO announcements between 2010-2019 made by US-based S&P500 listed firms. An event study is performed in order to examine the short run reaction of investors to the announcement of a new CEO, while an OLS regression is employed to examine the effect of gender on any abnormal reactions. A buy-and-hold return methodology is used to evaluate the one-year impact of the announcement. The results indicate that there is no significant relationship between the announcement of a new CEO and the stock market returns, while investors tend to be indifferent between the appointment of a female and a male CEO. These findings would imply that individuals have to acquire special skills and competencies in order to be appointed as CEOs that are not in any way related to gender. CEO gender should thus not be considered as a determining factor for stock market returns after a new CEO announcement.

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1. Introduction

For the first time in history, female chief executive officers (CEOs) outnumbered any single male name among S&P 500 CEOs in January 2023 (Catalyst, 2023). A great improvement versus 2018 when male CEOs named Harry tied with the total number of their female colleagues. An increasing trend in the appointment of female CEOs can also be observed as 13% of all new S&P 500 CEOs during the last year were females, reaching a remarkable new record of 41 out of the 500 (Boyle & Green, 2023). The purpose of this paper is thus to explore how the appointment of a female CEO is perceived by investors in the stock market. Do these announcements have a significant effect on stock prices and if so, is this effect persistent after a year?

The relationship between CEOs' gender and firm performance has been widely studied in the literature. Firms led by women CEOs tend to perform better than those led by males (Khan & Vieito, 2013). Peni (2014) provides evidence of a significantly positive effect on return on assets (ROA), but no significant effect on Tobin's Q. Female management style and ability to build strong personal relationships allow them to facilitate decision-making within their top management teams and thus further ameliorate organizational performance (Krishnan & Park, 2005). Increased diversity and higher female participation in top management tend to also be associated with higher performance (Perryman et al., 2016). Furthermore, evidence from small and medium enterprises shows that female CEOs can also indirectly influence firm performance through their strong market orientation (Davis et al., 2010). On the other hand, contradicting evidence is found when investigating how the stock market reacts to the appointment of a female CEO successor. Campbell and Vera (2010) find a positive reaction in the stock market both in the short and in the long run after the announcement of a female CEO. Positive and significant abnormal returns tend to also be realized in complex environments, even though having more women on the top management team is not necessarily associated with significant excess returns (Francoeur et al., 2008). According to Martin et al. (2009), insignificant abnormal returns are a result of higher risk aversion among females compared to males. This view is further supported by evidence that firms with relatively higher risk tend to hire females to mitigate part of it. Finally, more recent studies suggest that investors do not value the appointment of female CEOs significantly different than that of men (Scholtens & Brinkhuis, 2018).

Even though there are a lot of empirical studies investigating the relationship between the appointment of a female CEO and the stock market return, these tend to either focus on the short or on the long run. The motivation of this paper is to fill the gap in the literature by combining both approaches. Hence, the following research question is developed:

Research Question: How does the stock market react to the appointment of a female CEO? Is this effect persistent in the long run?

The standard event study approach is deployed to provide evidence of the immediate impact of the announcement of new CEO on stock returns, followed by an ordinary least squares regression to explore how being a female might impact any abnormal returns, while the Buy-and-hold abnormal return approach is used to investigate the persistence of this effect over an extended period of 12 months after the announcement.

To examine the effect of the announcement of the appointment of a female CEO on the stock market returns for US-based S&P 500 listed companies with the largest market capitalization in January 2023, BoardEX, Compustat IQ and CRSP databases are used. All databases are available through Wharton Research Data Services (WRDS). For this paper, only announcements between January 2010 and December 2019 are considered. This period allows me to have the latest data available while excluding the years 2020-2022 during which the coronavirus outbreak caused unforeseen economic, social, and political challenges (Ozili & Arun, 2020). The seven steps for executing an event study by Fama et al. (1969) are followed to perform the short-term analysis, with an estimation window of 100 days (Hall & Weiss, 1967) and three different event windows, namely 3-days (Lucey & Carron, 2011), 11-days (Scholtens & Brinkhuis, 2018) and 21-days (Campbell & Vera, 2010). An OLS regression is then performed on the 3-day cumulative abnormal returns with gender and other control variables related to CEO-specific and firm-specific characteristics. Following the methodology of Mitchell and Stafford (2000), the events identified in the previous step are matched with male CEO announcements of similar firms to explore if there are any significantly different effects over one year. The criteria used are size, industry, and announcement date (Scholtens & Brinkhuis, 2018). Events that do not meet these criteria, and those taking place in 2019 are not considered for the long-run event study.

The empirical results of this paper are expected to be in line with the findings of Lee and James (2007) suggesting that in the short run, investors react more negatively to the announcement of the appointment of a female CEO compared to that of a male, indicating a negative gender bias. On the contrary, significantly positive cumulative abnormal returns are expected after one year following evidence from Eduardo and Poole (2016) on higher firm performance for firms led by female CEOs. With the proportion of women in top management roles touching 32% in 2022 (Amar, 2023), the results of this paper can be useful both for investors' decision-making and for policymakers shaping regulations related to equal gender participation in managerial positions.

The remainder of the paper is organized as follows. Section 2 explores the relevant literature related to the effect of CEO gender on firm performance and stock market reaction. Section 3 discusses the data collection and description along with the methods employed. Section 4 presents and discusses the empirical results. Section 5 discusses my research limitations and provides suggestions for further research. Finally, Section 6 includes a conclusion of what has been discussed along with the main findings this empirical analysis.

2. Theoretical framework

This section explores the relevant literature and presents the formulated hypotheses.

2.1 Female leaders and firm performance

Female representation in senior leadership roles is attracting a lot of attention the last decade both in the literature and in the press, while the number of females in top management roles grew to a record-breaking 32% in 2022 (Amar, 2023). This is a step closer to achieving one of United Nations' development goals related to gender equality by 2030 (United Nations, n.d). However, equal gender representation in leadership is not the only reason why researchers are interested in female leadership characteristics.

More specifically, empirical studies have shown that firms managed by female CEOs tend to be associated with better performance and lower risk compared to those managed by their male counterparts (Khan & Vieito, 2013). Females' management style and strong personal relationships tend to be the key drivers behind the improved firm performance (Krishnan & Park, 2005). A positive relationship is also found when investigating a sample of small and medium-sized firms in the services industry, as women tend to have stronger market orientation and thus a significant better performance compared to males (Davis et al., 2010). Francoeur et al. (2008) test the predictions of agency and stakeholder theories on the effect of higher female participation on firm performance. They conclude that in complex environments firms with more females in their corporate boards or in their top management positions tend to be associated with positive and significant abnormal returns of 0.17%.

On the other hand, Simpson et al. (2010) find mixed results on the relationship between female directors and firm financial performance after examining board seats of S&P 1500 U.S firms between 2003 and 2007. These findings suggest that the ability of women to influence corporate performance is driven by individual characteristics and specific circumstances of each company rather than their gender. Similarly, Francoeur et al. (2008) report no supporting evidence of higher performance in non-complex environments for firms led by female directors.

Following the efficient market hypothesis developed by Fama (1970), I expect stock prices to incorporate all the available information in the market. Taking into consideration the vast majority of empirical evidence and the fact that female CEOs

tend to be associated with higher firm performance, I would expect the stock market to immediately reflect this information in their prices.

2.2 Age, education and firm performance

Apart from CEO's gender, the impact of age and education on firm performance has also been an area of interest for many researchers. Using a sample of owner-managed firms from Western Europe, Belenzon et al. (2019) find evidence that financial performance declines with age. More specifically, firms with CEOs older than 59 tend to be associated with a 13% lower return on assets (ROA). Higher risk aversion and the unwillingness of older CEOs to explore new paradigms due to a relatively short focus tend to lead to portfolios with lower risk-adjusted returns indicating an overperformance of the companies managed by younger CEOs (Serfling, 2014). CEOs' age is also uniformly associated with lower firm valuation, and thus with a lower Tobin's Q value (Nguyen et al., 2018). Mixed evidence regarding the effect of CEO's education on firm performance can be observed in the literature. Saidu (2019) shows a positive relationship between CEO's education level and the profitability of financial institutions, while Elsharkawy and Paterson (2018) fail to demonstrate a significant positive relationship. Firms led by CEOs holding an MBA or Ph.D. tend to have three-year post-listing returns that are 11% and 12% higher, respectively, compared to firms led by CEOs without such a background (Kallias et al., 2023). Furthermore, R&D-intensive industries tend to value Ph.D. knowledge more, while an MBA degree is more valuable to larger firms with more complex organizational structures. Empirical evidence based on the "Best-Performing CEOs in the World" 2016 ranking published by Harvard Business Review concludes that MBA degrees are not associated with either higher financial performance or higher environmental, social, and governance performance (ESG). Engineering degrees on the other side, tend to score better on ESG performance, which has an increasing importance, and thus on the overall performance rankings (Garcia-Blandon et al, 2019).

2.3 Market reaction on CEO announcements

The announcement of a top management change, and most importantly that of the highest-ranking officer, generates strong reactions from shareholders. According to Dedman and Lin (2002), there is a negative market reaction to the announcement of a new CEO. More recent empirical research investigating the effect of Internet

information gathering trough Twitter Sentiment Score (TSS) find evidence in accordance with the previous literature. More specifically, the announcement of a new CEO triggers high levels of TSS which is associated with low future excess returns across all industries (Leitch & Sherif, 2017). Organizations are aware of the negative consequences that a new CEO announcement might induce in the stock market, and thus they choose to create strategic noise around the announcement of a management change. Strategic noise refers to actions taken to change audience's perception of a firm (Elsbach et al., 1998). For instance, firms are 46% less likely to engage in a form of strategic noise when the new CEO comes from a high-reputation firm and 53% when the CEO has previously served in the same role respectively (Graffin et al., 2011). This is in line with empirical evidence suggesting that the market reacts more favorably to the announcement of a new CEO when the individual has previous experience either as a CEO or as a board member. The relationship is even more favorable when there is previous co-working experience or similar industry board experience (Tian et al., 2010).

On the other hand, there is scientific literature with opposite findings. For instance, Schoar and Zuo (2016) find evidence that the announcement of a new CEO who has previously served as a CEO during a recession period is associated with positive abnormal returns, implying that investors value more the skill sets acquired during this period. Furthermore, evidence from Chilean firms shows positive abnormal returns after the announcement of a new CEO, only if the previous CEO was associated with poor performance (Nino & Romero, 2007). This portrays the need of investors to penalize the previous CEO for poor performance, while showing an appraisal to the change of management (Paul & Hui, 2021). An immediate increase in the stock price of a firm is also realized when the announced CEO received their pay premium ex-ante (Ang et al., 2003). Investors perceive the ex-ante payment as an indicator of better CEO quality and thus of better firm performance in the future. Pessarossi and Weill (2013) when investigating stock prices of Chinese firms find a positive statistically significant relationship only for firms owned by the central government. Overall, according to empirical evidence positive abnormal returns tend to be realized only under special circumstances. For this reason the following hypothesis is developed:

H1: There is a negative market reaction to the announcement of a new CEO.

2.4 Market reaction on female CEO announcements

After almost ten years of debating, the European Commission reached an agreement on gender quotas on corporate boards (European Commission, 2022). More specifically, by 2026 firms employing more than 250 individuals will have to secure at least 40% of non-executive director roles and at least 33% of all board director roles for women. In the US, the percentage of top executive positions held by women shows a steady growth as well (U.S. Bureau of Labor Statistics, 2023). Even though we identify an increase in female representation in top management, the reaction of the stock market to the announcement of a female CEO tends to still be different than to that of a male. More specifically, Lee and James (2007) by investigating a sample of announcements between 1990 and 2000 find a more significant negative reaction on the announcement of the appointment of females. Braegelmann and Ujah (2020) use a more extended sample covering 1992 to 2016 and provide evidence that the stock market reacts more favorably to the announcement of a male CEO by 49 basis points compared to the announcement a female. The negative impact of female CEO appointment on stock prices is even more intense when the female CEO is appointed externally and in predominantly male dominated industries (Lee & James, 2007; Cook & Glass, 2011). Hence, we develop the following hypothesis:

H2: The announcement of a female CEO is associated with negative cumulative abnormal returns.

The negative relationship between the announcement of a female CEO and the abnormal returns of the firm suggest that there might be a disincentive for boards to appoint female CEOs when they are concerned with a lower share price and thus lower shareholder value (Lucey & Carron, 2011). Further evidence suggests that investors or investment funds located in countries with limited gender equality tend to invest less in firms lead by female CEOs (Friedman, 2020). The discomfort of investors towards female CEOs can also be seen from the fact that they tend to monitor and threaten women directors more compared to men (Gupta et al., 2018). Examining press realizes around the appointment of a female CEO further enhance the value of gender for investors as they tend to focus more on gender and gender related characteristics (Lee & James, 2007). Furthermore, earnings announcements made by female CEOs are more conservative compared to those made by males due to their risk-averse nature and ethical standards (Ho et al., 2014). These facts can be used to justify the importance of

taking into consideration CEO gender in the decision making of the board and of shareholders.

On the other hand, Adams et al. (2011) find a positive relationship between the appointment of a female director and the average market reaction after the announcement of mandatory gender quotas. This relationship holds even after controlling for individual-specific and industry-related characteristics. However, they highlight that their findings do not provide any direct support either for or against diversity quotas. Cook and Glass (2011) using an event study methodology with a 3-day event window on Fortune 1000 firms find significant positive abnormal returns of 1.03% after the announcement of a female CEO. This was in contrary to their expectations and the previous literature. However, they highlight that this relationship is significant in female-dominated industries only. A positive relationship can be also found when investigating Singaporean publicly listed firms (Kang et al., 2010). Ding and Charoenwong (2013) find a positive announcement effect of 2.31% over a two-day announcement period in Singaporean listed firms. The relationship tends to be stronger when the female CEO holds a non-dual role. Examining CEO announcement of Russell 3000 companies and using the Fama-French three factor model, Gondhalekar and Dalmia (2007) find a weakly positive relationship between the announcement of female CEO and the cumulative abnormal returns of the firm. They find no relationship for the announcement of male CEOs. Their two-year post-announcement abnormal returns are not statistically significant from zero for both groups. Similarly, when investigating Italian listed companies between 2012-2016 there is no significant evidence that the announcement of a female CEO is associated with higher future abnormal returns (Pastore et al., 2017). Mixed results are found by Beaegelmann and Ujah (2020) as their findings suggest that the effect varies with time and firm size, while other studies suggest that the effect is indifferent between the two genders (Pastore et al., 2017; Leitch & Sherif, 2017)

Significantly positive cumulative abnormal returns are expected after one year following evidence from Eduardo and Poole (2016) on higher firm performance for firms led by female CEOs. The third hypothesis is formulated as follows:

H3: The announcement of a female CEO is associated with positive cumulative abnormal returns after a year of the appointment.

3. Methodology

This section describes the formulation of the dataset and discusses the empirical methodology followed.

3.1 Data collection

In order to be able to explore the reaction of the stock market to the announcement of the appointment of a female CEO different sources are used. Through the WRDS portal and the Compustat Capital IQ database, a list of US-based corporations listed in the S&P 500 stock market with the highest market capitalization as of January 2023 is accessed. As higher market capitalization tends to be associated with a more significant presence in the stock market, as well as with more well-established and profitable firms (Reinganum, 1999), those companies can better cater to the needs of this empirical analysis. For instance, firms with higher market capitalization are less likely to draw attention to them and they are generally perceived as more reliable by investors, and thus their stock prices do not often fluctuate a lot. This allows me to better investigate any market reaction on the announcement of the appointment of a new female CEO.

"BoardEx North America – Announcements" database is used to gather any announcement containing the word "CEO" in the role description between January 2010 and December 2019. The 1929 announcements are then further evaluated to only include announcements regarding the appointment of a CEO, and not the dismissal or any other CEO related announcement, while also excluding announcements related to acting, regional, divisional, interim, designated or co-CEO roles. As such roles might be associated with negative or positive connotation already (Ballinger & Marcel, 2010), they might distort the empirical results of my paper. After these exclusions, a total of 403 announcements from 314 unique firms is considered in this study. Variables such as the names and the identification numbers for both companies and directors, effective dates of the announcements and a short announcement description are also obtained from the same database. Individual specific characteristics such as gender, nationality, and date of birth are gathered through the "BoardEx North America – Individual Profile" and matched to my time series announcement dataset based on the director identification number.

To be able to gather the panel data required for the short-run Event Study analysis, CRSP database is accessed. By using ticker codes corresponding to firms with

qualifying announcements, daily stock prices, company specific daily returns without dividends, as well as daily returns of the S&P 500 index are obtained for the period between January 1st, 2010, and December 31st, 2019. For the needs of the long run analysis and in order to be able to compute BHAR, total assets per fiscal year, S&P industry sector code, as well as standard industry classification code are gathered through the Compustat "Capital IQ North America" database. The same database is used to obtain other financial ratios such as return-on-assets, return-on-equity, debt-to-equity, price-to-earning, and price-to-book for all the firms with qualified announcements.

3.2 Descriptive statistics

According to the latest evidence, Boyle and Green (2023) conclude that the appointments of female CEOs show an increasing trend in 2023. To investigate if this trend is also depicted in my dataset and in the number of announcements of appointments of female CEOs in the period 2010 and 2019, Figure 1 is utilized.

Figure 1. % Split of the 403 CEO announcements by gender between 2010-2019.
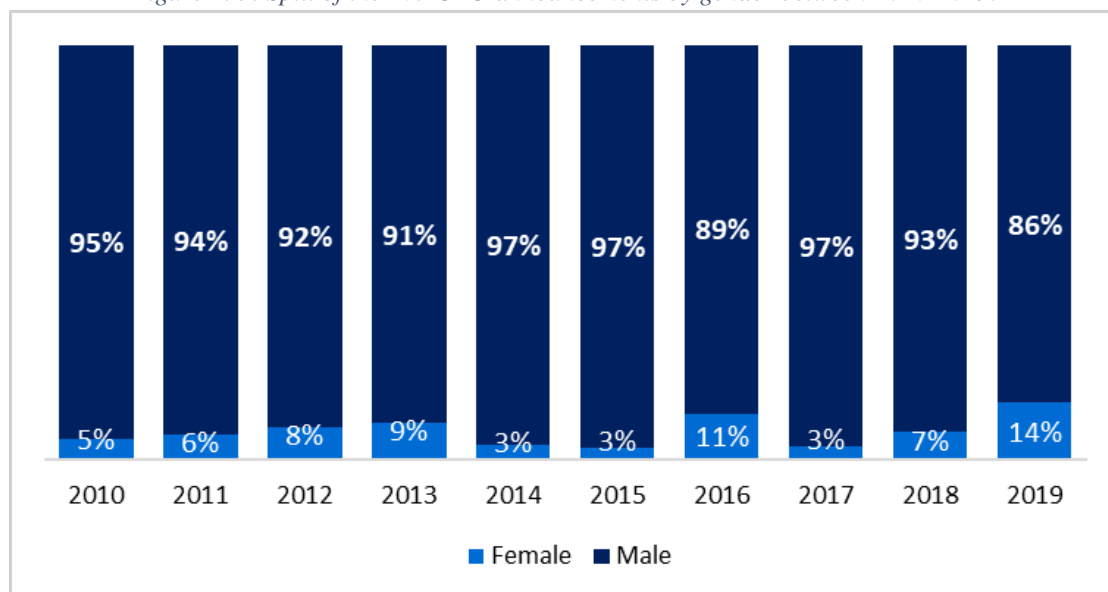
As depicted in Figure 1, an increasing trend can be identified between 2017 and 2019 as the number of announcements of female CEOs increases by almost 10pp reaching 14%. A decrease can be seen in 2014, 2015 and 2017 were male CEOs constituted approximately 97% of the announcements in my sample.

From the total of 403 announcements in my dataset for the period 2010 to 2019, 29 of them of them or 7.2% are related to female CEOs, while the remaining 374 or 92.8%

refer to their male counterparts. A summary of the individual specific characteristics is seen in Table 1. As nationality was not reported for certain CEOs, the total number of observations is 338.

Table 1. CEO gender and region of birth.

| | gender | | |
region	F	M	Total
Asia	1	5	6
Europe	0	30	30
North America	25	271	296
Oceania	0	3	3
South America	0	3	3
Total	26	312	338

Note. Tabulation of CEO gender and region of birth. Region of birth computed based on the country of birth as reported in BoardEx.

The vast majority of both female and male CEOs are North American constituting 87.5% of my sample. This can be justified by the fact that I am only investigating US-based firms, and thus the probabilities of having a North American national are higher. The second most frequent nationality is European with 8.9%. However, when splitting the sample between the two genders, there are no European female CEOs announced between 2010 and 2019. Furthermore, the average age of CEOs at the time of the announcement of their appointment is 53.4 years (*SD* = 5.18). The youngest CEO in the sample is 35 years-old, while the oldest is 73 years-old. As studies have shown, age is associated with higher performance and the most common decade at appointment is between 50 and 59 years (Davidson et al., 2006).

The descriptive statistics for the firm-specific variables at the year of the announcement are presented in Table 2.

Table 2. Firm-specific characteristics summary statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
roa	343	.153	.108	-.208	.788
roe	331	.16	.747	-12.096	2.586
d_e	343	1.751	12.217	-179.413	76.23
p_e	341	16.047	45.743	-437.2	334.769
p_s	343	2.441	2.479	.038	18.779
p_b	332	4.67	6.786	.267	54.114
t_a	339	111593.72	454210.25	184.6	4709014

Note. Firm-specific financial ratios at the end of the fiscal year of each CEO announcement between 2010-2019. All ratios obtained through CRSP.

As most of the firm-specific characteristics are reported on a yearly basis, my dataset consists of a total of 343 observations associated with the end of the year of the

corresponding announcement date. A big variation can be identified between the minimum and the maximum values in the dataset. This is justified by the fact that firms in the dataset were chosen based on their market capitalization only. For instance, taking into consideration the standard industry classification code for each firm, I expect firms belonging to the Manufacturing sector to be more asset-intensive compared to those providing services and thus explaining part of the variation. The variation in the type of firms constituting the dataset leads in return to relatively large standard deviations compared to the mean values. This implies the existence of outliers in the dataset. The difference observed in the number of observations is due to the availability of financial data when selecting the variables.

3.3 Event study

An event study is the empirical method used to evaluate the economic impact of a defined event on a specific value of a firm (MacKinlay, 1997). For my empirical analysis, the event study methodology is utilized to examine whether the announcement of a newly appointed CEO affects the stock prices of S&P 500 firms ranked by their market capitalization as of January 2023. More specifically, the event study analyzes whether there is an abnormal return associated with the announcement. The variables used in this analysis are the company tickers (company_id) and the announcement dates (event_date) that are consequently merged with the daily stock returns (ret) and the S&P 500 Index return (market_return) based on their corresponding tickers and dates. The abnormal return can then be computed as the difference between the actual return and the approximate return in the absence of the event (MacKinlay, 1997). To perform the event study, the seven steps proposed by researchers Fama et al. (1969) for executing an event study are followed. These steps are depicted in Figure 2 below.

Figure 2. The 7 steps of an event study by Fama et al. (1969)
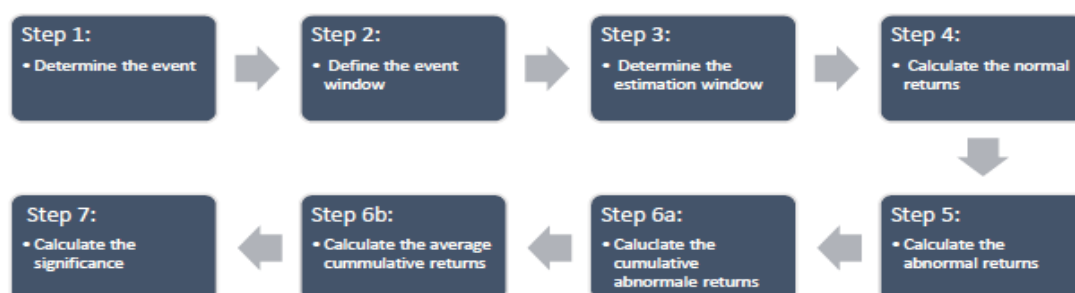
According to Fama et al. (1969), the first step of an event study is to determine the event of interest. As described in section 3.1, company announcements related to the appointment of a new CEO are used in this analysis. From a total of 1932 announcements between January 2010 and December 2019, only 403 were considered in the event study based on the needs of my analysis.

3.3.1 Determining event and estimation windows

The second step is to consider an appropriate event window, defined as the time interval during which any abnormal returns are evaluated. In a completely efficient market, the event window would be equal to the announcement day as stock prices are considered to be perfectly reflecting all available information (Fama, 1970; Visaltanachoti & Yang, 2010). However, as more recent studies have shown the idea of a perfectly efficient market is far from being realistic due to information leakages (Meulbroek, 1992; Fishe & Robe, 2004; Hameed et al., 2008). For instance, the disclosure of sensitive information, such as the announcement of the appointment of a new CEO, before the official release by the company might have an effect on stockholders and consequently on stock prices. According to the literature, several different approaches can be considered when determining the most appropriate event window. Brooks (2019) suggests an event window anywhere between 100 and 300 days for daily observations, while Bacon and Jones (2007) claim that the event window should be at least 3 days in order to control the possibility of leakages. In this empirical study, three event windows will be utilized in order to be able to check the robustness of my results. The three event windows are 3-days [-1,1] as deployed by Lucey and Carron (2011),11-days [-5,5] by Scholtens and Brinkhuis (2018), 21-days [-10.+10] by Campbell & Vera (2010). These event windows allow me to control both for any confounding events, and for any potential anomalies.

The third step is to determine the estimation window, deployed to calculate an approximation of the stock returns under the assumption that the announcement of a newly appointed CEO hasn't happened. In my empirical analysis, a 100-day estimation window is used as according to the research by Hall & Weiss (1967) any estimation window longer than 100 days is a good benchmark capturing all available information in the market. Furthermore, a 20-day gap between the event window and the estimation window is used in order to avoid the overlap of event and estimation Taking into consideration that the average tenure of an executive is approximately 4.9 years, and

that the notice period tends to be anywhere between 3 to 12 months (Korn, 2020) the possibility of having events too close to each other is negligible. In Figure 3, the timeframe of my event study is visualized.

Figure 3. Timeline of event and estimation windows
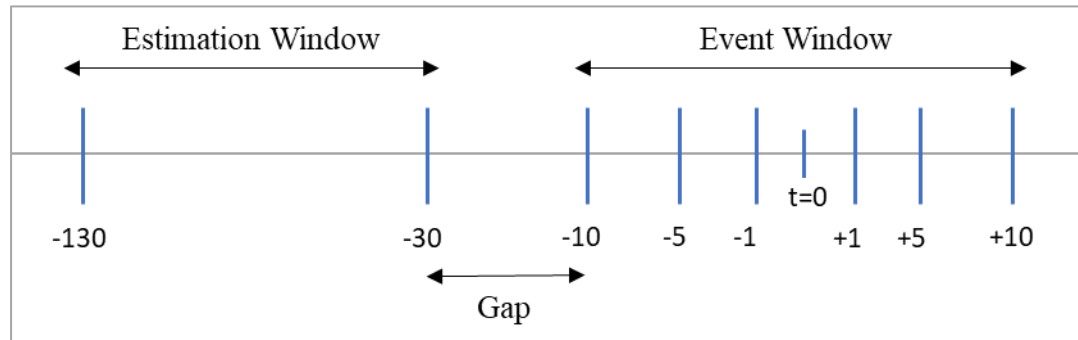
Note. Event windows of 3, 11, and 21 days. For illustration purposes, 20-days gap and 100-days estimation window are only presented for the largest event window.

3.3.2 Estimating AR and CAR

The fourth step is to compute the normal returns. For the purpose of this empirical analysis, the market model is used as it is built under the assumption that there is a linear relationship between the security and the market return (MacKinlay, 1997). The model is defined as follows:

$$R_{it} = \alpha_i + \beta_i * R_{mt} + \varepsilon_i \tag{1}$$

Where:

R_{it} = the return of stock i on time t

a_i = the risk adjusted return of stock i

β_i = the sensitivity of stock i relative to the market return

R_{mt} = the return on the S&P500 index on time t

ε_i = the zero mean disturbance term

To compute the daily returns of individual stocks and those of the S&P500 market index, the following formula is used where $t = time\ in\ days$:

$$Daily\ return_t = \frac{closing\ price_t - closing\ price_{t-1}}{closing\ price_{t-1}} \tag{2}$$

The next step is to calculate any abnormal returns arising around the announcement day. According to MacKinlay (1997), the standard approach on computing abnormal

returns accounts for the deviation between the actual stock return and its expected return. However, the needs of the market model approach require the use of an altered formula in order to be able to control for the overall market trend.

$$AR_{it} = R_{it} - (\alpha_i + \beta_i * R_{mt}) \tag{3}$$

Where:

AR_{it} = the abnormal return of stock i on time t

R_{it} = the return of stock i on time t

a_i = the risk adjusted return of stock i

β_i = the sensitivity of stock i relative to the market return

R_{mt} = the return on the S&P500 index on time t

The fifth step is to measure the total impact of the event over a particular time period by computing the cumulative abnormal returns (CAR), defined as the summation of individual abnormal returns over the selected period for each firm (4). To aggregate over all the firms in my sample, the following formulas (5) and (6) are computed for average abnormal returns and cumulative average abnormal returns respectively:

$$CAR_i(t_1, t_2) = \sum_{t=t_1}^{t_2}(AR_{it}) \tag{4}$$

$$\overline{AR_t} = \frac{1}{N}\sum_{i=1}^{N}(AR_{it}) \tag{5}$$

$$\overline{CAR}(t_1, t_2) = \frac{1}{N}\sum_{t=t_1}^{t_2}\overline{AR_t} \tag{6}$$

According to the previous literature, I expect a negative reaction to the announcement of a newly appointed CEO (Dedman & Lin, 2002; Leitch & Sherif, 2017). This implies that firms announcing a new CEO are expected to realize negative CAR around the announcement day, therefore CAAR is also expected to be negative.

Lastly, in order to evaluate the significance of my results a statistical t-test is performed, examining whether the null hypothesis assuming that $\overline{CAR}$ differs significantly from zero. Following the vast majority of economic studies, a 95% confidence interval with a critical value of 1.96 is considered.

$$t\overline{CAR} = \frac{\overline{CAR}\ (t_1, t_2)}{\sqrt{var(\overline{CAR}(t_1, t_2))}} \tag{7}$$

3.4 Ordinary least squares regression

In order to be able to examine my second hypothesis, meaning if the announcement of a female CEO is associated with negative abnormal returns, an OLS regression is used. Apart from investigating the impact of gender on the stock market returns at the announcement of a new CEO, the OLS regression can also be used as a robustness check on the results found during the event study. Following the methodology of Lucey and Carron (2011), the dependent variable of the regression is the CAR value from the 3-day event window for every firm. As shorter event windows are associated with more significant results (Oler et al., 2008), the 3-day CAR is expected to be the best estimator for my analysis. The following linear regression equation is developed:

$$car3 = \beta_0 + \beta_1 * female + \beta_2 * age + \beta_3 * \ln_{t_a} + \beta_4 * roa + \beta_5 * roe + \beta_6 * Construction + \beta_7 * Fin + \beta_8 * Manufacturing + \beta_9 * Mining + \beta_{10} * Retail + \beta_{11} * Services + \beta_{12} * Electric + \varepsilon_i \tag{8}$$

The control variables can be split into two categories: individual-specific and firm-specific. Individual-specific characteristics include a female dummy, returning the value of 1 in case CEO is a female, and the age of CEO at the time of the announcement. Both variables have been used in previous literature and are expected to have an impact on CAR after the announcement of a new CEO (Lee & James, 2007). Firm-specific characteristics include proxies for firm size, profitability, and industry. More specifically, the natural logarithm of total assets (ln_t_a) is used as a proxy for firm size (Mothlagh et al., 2016). Return on assets (roa) and return on equity (roe) are used as profitability proxies (Zaheri & Barkhordary, 2015). Three-digit standard industrial classification (SIC) codes are used as a proxy for the industry in which the firm operates in (Lee & James, 2007). Dummy variables are created to account for each sector. Overall, a negative relationship between female and CAR is expected as investors tend to negatively value the appointment of a female CEO. On the other hand, a positive relationship is expected between age and CAR as older CEOs tend to be associated with higher performance, and thus higher stock returns, due to their experience. Size and profitability proxies are also expected to be positively related with CAR as they are considered to be valuable characteristics of firms listed in stock exchange market (Shafi, 2014).

3.5 Buy-and-hold abnormal return

As described in the previous sections, an event study methodology is used to evaluate the economic impact of an event on a specific value of a firm over a short period of time (MacKinlay, 1997). To be able to test the third hypothesis by examine whether the announcement of a female CEO is associated with positive CAR after one year of the announcement, and thus to examine if the short run effect is persistent over a longer period of time, buy-and-hold abnormal return approach (BHAR) is deployed. According to the literature, cumulative abnormal returns method is biased when examining the long run performance (Barber & Lyon, 1997) and thus BHAR is considered to be the most common method to evaluate long term performance. BHAR refers to difference in the long-run return arising from holding the stock of a firm compared to that of a benchmark asset or matching firm (Dutta & Dutta, 2015). According to Barber and Lyon (1997), the first step is to compute the H-month BHAR for event i using the following:

$$BHAR_{iH} = \prod_{t=1}^{H}(1 + R_{it}) - \prod_{t=1}^{H}(1 + R_{Bt}) \qquad (9)$$

Where:

$R_{it} =$ the return of stock i on time t

$R_{Bt} =$ the return of a control firm on time t

For the purpose of my empirical analysis 12 months, or approximately a one-year period, is used starting from the day of the announcement. To formulate my sample, I use the 27 events associated with the announcement of female CEOs resulting from the event study. I then further evaluate them to exclude events taking place in 2019 as for such events, the one-year return is out of the scope of this analysis. In order to create the benchmark firm portfolio, each of the 22 remaining events has to be matched with a control firm based on the three criteria suggested by Scholtens and Brinkhuis (2018). The three criteria include size, industry and announcement date. For the purpose of my empirical analysis, a forth criterion has to be implemented based on gender. This means that female announcements have to be matched with male announcements only. The matching process is as follows. First, using total assets as a proxy for firm size, potential matches are formed. Any firm with a variance of up to 30% in total assets is considered a good match (Scholtens & Brinkhuis, 2018). Second, applying the gender criterion,

any potential matches between firms with female CEO announcements are eliminated. Following, the remaining potential matches are evaluated based on their 4-digit SIC codes. Matches between firms that do not operate in the same classification division (Appendix 8.1) are eliminated as they do not fulfill the industry criterion. Lastly, the final matching is performed based on the closest announcement date. Overall, firms having the smallest variance in terms of total assets, announcing opposite gender CEOs while also operating in the same industry and having the closest announcement dates are matched. Events that do not meet these criteria have to be removed from the sample resulting in 13 events. The final matches are presented in Appendix 8.2.

The t-statistic, used to test the null hypothesis that the mean of the buy-and-hold return is equal to zero, is then computed as following:

$$t_{BHAR} = \frac{\overline{BHAR}}{\sigma(BHAR_H)/\sqrt{n}} \tag{10}$$

Where:

$\overline{BHAR} = sample\ mean$

$\sigma(BHAR_H) = cross\ sectional\ sample\ standard\ deviation$

Following the results of Eduardo & Poole (2016), I expect a positive relationship between the announcement of a female CEO and the stock returns of the corresponding firm after a one-year period. As women are associated with higher performance (Khan & Vieito, 2013), especially in complex environments (Francoeur et al., 2008), I am expecting stock prices to reflect that assuming the perfect market hypothesis holds.

3.5.1 Non-parametric test

Due to the small number of observations in the long run analysis, a non-parametric sign test is applied to the BHARs to further evaluate the robustness of my results. According to Brooks (2019), non-parametric tests require less assumptions compared to the parametric t-test and are thus more likely to lead to results with statistical inference when the sample size is small. Taking into consideration that BHARs found in the long run analysis are not symmetrically distributed (Appendix 8.3), a general paired sample sign test is performed (Cowan, 1992). Observations are split into two groups based on their signs, and then tested on whether there is a balanced number of positive and negative BHAR values. The testing is performed in STATA.

4. Empirical results

This section includes a discussion of the results obtained through my empirical analysis. First, the event study results are presented. By utilizing the three different event windows, a comparison between these results is performed, allowing me to further understand how the announcement of a new CEO affects the stock market of a firm. To better cater the needs of my analysis event study results are presented on a total, rather than on an individual firm basis. Then, the results of the linear regression model are presented where the impact of CEO gender on the stock price returns after the announcement of a new CEO is examined. Furthermore, the results of the BHAR approach along with the sign test results are presented allowing me to evaluate whether the effect on stock prices is persistent one year after the announcement. The main analysis is performed in STATA following the event study methodology of Ullah et al. (2021). Finally, a discussion of the results compared to my initial expectations and compared to the literature is performed.

4.1 CEO announcement and stock returns

4.1.1 Event Window [-1,1]

Table 4 presents the results of the event study with a 3-day window. Average abnormal returns, cumulative abnormal returns and the corresponding t-statistic are presented for each day in the event window.

Table 4. 3-day event window results.

Event Study [-1,1]

dif	AAR	CAAR	CAARtest
-1	0	0	0.264
0	-0.001	-0.001	-0.304
1	0	-0.001	-0.252

Note. AAR and CAAR by event window day for the total of 207 announcements between 2010-2019. The S&P500 market index has been used in the computation of AR. T-test computed for the mean CAR.

Results show a 0.1% decrease in AAR during the actual announcement day and consequently, a 0.1% decrease in CAAR the following day. This would suggest the existence of a negative reaction of investors to the announcement of a new CEO. This is in line with my expectations and with prior literature (Dedman & Lin, 2022; Leitch & Sherif, 2017). However, my results are not robust as the t-statistic is lower than the

critical value of 1.96. This means that we fail to reject the null hypothesis that CAAR is different than zero at a 95% significance level, and thus no conclusions can be drawn from my findings.

4.1.2 Event window [-5,5]

Table 5 below presents the results of the event study with an 11-day window.

Table 5. Event Window [-5,5]

Event Study [-5,5]

dif	AAR	CAAR	CAARtest
-5	**-0.002**	**-0.002**	**-2.336**
-4	0.001	-0.001	-0.842
-3	0.002	0.001	0.438
-2	0.002	0.003	1.573
-1	0	0.003	1.370
0	-0.001	0.002	0.708
1	0	0.002	0.659
2	0.001	0.003	0.826
3	-0.001	0.001	0.446
4	0.001	0.002	0.618
5	-0.001	0.002	0.460

Note. AAR and CAAR by event window day for 206 announcements between 2010-2019. The S&P500 market index has been used in the computation of AR. T-test computed for the mean CAR.

As depicted, AARs are found to be negative on t-5, t0, t+3 and t+5. Even though the magnitude of AARs tends to be relatively small (-0.2%, -0.1%, -0.1% and -0.1% respectively for each day), results are in line with my previous expectations as the announcement of a new CEO results indeed in negative AAR. This would imply that investors tend to negatively value changes in management and thus stock returns are decreased. However, when examining the cumulative impact negative values are only realized on t-5 and t-4. Furthermore, considering the robustness of the results, an increase in the magnitude of t-statistic for the period of t-1 to t+1 compared to the results of the 3-day window is realized. Even though the magnitude has increased, from the 11 days in the window, only the CAAR for t-5 is statistically significant at a 95% significance level. This means that the absolute value of the T-statistic is higher than the critical value of 1.96, and thus we can reject the null hypothesis that CAAR is indifferent from 0. A statistically significant negative CAAR occurring 5 days before the actual event could be associated with the possibility of information leakages prior to the event date. It is thus worth exploring a larger event window to examine how results might evolve further.

4.1.3 Event window [-10,10]

The outcome of the 21-day event window is depicted in Table 6 below. Within this larger window, more negative AAR values can be identified as t-6 and t+7 have realized a negative AAR of -0.1% each. When comparing the cumulative impact, the results tend to be in the opposite direction compared to the 11-day window. More specifically, within the whole window CAAR values are positive. This implies that the announcement of a new CEO tends to be positively associated with the firm's stock returns. Even though these results are not in line with my expectations, they are in accordance with the findings of Schoar and Zuo (2016), and Nino and Romero (2007) suggesting positive abnormal returns after the announcement of a new CEO under special circumstances.

Table 6. Event Window [-10,10]

Event Study [-10,10]

dif	AAR	CAAR	CAARtest
-10	0.001	0.001	1.548
-9	0	0.002	1.436
-8	**0.001**	**0.002**	**1.757**
-7	**0.001**	**0.003**	**2.043**
-6	-0.001	0.002	1.127
-5	-0.002	0	0.133
-4	0.001	0.001	0.454
-3	0.002	0.003	1.114
-2	**0.002**	**0.005**	**1.820**
-1	**0**	**0.005**	**1.707**
0	-0.001	0.004	1.155
1	0	0.004	1.147
2	0.001	0.005	1.258
3	-0.001	0.004	0.921
4	0.001	0.004	1.044
5	-0.001	0.004	0.912
6	0.001	0.005	1.133
7	-0.001	0.004	0.971
8	0	0.004	1.061
9	0.001	0.005	1.200
10	0	0.005	1.109

Note. AAR and CAAR by event window day for 205 announcements between 2010-2019. The S&P500 market index has been used in the computation of AR. T-test computed for the mean CAR.

Evaluating the statistical significance of my findings, only the CAAR value during the seventh day before the announcement is statistically significant at a 95% significance level and thus, we can reject the null hypothesis that CAAR is equal to zero. This implies that the announcement of a new CEO is associated with a 0.3% increase in the CAAR seven days before the announcement. At a 90% significance level, we can also

conclude that the announcement of a new CEO is associated with 0.2%,0.5% and 0.5% increase in CAAR during t-8,t-2 and t-1 respectively. The increase in the robustness of CAAR values compared to the 11-day and 3-day windows is opposite to the findings of Oler et al. (2008) as authors suggest that shorter event windows are associated with more statistically significant results when daily data is utilized.

4.2 Female CEO announcements and stock returns

In this section, the results of the OLS regression are presented. In order to be able to examine the relationship between cumulative abnormal returns, as these arise from the 3-day event window, and CEO gender at the time of the announcement, I have used two regression models. Linear regression A includes the main focus variable, namely CEO gender, and the age of CEO at the time of the announcement. As previously discussed in the literature these two individual specific characteristics have been found to be correlated with firms' stock market performance. Linear regression B builds on the previous model by including more control variables, related to company specific characteristics this time. This allows me to examine how strong the relationship between CEO gender and CAR is as more related explanatory variables are added in the regression. Before the results of the regression are presented, it is worth mentioning that based on the results of the event study, no statistically significant CAR was identified in any of the three event windows used. Furthermore, the CAR values found tend to be significantly small in magnitude, suggesting that a relationship between the announcement of a new CEO and stock price returns is not strong. Taking into consideration that the mean value of CAR was found to be equal to -0.001, the results of the OLS regression are expected to show a similar insignificant pattern both in terms of magnitude and statistical significance.

Table 7 presents the results of the first model. Following my expectations, nor the constant variable neither the control variables are statistically significant. This implies that we fail to reject the null hypothesis that all coefficients are equal to zero. Even though no statistical inference can be made, it is worth commenting on the direction of the relationship. Constant coefficient is negative which is in line with my first hypothesis suggesting that the announcement of a new CEO is associated with negative CAR. Female dummy has a positive, but close to zero, coefficient. This is contradictory to my expectations as a negative relationship between CAR and being a female CEO was expected. However, since results are not statistically significant, the only

conclusion that can be drawn is that we fail to reject the null hypothesis that all coefficients are equal to zero.

Table 7. OLS regression between CAR[-1,1] and individual specific characteristics

Linear regression A

car3	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
female	.003	.006	0.46	.649	-.009	.014	
age	0	0	1.22	.225	0	.001	
Constant	-.021	.017	-1.26	.207	-.054	.012	

Mean dependent var		-0.001	SD dependent var			0.034	
R-squared		0.005	Number of obs			204	
F-test		0.887	Prob > F			0.413	
Akaike crit. (AIC)		-800.677	Bayesian crit. (BIC)			-790.723	

*** p<.01, ** p<.05, * p<.1
Note. Ordinary least squares regression with the 3-day CAR values obtained on a firm level as dependent variable. Individual specific characteristics include a female dummy indicating the gender of CEO, and a continuous variable for age.

Table 8 demonstrates the extended model including company specific control variables. As it can be seen from the R-squared, increasing from 0.005 to 0.069, the extended model is better at explaining the variance in the dependent variable. Both values however are below the lowest acceptable levels of at least 0.1 for social sciences given that some of the predictors or explanatory variables are statistically significant (Ozili, 2022). Compared to Model A, an increase in the magnitude of the coefficients of female and constant is found. Their direction remained the same but as previously mentioned, no statistical inferences can be made. From the company specific characteristics, two sector dummies are found to be statistically significant. More specifically, operating in the wholesale and finance sectors are associated with a -1.8% and a -2.1% decrease in the CAR value respectively. Wholesale coefficient is statistically significant at a 10% significance level, while finance coefficient at a 5% level. The rest of the variables in this regression model appear to be statistically insignificant, and thus we fail to reject the null hypothesis that they are uncorrelated with CAR. However, it is worth noting that the natural logarithm for total assets (ln_t_a), roa and roe tend to have the expected signs that would suggest a positive correlation if statistical significance was found. Overall, the results of my OLS regression fail to establish a statistically significant relationship between being a female CEO and the CAR value arising in a 3-day event window around the announcement date. This implies that I have to reject my second hypothesis expecting that the announcement of a female CEO is associated with negative cumulative abnormal returns. These findings are in line with Pastore et al.

(2017) and Leitch and Sherif (2017) suggesting that stock market reaction on the announcement of a new CEO is indifferent between the two genders.

Table 8. OLS regression between CAR [-1,1] and all control variables

Linear regression B

car3	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
female	.006	.006	1.03	.306	-.005	.017	
age	0	0	0.65	.518	-.001	.001	
ln_t_a	.002	.001	1.56	.12	-.001	.005	
roa	.004	.024	0.18	.86	-.044	.052	
roe	0	.001	0.29	.774	-.001	.001	
Wholesale	-.018	.01	-1.71	.09	-.038	.003	*
Fin	-.021	.01	-2.13	.034	-.04	-.002	**
Manufacturing	-.013	.009	-1.41	.161	-.032	.005	
Mining	-.013	.01	-1.28	.202	-.032	.007	
Retail	.003	.013	0.27	.785	-.021	.028	
Services	-.012	.01	-1.11	.269	-.032	.009	
Electric	-.001	.012	-0.11	.912	-.026	.023	
Constant	-.025	.025	-1.01	.312	-.075	.024	

Mean dependent var		-0.000	SD dependent var		0.029
R-squared		0.069	Number of obs		175
F-test		1.405	Prob > F		0.168
Akaike crit. (AIC)		-728.922	Bayesian crit. (BIC)		-687.780

*** p<.01, ** p<.05, * p<.1*
Note. Ordinary least squares regression with the 3-day CAR values obtained on a firm level as dependent variable. Individual specific characteristics include a female dummy indicating the gender of CEO, and a continuous variable for age. Firm specific characteristics include natural logarithm of total assets, return on assets and return on equity. Following, 7 dummy variables indicating the industry in which firms operate in. Public administration industry dummy being used as the reference group and thus dropped from the regression.

4.3 Long run effect

In this section, the long-term BHAR results are presented based on a (+1,+12) monthly event window (Appendix 8.4). The BHAR value found is thus the difference in the long-run return arising from holding the stock of a firm with a female CEO announcement compared to that of a matching firm with a male CEO announcement. Findings imply that the average BHAR value during the first year after the announcement is negative (*M* =-0.371, *SD* = 2.583). This would suggest that during the year after the announcement BHAR is negative by 37.1% for female led firms compared to their corresponding benchmarks. This is in the opposite direction compared to my third hypothesis as a positive relationship between the announcement of a female CEO and the stock returns of the corresponding firm after one year was expected. A plausible explanation for the negative direction of the coefficient is the existence of gender stereotypes regarding the different behavior of males and females. According to Cook and Glass (2011), there is empirical evidence associating leadership

roles with stereotypical male characteristics. It is thus generally perceived by investors that women tend to be less qualified and less competent compared to their male counterparts resulting in lower stock market performance.

Even though I can comment on the direction of the coefficient, no statistical inference can be drawn from these results. The small number of observations in my sample reduce the explanatory power of the model, and thus the small t-test value along with the relatively high standard deviation can be justified. Consequently, the t-value is below the critical value suggesting that there is not enough evidence to reject the null hypothesis that the coefficient of BHAR is equal to zero, β= -0.371, $t(11) = -0.52$, $p >$ .05. These results are also in line with the non-parametric test performed. According to the sign test, the obtained value, $p = 1.0000$, is greater than the critical value, $\alpha = 0.05$, and thus there is not enough evidence to reject the null hypothesis that there is a balanced number of positive and negative BHARs in the sample. Overall, in contrast to my initial expectations, the long run results fail to establish a statistically significant relationship between a female CEO and buy-and-hold returns after a year of their announcement.

4.4 Discussion

Following the increasing trend in the appointment of new female CEOs among S&P500 listed firms, reaching a total of 41 out of the 500 CEOs in 2022 (Boyle & Green, 2023), the main purpose of this empirical analysis is to investigate how the appointment of female CEOs is perceived by investors in the market. Starting from the short run analysis, a negative relationship between the announcement of a new CEO and average abnormal returns of -0.1% is found in all event windows. Even though no conclusions can be drawn from these results, as they are not statistically significant, it is worth mentioning that they are in line with previous studies suggesting a negative market reaction to the announcement of a new CEO (Dedman & Lin, 2002). When splitting the event window in individual days statistically significant CAAR values can be found. For instance, in the 11-days window the announcement of a new CEO tends to be associated with -0.2% in CAAR five days before the announcement. As previously mentioned, this could be an indication of information leakages prior to the actual announcement. In the 21-days window, a significant increase in the CAAR value of 0.3% is present on the seventh day prior to the announcement. Taking into consideration that firms are aware that investors tend to react negatively to the announcement of

management changes, they might choose to engage in strategic noise making to try and change the investor's perception of the firm (Elsbach et al., 1998). This would imply that they might act in a certain way in order to take the spotlight away from the management change announcement and into some other aspect of the business. It would thus be the case that positive returns are experienced some days prior to the announcement. To summarize, there is not enough evidence in any of the three event windows examined to reject the null hypothesis that CAAR coefficients are different than zero. This implies that for US-based S&P500 firms with the highest market capitalization as per January 2023, the announcement of a new CEO does not significantly impact the cumulative abnormal returns of the firm.

Investigating how gender affects the CAAR value of the 3-day event window by regressing CAAR with control variables for individual specific characteristics and firm specific characteristics, a positively coefficient was found for female CEO. Even though the coefficient is not statistically significant, it is still worth commenting on the reasons behind why a positive coefficient was found in line Campbell and Vera (2010) but in contrary to my initial expectations. Fims lead by females tend to be associated with better performance (Khan & Vieito, 2013), while their unique management style and their ability to build strong relations (Krishnan & Park, 2005) and their strong market orientation (Davis et al., 2010) further ameliorate firm's performance. Furthermore, empirical evidence has shown that females who managed to get to senior leadership roles have extraordinary skills and competences (Whitisuphakorn & Jiraporn, 2017). This could be another plausible explanation of the positive coefficient as investors might perceive female CEOs as more capable compared to their male counterparts and thus positively react to their announcement. To summarize, my results fail to establish a statistically significant relationship between the cumulative abnormal returns and the CEO gender. This would imply that, contrary to my initial expectations, investors are indifferent between the appointment of a female and a male CEO. This is in line with the evidence of Scholtens and Brinkhuis (2018) suggesting that investors do not value the appointment of female CEOs significantly different than that of men. A plausible explanation for this is the fact that in order to attain a CEO role, individuals have to acquire special skills and competencies that are not in any way related to gender (Faccio et al., 2011). Differences between female and male senior leaders are thus smaller than initially believed (Vinkenburg et al., 2011)

The results of my long-run analysis on how the buy-and-hold returns of a firm with a female CEO announcement compared to a benchmark firm with a male CEO announcement differ after a one-year period, show a negative return of 37.1%. As this is not statistically significant, no statistical inferences can be drawn. The non-parametric sign test further enhances the robustness of my results as it also provides evidence that positive and negative BHARs are balanced in the sample. However, a plausible explanation for the unexpected sign could be the existence of gender stereotypes associating senior leadership roles with male-specific characteristics (Cook & Glass, 2011). This would mean that by nature women are perceived as less competent by investors. The results are thus not in line with my initial expectation of higher long run performance for firm led by female CEOs (Eduardo & Poole, 2016), but in line with Gondhalekar and Dalmia (2007) suggesting that the two-year returns do not vary significantly between the two genders.

Following the discussion of the short and long run results, an answer to my research question can be made. The reaction of the stock market to the appointment of a new female CEO do not statically vary from that of their male counterpart. Investors tend to perceive the two genders as equal when in procession of senior leadership roles in well established firms. The effect tends to be persistent one year after the announcement of a new CEO, as the buy-and-hold returns between the female-led firms and the corresponding male-led benchmark firms do not vary significantly. Overall, the CEO gender should not be considered as a determining factor for stock market returns after a new CEO announcement.

5. Limitations and further research

There are several limitations identified in this empirical analysis. As the main research question is to explore how the announcement of a female CEO is associated with stock returns in the short and long run, CEO announcement dates were the main variable of interest. From the 1929 announcements found to contain the word CEO in the period between 2010 and 2019, only 403 were considered for my analysis. This is due to the fact that I have decided to exclude announcements related to acting, regional, divisional, interim and co-CEO roles as these tend to be associated with negative or positive connotation already (Ballinger & Marcel, 2010). As a consequence, the number of observations in my dataset decreased significantly. Furthermore, the number of announcements associated with female CEOs is only 29. As small sample sizes tend to be associated with less powerful statistical models, the probability of committing a type II error is increased. More specifically, type II error occurs when the statistical model does not provide enough evidence to reject the null hypothesis when it is in fact false (Brooks, 2019). Even though it is out of my research scope, having included the initial number of announcements might have resulted in more statistically significant and more representative results. Another limitation arising from my analysis is the small magnitude of coefficients found both in the event study and in the OLS regression. This could be explained by the fact that my dataset consists of announcements of US-based firms with the highest market capitalization. As market capitalization tends to be associated with more stable and well-established firms that do not attract a lot of attention in the market, investors are less skeptical towards them and thus their stock returns tend to be relatively stable. It is thus harder to find a significant abnormal return. A suggestion for further research is to include announcements based on a different proxy for size such as total profits or net assets. Following the results of the OLS regression, another suggestion would be to focus on firms operating in one industry only. Based on my findings, firms operating in the manufacturing and financial sectors tend to be associated with more negative cumulative abnormal returns. These two industries tend to be among the most male dominated industries and thus exploring how investors perceive female CEOs would be interesting for further research. In addition, the very low R-squared coefficient for all the models used in the OLS regression suggest that my model is explaining only a small part of the variation in the control variable. This is both due to the fact that my control variable is very small in magnitude

as the mean cumulative abnormal return is only -0.1% and -0.0% accordingly, and due to omitted variable bias. A suggestion for further research would thus be to incorporate all announcements, focus on one industry and add more control variables related to individuals, such as education and nationality, as well as more company specific characteristics. Finally, due to data availability the reason for the appointment of a new CEO is not included in my analysis. As Lee and James (2007) have empirically proven, controlling for the reason of CEO turnover is very important as it can have a significant impact on the stock market's reaction to the announcement. For instance, CEO turnovers due to forced CEO resignation, restructuring and acquisitions tend to be negatively perceived by investors, while on the contrary natural succession or succession after poor performance are positively perceived. However, adding a control variable for the reason of CEO succession is outside the scope of this analysis and thus it can be used as a point for further research.

6. Conclusion

Following the fact that for the first time in history female CEOs outnumbered any single male name among S&P500 CEOs in January 2023 (Catalyst, 2023), the purpose of this empirical analysis was to explore how the stock market reacts to the announcement of the appointment of a female CEO and whether this effect is persistent in the long run. This research fails to establish a significant relationship between CEO gender and stock market performance both in the short and in the long run. This connotates that investors do not value the appointment of a female CEO different than that of a male and that stereotypical perceptions regarding genders might not be relevant in senior leadership roles.

The results of my short-term event study analysis fail to provide evidence that cumulative average abnormal returns are different than zero, suggesting that the announcement of a new CEO do not significantly affect the stock market returns. However, in the 11-day event window significant cumulative average abnormal returns of -0.2% are realized five days prior to the announcements that could imply the possibility of information leakages prior to the announcement. On the contrary, a significant increase of 0.3% can be found on the seventh day before the announcement when investigating the 21-day event window. This might be an indication of companies engaging in strategic noise making to try and change the investor's perception of the firm prior to the announcement, resulting in a less negative impact on the actual day of the announcement. The results of the OLS provide evidence that investors are indifferent between the appointment of a female and a male CEO, which suggests that in order to attain a CEO role, individuals have to acquire special skills and competencies that are not in any way related to gender. The long-run results also fail to establish a significant relationship between gender and market returns, suggesting once more that one-year returns do not vary significantly between the two genders. Future research could consider expanding the scope of this analysis by incorporating all CEO announcements, independent of the specifics of each role, and including the reason for the appointment.

7. References

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8. Appendix

8.1 Division classification – SIC codes

In order to fulfill the industry criterion for the matching of the firms for the long run event study, the 4-digit SIC codes are utilized. Based on the first 2 digits, the division is determined. Using the division, industry dummies are created for the OLS regression. The division classification is presented below (*Structure of SIC Codes - SICCODE.com*, 2020).

| Division	Title
A: 01 – 09	Agriculture, Forestry, Fishing
B: 10 – 14	Mining
C: 15 – 17	Construction
D: 20 – 39	Manufacturing
E: 40 – 49	Transport & Public Utilities
F: 50 – 51	Wholesale Trade
G: 52 – 59	Retail Trade
H: 60 – 67	Finance Insurance, Real Estate
I: 70 – 79	Services
J: 91 – 99	Public Administration

8.2 BHAR – firm matches

The final matches used in the BHAR analysis are presented below.

#	Company Name	Director Name	Role Name	Announcement Date	CompanyID	DirectorID	Ticker	Gender	SIC	Total Assets
1	CAMPBELL SOUP CO	Denise Morrison	President/CEO	28-9-2010	5620	310487	CPB	F	2030	6276
M1	BIOGEN INC (Biogen Idec Inc prior to 03/2015)	Doctor George Scango	CEO	30-6-2010	440155	272786	BIIB	M	2836	8092
2	SEMPRA ENERGY CORP	Debbie Reed-Klages	CEO	27-6-2011	27588	47031	SRE	F	4931	33356
M2	XCEL ENERGY INC	Ben Fowke III	Chairman/President/CEO	18-5-2011	33830	57657	XEL	M	4931	29497
3	HP INC	Meg Whitman	President/CEO	22-9-2011	14722	34345	HPQ	F	3570	129517
M3	APPLE INC (Apple Computer Inc prior to 01/2007)	Tim Cook	CEO	24-8-2011	2355	55422	AAPL	M	3663	116371
4	ALLIANT ENERGY CORP	Pat Kampling	Chairwoman/President/CEO	20-1-2012	1476	491611	LNT	F	4931	10786
M4	DISH NETWORK CORP (Echostar Communications Co	Joe Clayton	President/CEO	16-5-2011	10024	52367	DISH	M	4841	11470
5	ULTA BEAUTY INC	Mary Dillon	CEO	24-6-2013	465379	487099	ULTA	F	5990	1603
M5	TRACTOR SUPPLY CO	Gregory Sandfort	President/CEO	27-9-2012	31088	452181	TSCO	M	5200	1707
6	GENERAL MOTORS CO	Mary Barra	CEO	10-12-2013	1673114	892349	GM	F	3711	166344
M6	FORD MOTOR CO	Mark Fields	President/CEO	1-5-2014	12262	42556	F	M	3711	208527
7	AMERICAN WATER WORKS CO INC	Susan Story	President/CEO	12-12-2013	1966	535729	AWK	F	4941	14027
M7	ONEOK INC (WAI Inc prior to 11/1997)	Terry Spencer	President/CEO	25-7-2013	23165	620137	OKE	M	4923	17708
8	LOCKHEED MARTIN CORP	Marillyn Hewson	President/CEO	12-11-2012	19048	202548	LMT	F	3760	38657
M8	QUALCOMM INC	Steve Mollenkopf	CEO	13-12-2013	25529	640531	QCOM	M	3674	45516
9	GENERAL DYNAMICS CORP	Phebe Novakovic	Chairman/CEO	6-6-2012	12984	45561	GD	F	3721	34309
M9	PHILIP MORRIS INTERNATIONAL INC	André Calantzopoulos	CEO	13-3-2013	1060044	36791	PM	M	2111	38168
10	CMS ENERGY CORP	Patti Poppe	President/CEO	26-1-2016	7147	1094129	CMS	F	4931	21622
M10	NISOURCE INC (NIPSCO Industries Inc prior to 04/199	Joe Hamrock	President/CEO	9-6-2015	22260	594908	NI	M	4932	17493
11	PROGRESSIVE CORP	Tricia Griffith	President/CEO	12-5-2016	25199	40291	PGR	F	6331	66855
M11	ASSURANT INC	Alan Colberg	President/CEO	16-9-2014	550072	853893	AIZ	M	6351	63125
12	PG&E CORP	Geisha Williams	President/CEO	14-11-2016	24303	556797	PCG	F	4931	68598
M12	KINDER MORGAN INC (Kinder Morgan Holdco LLC pri	Steve Kean	President/CEO	21-1-2015	1687673	480557	KMI	M	4923	84104
13	HERSHEY CO (THE)	Michele Buck	President/CEO	17-12-2016	14714	485170	HSY	F	2060	5524
M13	HORMEL FOODS CORP	Jim Snee	President/CEO	7-9-2016	15070	806078	HRL	M	2011	6370

8.3 Symmetrical plot for BHARs

In order to select the right non-parametric test, the symmetry of the distribution of BHAR had to be evaluated. Using *symplot* in STATA, the following plot is created. Following the results below, bhar is not symmetrically distributed as observations do not lie on the diagonal line.
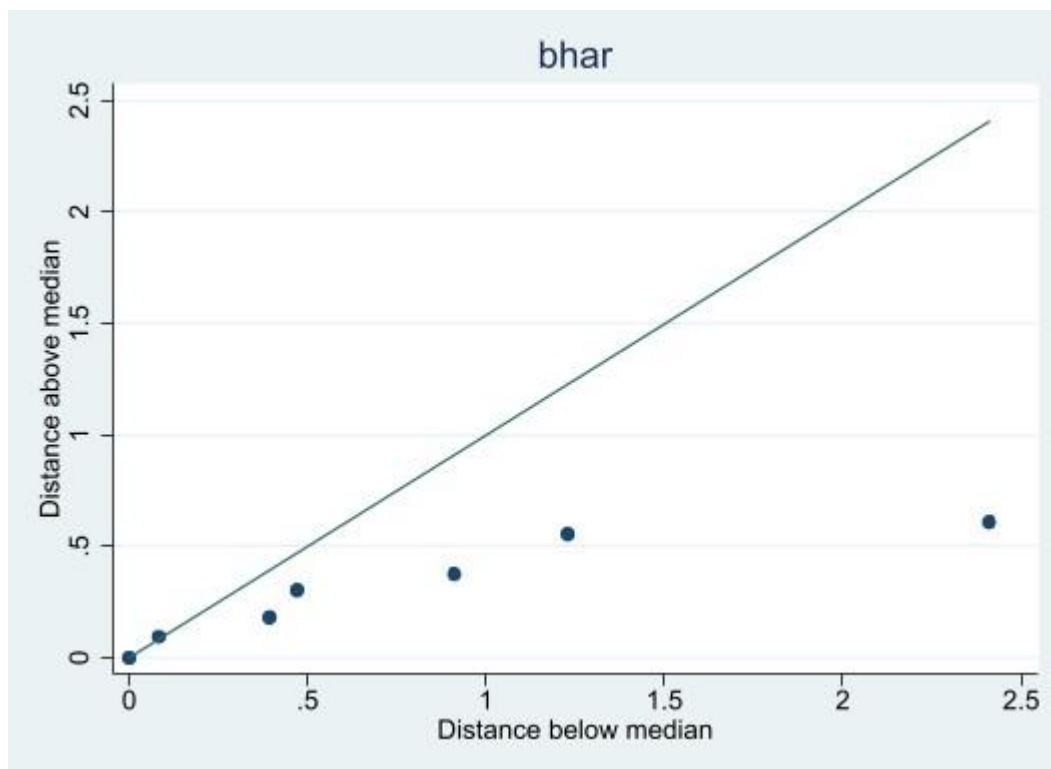
8.4 BHAR results

Linear regression C presents the results of the BHAR analysis using a (+1,+12) window.

Linear regression C

bhar	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Constant	-.371	.716	-0.52	.614	-1.932	1.19	

Mean dependent var	-0.371	SD dependent var	2.583
R-squared	0.000	Number of obs	13
F-test	0.000	Prob > F	.
Akaike crit. (AIC)	62.527	Bayesian crit. (BIC)	63.092

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