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# Are Firms Circumventing Affirmative Actions? - Research on Board Structure and Female Leadership

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**Abstract**

Over the last few years, gender equality has been on the rise. Among others, you can see this in the introduction of board gender quotas in corporations. In this paper, I investigate whether firms are running away from affirmative actions, more specifically, board gender quotas. Using Difference-in-Difference analysis, I study the effect of the Californian Senate Bill No. 826 (SB 826) on board structure characteristics. I estimate the likelihood of females being appointed to top management positions. I find, on average, a significant increase in the proportion of women in the board as well as an increase in the board size. No significant changes in share of independent directors, mean age, network size and nationality mix, were obtained. Additionally, the results show that a director in an inferior board position has a higher likelihood of being female. Based on my results, it seems that firms are circumventing affirmative actions. However, further research is necessary because of several limitations.

# Contents

# 1 Introduction

Even though women have been more present in management positions, they are far from being equally represented in the board of firms, let alone as presidents of the board. Women hold 52% of all professional-level jobs but only 14,6% of the executive positions (Warner and Corley, 2017). In 2003, just 65% of American firms, had the minimum of one female director while only 25% had more than one (Adams and Ferreira, 2009). The first country to implement a policy regarding gender quotas in the board was Norway, in 2003. Soon after more European countries followed. However, some countries chose to implement a soft quota. A soft quota is for example a recommendation that is meant to encourage firms to hire more women. Finally, several Eastern and Southern European countries, don't have any recommendation or quota at all (Arndt and Wrohlich, 2019).

The first state in the United States to enact a required board gender diversity quota was the state of California. On the 30th of September 2018, the Governor of California, Jerry Brown, signed Senate Bill No. 826 (SB 826). This board gender quota has a different structure in comparison to the quota's in European countries which require a given percentage. In European countries, the board needs to have between 20% and 40% of women in the board. The Californian SB 826 is structured as follows: by 2019, all publicly listed corporations with headquarters in California had to have at least one female board member. By 2021, the firms had to have at least two female board members when the board consisted of five people and at least three female board members when the board consisted of six or more people (Greene et al., 2020). Not complying by this law will result in a $100,000 monetary fine for the first violation and a $300,000 fine for each following violation (Greene et al., 2020).

In this paper, I research whether the Californian board gender quota results in a change in the board representation. I do this in a twofold analysis: I study the change in board characteristics as well as what positions women take on within the board of directors. I hypothesize that the Californian board gender quota results in an increase of the share of women in the board, an increase in the number of directors in the board, an increase in the share of independent directors on the board, and no significant change in mean age, nationality mix, and network size. Further, I hypothesize that women are more likely to be appointed to inferior positions in the board of Californian firms.

The research contributes to the existing literature on the Californian board gender

quota which was recently implemented. Plenty of literature can be found on the Norwegian and other European statutory quota's. However, because the last stage of the reform took less than a year ago, the literature on California is still fairly limited. Using difference-in-difference analysis (DiD), I investigate the effect of the of the Californian reform (SB 826) quota on the board structure of publicly listed corporations headquartered in California. I look at the change in various board characteristics, such as: gender ratio, board size, share of independent directors, mean age, network size and nationality mix over the years 2017-2022. I study the two stages of the reform separately, which has not been done in other papers (Meyerinck et al., 2018; Greene et al., 2020). Also, because of how the reform is structured, unlike other papers (Yang et al., 2019; Matsa and Miller, 2013), the control and treatment group have the same geographical location. This minimizes the difference between the two groups.

In recent years, gender equality has been on the rise in various aspects of society, this can be seen in: closing of the pay gap, equal voting rights, gender quotas that enforce a more equal gender division in political parties as well as companies. Finally, to the best of my knowledge, the likelihood of females being appointed to different positions within the board has not been researched before. The existing literature only researches the appointment of a female CEO or President, not other positions. I examine whether or not the positions that women have in the board are inferior, using a Linear Probability Model (LPM). I classify the board positions as following: (1)President/ Chair(wo)man, (2)Vice- President/ Vice Chair (wo)man, (3)CEO, COO and CFO , (4)Secretary and Treasurer, and (5)Other management positions. For this analysis, the first four groups are considered positions in top management (Hofstrand and Anders, 2009), while group five is considered inferior. I look at the probability of the individual being a female, considering the position as given.

My results show an increase in the share of women in the board as well as an increase in the board size as a result of the Californian board gender quota. After 2019, the share of women increased, on average, by 0.087 percentage points while the number of directors increased, on average, by 0.291 percentage points. No significant results in the changes of board structure were obtained after 2021. Secondly, I find that directors belonging to the inferior board position are more likely to be a female. Directors are 0.171 percentage points, and 0.112 percentage points more likely to be a women when

occupying the position of Treasurer and Secretary, or Other, respectively. These results may indicate that firms are circumventing the board gender quota. However, further research on the Californian board gender quota is necessary.

In the remainder of this paper, I first review the existing literature and build my hypotheses (see section 2). Then I discuss the date on the boards and individuals(see section 3). After that. I discuss the methodology (see section 4) and the results obtained (see section 5). Finally, in the conclusion, I discuss the results, the limitations of this paper and ideas for future research (see section 6).

# 2 Theoretical Framework

In this section, I first review the existing literature on board structure, board diversity and female leadership. After that, I build my hypothesis based on the existing literature. The literature review on board structure and board diversity is largely based on my previous paper (Kaczmarek, 2022).

## 2.1 Literature Review

### 2.1.1 Board Structure and Board Diversity

Numerous articles examining the effect of the gender quota in Norway have been published since it was first implemented. The majority of the literature investigates how the changed board structure affects firm performance. As a result of the policy, Norway's board representation of women has significantly grown, going from 9% to the required 40%.

Yang et al. (2019) was the first paper to establish a causal perspective of the gender quota in Norway. The authors looked at how women directors affect company performance. Utilizing the difference-in-difference method and using Finland, Sweden, and Denmark as the control group, the study demonstrates how the required female quota has a negative impact on business performance. Similar studies were conducted in the United States, where it was discovered that the mandatory gender quota in California is linked to significantly lower announcement returns (Greene et al., 2020; Meyerinck et al., 2018).

The directors' primary responsibilities within the board are to monitor and advise top management. Greater monitoring and advice of the board are connected with traits like independence, experience, and connections (Greene et al., 2020). Bøhren and Staubo (2016) discovered that the implementation of the gender quota in Norway, has increased the share of independent directors. Accordingly, Boone et al. (2007) discovered that as a firm grows, board size and independence rise along with board diversity over time. According to the Agency Theory, having an independent board is advantageous because it keeps board members from shirking [1]. Because of this, the executives are allegedly being monitored better (Carter et al., 2003).

According to the Resource Dependency Theory, boards with more diversity have ac-

[1] Avoiding responsibility at work.

cess to more external expertise, which improves decision-making by allowing for a variety of viewpoints from board members (Salancik and Pfeffer, 1978). Female board members might understand particular concept better than male board members. This shows a better ability to solve problems and a beneficial impact on the performance of the firm. Following this, Bernile et al. (2018) discovered that having a more diverse board reduces risk and improves firm performance.

In addition, the proportion of women on the board is positively correlated with strategic control and effectiveness of the board through an increase in development activities and a decrease in conflicts (Nielsen and Huse, 2010). Females also add value in terms of the creation of innovation (Huse et al., 2011). Accordingly, when the firm's strategy is focused on innovation, females bring informational and social benefits to the board, improving firm performance (Dezsö and Ross, 2012).

Thus, contradicting Yang et al. (2019); Meyerinck et al. (2018) and Greene et al. (2020), who showed that the board gender quote which increased female diversity, had a negative influence on firm performance. Other research (Salancik and Pfeffer, 1978; Bernile et al., 2018; Nielsen and Huse, 2010; Dezsö and Ross, 2012) shows that that having more females in the board increases the firm performance. However, either way, shareholders may react negatively towards the appointment of a female leader (Lee and James, 2007), resulting in a decrease in stock price as well as decrease in Tobin's Q [2] (Ahern and Dittmar, 2012).

Besides gender diversity in the board, there is also cultural diversity. Similarly to what Yang et al., Greene et al. and Meyerinck et al. find for gender diversity, Frijns et al. (2016) find that cultural diversity also has a negative effect on Tobin's Q as well as Return on Assets (ROA). In fact, these negative effects are concentrated among the independent board members. However, Erhardt et al. (2003) find that both gender and cultural diversity in the board are associated positively with financial indicators. There are thus contradictory findings for the effect of board diversity in general.

### 2.1.2 Female Leadership

When thinking about leadership, most of us think of a dominant male figure. This is because leadership is largely associated with masculine traits (Kulich et al., 2011).

[2] The ratio between market value and its assets' replacement cost.

In accordance with incongruity theory, men are associated with the possession of more agentic traits, such as: assertiveness and instrumentality, while females are associated with more communal traits, such as: warmth and selflessness (Eagly and Carli, 2003). When a women shows her communal qualities, she is told that she is not agentic enough for a top management position. However, if she has the desirable agentic qualities, she is told that she is not communal enough (Eagly and Carli, 2018). It is rarely the right fit. Therefore, women tend to be stuck in middle management positions. Women are, in general, less straight forward and confident in expressing what they want, than men, during the recruitment process. The lack of confidence also results in less women applying to positions they don't fully meet the criteria for (14% in comparison to men, 20%) (Garcea et al., 2012).

Negative stereotypes circling around women in top management may also be one of the reasons why they are so underrepresented Adams (2016). Stereotypes regarding women's capabilities of performing poorly relatively to men in top management positions are enhanced by the fact that there are more men than women in these positions. And because of the stereotypes arising, women are not appointed to leadership positions, entering a vicious circle. Besides that, because of biological reasons, people assume that women will give up their career or work less in order to raise their off-springs. Because they work less, they have less experience, and are presumed less capable of handling a high function (Eagly and Carli, 2003).

Gupta and Raman (2014) found that the likelihood of a female becoming a CEO increases with the number of females in the board of directors. However, in their research, this is only significant when the CEO is appointed internally, not when the new CEO is hired externally. Accordingly Wang and Kelan (2013) find that firms with older and higher educated female directors have a higher probability of appointing a female to President of the board.

## 2.2 Hypothesis Development

In this research, I study whether firms are running away from affirmative action. I do this by a twofold research on the Californian board gender quota (SB 826), the affirmative action in question. Firstly, I research the effect of the board gender quota in California on different board structure characteristics. Secondly, I look at the likelihood of a female

being appointed to a position, given that position and other control variables. My main research question is:

> Does the Californian board gender quota result in a change in the board representation?

I mainly study the change in gender ratio, number of directors, and share of independent directors. Previous research shows that a board gender quota in California has successfully increased the share of women in the board of directors (Greene et al., 2020). This means that firms indeed fear the sanctions imposed with not complying or are following the trend of hiring more female management. Thus, my first hypothesis follows immediately from the policy ans is:

> H1: The Californian board gender quota will increase the share of women in the board.

Besides that, Yang et al. (2019) and Matsa and Miller (2013) found that the Norwegian board gender quota has increased the board size. Even though this trend seems illogical in Norway, it does make perfect sense in California because of the different structure. Unlike in Norway, which requires a certain percentage of the board to be female, the SB 826 (Californian board gender quota) looks as follows: by 2019, all publicly listed corporations with headquarters in California had to have at least one female board member. By 2021, the firms require the firms to have at least two or three board members when the board consists out of five or, at least six people, respectively. Therefore, the firms have the choice to replace male directors with female directors or expand the board by hiring additional female directors. When these requirements are not fulfilled, companies will face a monetary penalty: $100,000 for the first violation and $300,000 for each following violation (Greene et al., 2020). Further, according to Adams and Ferreira (2009), female directors are more likely to serve as independent directors. Thus, given that the share of women in the board increases, so does the share of independent directors (Bøhren and Staubo, 2016; Boone et al., 2007). Therefore, I speculate that firms will choose to expand the board instead of replacing a male and thereby try to escape the affirmative action imposed on them as well as an increase in the share of independent directors resulting from hypothesis one. My second hypothesis is:

H2: The Californian board gender quota will increase the number of directors as well as the share of independent directors on the board.

The secondary research on board characteristics studies the change in the, nationality mix, mean age and network size. Even though Meyerinck et al. (2018) found that the newly appointed female directors in California significantly differ in age and experience in comparison to the leaving male directors, I believe this will not have a huge impact on average age and average network size. Thus, following Yang et al. (2019), I expect no significant change in mean age, nationality mix and network size. My secondary hypothesis are:

H3: The Californian board gender quota will have no significant effect on mean age, nationality mix or network size.

The other main study in my paper looks at the likelihood of the director being female given the board position he/she is appointed to. Even though Gupta and Raman (2014) found that females are more likely to be appointed to CEO with more gender diversity in the board. Since this result is only significant for scenarios where one of the current directors is appointed to CEO, this does not hold for the newly hired female directors. Similarly, a female is more likely to be appointed to President when she already was a female director (Wang and Kelan, 2013). Therefore, I speculate that the newly hired female directors will serve inferior positions. More specifically, positions that belong the the fifth category (more on this in Section 3) for a certain amount of time, before they are appointed to top management positions, such as: President, Vice- President, CEO, CFO, COO, Treasurer and Secretary (Hofstrand and Anders, 2009). The last hypothesis is:

H4: Women are more likely to be appointed to inferior positions in the board of Californian firms.

# 3 Data

In this section, I explain the process of gathering data and creating the databases for the analysis. It includes a description of each variable and how I generate it. Besides that, the quantitative descriptive statistics and graphs are included.

The Wharton Research Data Website (Wha, 1993) was used to manually gather from the BoardEx database, which includes detailed information on individuals serving in the board of firms in the United States as well as companies themselves. The data has been extracted and compiled from four data sets: Company Profile Details, Organization Summary- Analytics, Individual Profile Details and Board and Director Committee. The Company Profile Details data set includes data on the Headquarters address, Sector of the company, Organisation type and Number of Employees. The Organization Summary-Analytics dataset includes data on whether the board position is Executive or Supervisory, Time to Retirement, Time on the Board, Time in Company, Annual Report Date, the Gender-Ratio, Nationality Mix, Board Size and Network Size of the individual. The Individual Profile Details data set includes data on the Age, Gender and Nationality of the directors. Finally, the Board and Director Committee data data set includes data on the Board Position.

The preliminary data analysis resulted in two separate data sets: (1) Panel data on the Board over the years 2017-2021 and (2) Panel data on individuals over the years 2017-2021.

## 3.1 Board Data for Difference-in-Difference Analysis

For the Board Data, the company and organization summary data sets were merged on board ID. To obtain only companies headquartered in California, the company headquarters address was extracted from the company profile details dataset. Missing values for *Mean Age, Nationality Mix* and *Number of Employees* were replaced with the mean values. While companies with missing values in *Sector* were taken out from the analysis. This resulted in data on 407 quoted companies in California over the observed interval of 2017-2021. However, because of the time-frame, only 377 of these companies had data for the year 2020 and 135 for the year 2021. The year 2022 was not included in this analysis as there is only data on 3 companies.

Table 1 includes the quantitative descriptive statistics on this dataset and Table A1 in Appendix A, includes the correlation between all the variables.

### 3.1.1 Dependent Variables

To investigate the change in board structure, I look at various board composition variables: Gender Ratio, Number of Directors, Share Independent Directors, Nationality Mix, Mean Age and Network Size (Chen and Al-Najjar, 2012; Linck et al., 2008; Boone et al., 2007; Hermalin and Weisbach, 1988). These will act as dependent variables.

*Gender Ratio* is the ratio of men to women in the board of directors. It thus takes the value of 1 when the board is fully male, and the value of 0 if the board is fully female. In this analysis, the smallest Gender Ratio is 0.286, which belongs to the company Daré Bioscience, Inc., that is in the control group. Figure 3 in section 4 shows the trend of the gender ratio over the years. Both the treatment and control group show a decreasing trend in gender ratio. However, the treatment group has, on average, a higher gender ratio than the control group. For the treatment group, the gender ratio has decreased more on average ( from approximately 0.9 to 0.75) than for the control group ( from approximately 0.775 to 0.675).

*Number of Directors* represents the number of directors in the board of the company. In this sample, the board size varies from four to seventeen. Figure 3 in section 4 shows the Number of Directors trend over the years. For the treatment group, there is an increase in the number of directors over the years 2017-2019, which can be explained by companies deciding on expanding their board instead of replacing a male director. However, over the years 2019- 2021, there is a steady trend in the number of directors. Meaning that on average, boards did not expand further. Companies could have experienced a negative effect on company performance linked to the board expansion (Greene et al., 2020), and decided to not expand the board further. The control group shows largely an increasing trend. Besides that, over the years 2019-2020, the average number of directors slightly decreases.

*Share Independent Directors* is the proportion of the Independent Directors in the board. The board dataset was temporarily merged with the individual dataset. The *Independent* individual-level dummy variable (more on the variable explained in the individual data section) is represented on firm-level in this dataset. Thus, it represents the

share of individuals that have the word 'Independent' in their Role name. Looking at the mean, we see that most boards consist largely of independent directors.

*Nationality Mix* is the proportion of directors in the board that have a non-US nationality. In this sample, the cultural diversity is low. The highest cultural diversity is 0.8 and belongs to the company NETSOL Technologies, Inc.. Missing values on Nationality Mix, were replaced by the mean.

*Mean Age* is the mean age of the directors in the board. Such as, *Share Independent Directors*, this variable was obtained by merging with the individual dataset and transforming the variable from individual-level, to firm-level. Missing values on an individuals age were replaced by the mean age.

*Network Size* is the number of people that have an overlapping employment, education, and others. This variable was created in the same manner as *Share Independent Directors* and *Mean Age*.

### 3.1.2 Treatment Variables

For this analysis, I am studying the effect of the two stages of the reform separately. Coinciding with that, I have two treatment groups and two treatment variables, all of them are dummy variables. *Treatment Group 1* is equal to 1 when the company belongs to the first treatment group. Meaning, the company had gender ratio 1 in 2017. 118 companies belong to the first treatment group, while 289 belong to the control group. *Treatment Group 1 * Post 2019* is an interaction term between *Treatment Group 1* and the post-2019 years (including 2019). Similarly, *Treatment Group 2* is equal to 1 when the company is in the second treatment group. Unlike the first treatment group, this treatment group was not generated based on gender ratio, but based on number of women in the board. The company belongs in the second treatment group if it did not meet the following criteria: at least two female directors when the board size equals five, or at least three female directors when the board size is six or larger. Because of how the variable was generated, it is less reliable than *Treatment Group 1* as it may be that BoardEx did not have data on all of the directors in the board. 169 companies belong to the second treatment group, while 238 belong to the control group. *Treatment Group 2 * Post 2021* is the interaction term between *Treatment Group 2* and the year 2021.

### 3.1.3 Control Variables

Following Yang et al. (2019) and Matsa and Miller (2013), I don't add any control variables besides, sector and company fixed effects. Additionally, since I am working with panel data, year fixed effects are added. To account for the sector fixed effects, I create the categorical variable *Sector* which merged 51 different sectors into five groups: (1) Goods & Services, (2) Finance, (3) Other, (4)Compliance, and (5) Industrial. The division of sectors in groups can be found in the Appendix A, Table A2. This variable is meant to account for the difference in board structure between different sectors. Besides that, with company fixed effects, I account for the differences between the 407 companies in my sample. Year fixed effects are also added into the regression as a categorical variable.

## 3.2 Individual Data for Linear Probability Model

For the individual data, the organization summary-analytics dataset, the individual profile dataset and the board and director committee dataset were merged on director ID. For this analysis, only supervisory board positions were selected. For directors that serve on multiple boards, only one position is included in this research to prevent repeated values in the panel data. This resulted in data on 2,436 individuals in 2017, 2,484 in 2018, 2,601 in 2019, 2,452 in 2020 and 918 in 2021. Unlike for the board data, the same individuals were not followed over the years 2017-2021 as some directors ended their function and some began their function in this time period. For this analysis, it is crucial to include the newly hired individuals which would have been impossible when only researching directors that worked over this whole time-frame.

Table 1 shows the descriptive statistics on this dataset and Table A3 in Appendix A, includes the correlations between the dependent variable, gender, the independent variable, and all the explanatory variables.

### 3.2.1 Dependent Variable

The dependent variable is *Gender*, which is a dummy variable that takes the value of 1 when the individual is a female and 0 when the individual is a male. More specifically for the LPM, the dependent variable represents the likelihood of the individual being a female given the independent variables. In this sample, 22.90% is female and 77.10% is

Table 1: Summary Statistics

| **Variable** | **Number of Observations** | **Mean** | **Standard Deviation** | **Minimum** | **Maximum** |
|---|---|---|---|---|---|
| PANEL A: Board Data | | | | | |
| Treatment Group 1 *Post 2019 | 1,733 | 0.153 | 0.361 | 0.000 | 1.000 |
| Treatment Group 1 | 1,733 | 0.290 | 0.454 | 0.000 | 1.000 |
| Treatment Group 2 *Post 2021 | 1,733 | 0.031 | 0.172 | 0.000 | 1.000 |
| Treatment Group 2 | 1,733 | 0.412 | 0.492 | 0.000 | 1.000 |
| Gender Ratio | 1,733 | 0.808 | 0.123 | 0.286 | 1.000 |
| Number of Directors | 1,733 | 8.023 | 2.061 | 4.000 | 17.000 |
| Share Independent Directors | 1,733 | 0.963 | 0.082 | 0.273 | 1.000 |
| Nationality Mix | 1,733 | 0.125 | 0.188 | 0.000 | 0.800 |
| Mean Age | 1,733 | 62.989 | 5.394 | 40.000 | 78.000 |
| Network Size | 1,733 | 1992.110 | 1221.510 | 57.143 | 8604.462 |
| Number of Employees | 1,733 | 7365.018 | 23758.540 | 1.000 | 284000.000 |
| Sector | 1,733 | 3.037 | 1.107 | 1.000 | 5.000 |
| PANEL B: Individual Data | | | | | |
| Treatment Group *Post 2021 | 10,891 | 0.127 | 0.333 | 0.000 | 1.000 |
| Treatment Group | 10,891 | 0.233 | 0.422 | 0.000 | 1.000 |
| Role | 10,891 | 4.689 | 1.033 | 1.000 | 5.000 |
| Gender | 10,891 | 0.230 | 0.421 | 0.000 | 1.000 |
| Age | 10,891 | 62.794 | 9.423 | 30.000 | 97.000 |
| Nationality | 10,891 | 0.391 | 0.488 | 0.000 | 1.000 |
| Time on Board | 10,891 | 6.906 | 6.319 | 0.000 | 55.400 |
| Time in Company | 10,891 | 7.023 | 6.525 | 0.000 | 55.400 |
| Time to Retirement | 10,891 | 6.750 | 9.518 | -27.000 | 39.500 |
| Independent | 10,891 | 0.960 | 0.197 | 0.000 | 1.000 |
| Multiple Positions | 10,891 | 0.005 | 0.069 | 0.000 | 1.000 |

Note: Table contains the Summary Statistics of the variables. Column(1) shows the number of observations. Column(2) shows the average characteristics. Column(3,4,5) report the Standard Deviation, Minimum and Maximum value, respectively.

male. The proportion of females has grown from 17.59% in 2017 to 34.10% in 2021.

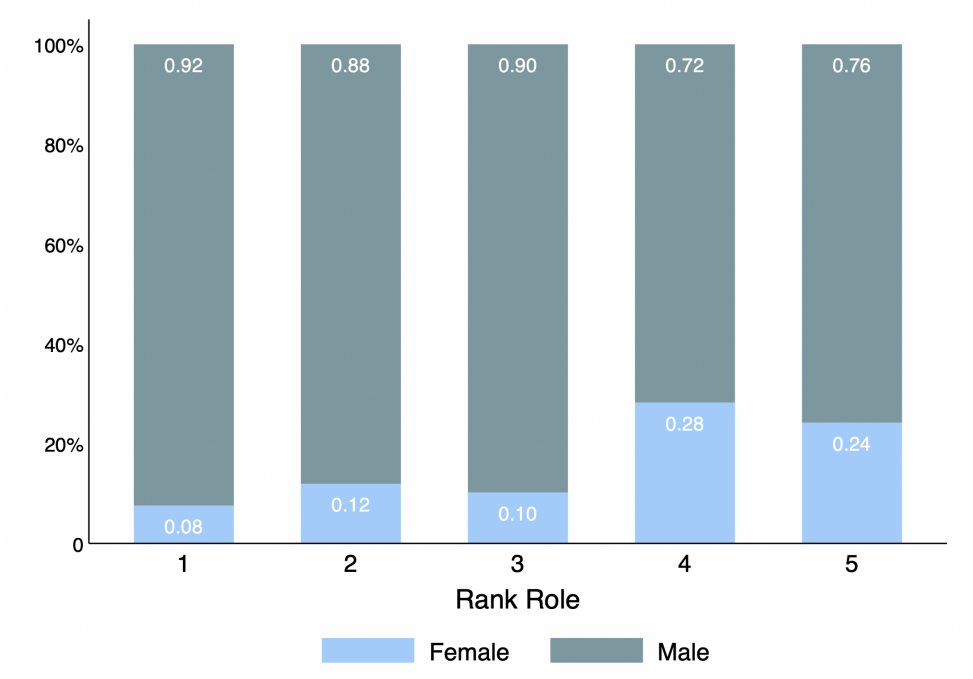


Figure 1: Proportion of males and females in each position

### 3.2.2 Independent Variable

The independent variable is *Role*. 931 unique role names were dissected and segregated into the categorical variable *Role*, with groups: (1)President/ Chair(wo)man, (2)Vice-President/ Vice Chair (wo)man, (3)CEO, COO and CFO, (4)Secretary and Treasurer, and (5)Other management positions. Figure 1 shows the proportion of females and males in each of these positions. In general, there are significantly more males in all of these positions. The highest proportion of women can be found in group 5, Secretary and Treasurer which corresponds to 0.28 percentage points. While the smallest proportion of women can be found in category 1, president of the board. Only 8% of all the presidents of the board in this sample, are women.

### 3.2.3 Control Variables

I control for the treatment as well as numerous individual-descriptive variables: Age, Nationality, Time on Board, Time in Company, Time to Retirement, Independent and Multiple Positions.

For this analysis, I study the reform as a whole. Therefore, there is only one treatment group. *Treatment Group* is a dummy variable that is equal to 1 when the director is in the board of a firm that belongs to the first treatment group of the previous analysis. Once

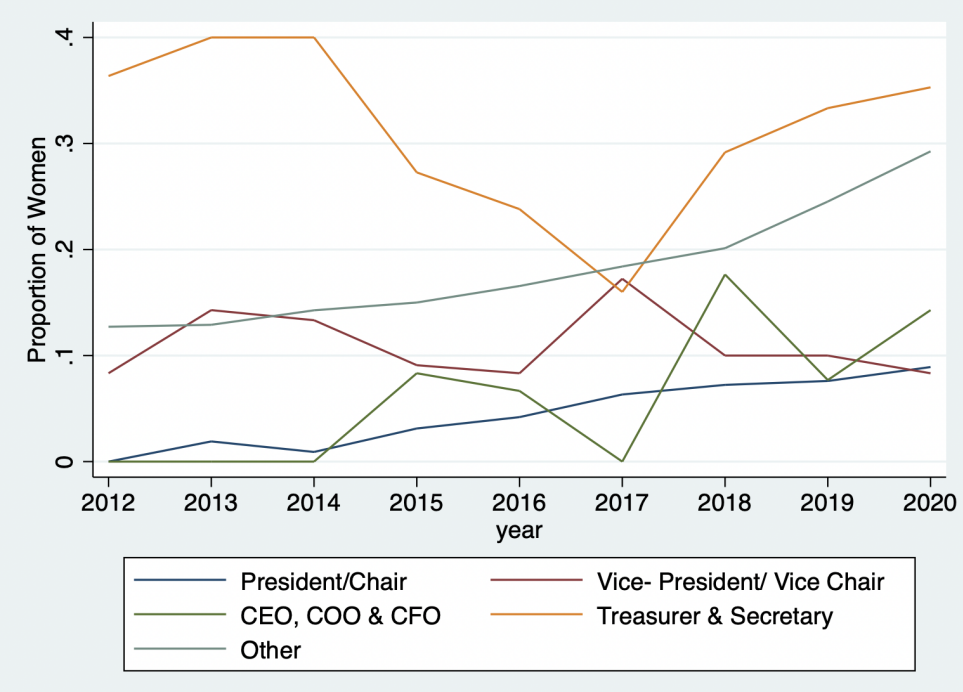


Figure 2: Proportion of Women in management positions over the years 2012-2020.

again, these firms had a gender ratio of 1 before the reform in 2017. *Treatment Group*Post 2021* is the interaction term between *Treatment Group* and the year 2021. Figure 2 shows the proportion of women in management positions over the years 2012-2020. The year 2021 was excluded from this graph to create a more accurate representation of the trend, as the sample size for role group 2,3 and 4 is too small or even non existing[3].

*Age* is the age of the director and was generated by subtracting the date of birth from the year. The variable *Nationality* was re-coded into a dummy variable: 1 if the director is from the U.S., 0 if the director is a foreigner. *Time on Board* shows how many years the individual has served on the board. *Time in Company* shows how many years the individual has worked in that company.

*Time to Retirement* shows how many years the individual has until he/she reaches the minimum retirement age, 70 years old. Negative numbers indicate how many years the individual could have stopped working already. *For example: the 97 year old individual has Time to Retirement -27 as he could have retired 27 years ago, at the age of 70.* Missing values for time to retirement were manually calculated by subtracting the age from the minimum retirement age

Such as briefly previously mentioned, the dummy variable *Independent* was created

[3]For 2021, there are only 9 observations for rank role 2, 0 observations for 3 and 1 observation for 4.

such that it takes the value 1 when the director has the word 'Independent' in his/her Role name. *For example: Independent Director.*

Similarly, the dummy variable *Multiple Positions* was created such that it takes the value of 1 when the director has multiple roles. *For example: President and Treasurer.* In case the director has multiple positions, he/she will count towards the higher ranked one. In the case of the example, the director will have *Role=1* as President (1) is ranked higher than Treasurer (4).

# 4 Methodology

In this section, I explain the methodology. For my twofold research, I have two separate methodologies. The change in board structure will be estimated by difference-in-difference analysis (DiD), while the likelihood of a female taking on an inferior role in the board is estimated by a linear probability model (LPM).

## 4.1 Difference-in-Difference Analysis

Using DiD, I look at the effect of the introduction of the SB 826 on board structure in Californian publicly listed corporations. I do this by looking at the change in board characteristics, such as: gender ratio, number of directors, share of independent directors, nationality mix, mean age, and network size. The SB 826 consists of two stages, therefore, I will construct two separate estimates for each variable of interest. Firms that belong to the treatment group do not meet the criteria of the SB 826 [4]. Firms that already met the criteria and are thus not affected by that stage of the policy, belong to the control group. By taking this approach, a control group could be formed with the same geographical location, unlike in other papers (Yang et al., 2019; Matsa and Miller, 2013). This is beneficial as it minimizes the difference between the treatment and control group.

DiD is suitable for this research as considers both the initial differences between treatment group and control group, as well as time-varying unobserved characteristics that affect both groups equally. By taking account the intial differences, it removes the problems that arise with selection bias. The treatment is determined at aggregate level, we thus know why some firms belong to the treatment group and some to the control group. Unlike with individual fixed effects where we are unsure where the variation comes from. DiD creates a counterfactual that is suitable for causal inferences, which the research on board gender quota is lacking. The counterfactual, is estimated by applying the trend that occurred to the control group, on the treatment group at t=0. After that, the Average Treatment Effect of the Treated (ATT) is estimated by taking the difference between the counterfactual and the treated after the intervention (time t=1). DiD, also

[4](1) Californian corporations need to have at least one female board member by 2019, (2)Californian corporations need to have at least two or three female board members when the board has five or more than five board members, respectively. More on the specifications of treatment and control group can be found in section 3.

known as double difference, first takes the difference between treatment and control group, and then the difference between the two time periods. The following formula represents the ATT (E[Y(0)—T=1, t=1) estimation:

$$\begin{aligned} \text{ATT} = E[Y(1)|T=1,t=1] - E[Y(0)|T=1,t=0] \\ - (E[Y(0)|T=0,t=1] - E[Y(0)|T=0,t=0]) \end{aligned} \tag{1}$$

Thus any initial differences between treatment and control group that would be there without the treatment, are taken into account in the ATT.

DiD relaxes certain assumptions, such as: with-without, by taking into account the initial difference between treatment and control group, as well as before-after, by accounting for the differences that happen over time that are not related to the policy intervention. However, the only assumption we make with DiD is that the initial differences between the treatment and control group stay the same over time. This assumption is called the Parallel Trends Assumption (PTA). The PTA holds when the treatment and control group outcomes would have been the same in absence of treatment. Thus, DiD cannot deal with time-varying differences between treatment and control group.

To test the PTA for each board characteristic variable, I compare the trend of the control and the treatment group from the year 2012 until 2018 (vertical line), which can be seen in Figure 3. The trend for treatment and control group runs parallel for gender ratio, number of directors and network size. However, the trend for treatment and control group does not run parallel for share of independent directors. In fact, the groups experience opposite spikes. The trend for both groups for mean age also does not run parallel as the mean age for the control group first increases and then decreases. While the mean age for the treatment first decreases and then steadily increases over the years. The trends for nationality mix run parallel from the year 2013 on. The two groups also experience similar fluctuations. Hence, the PTA holds for gender ratio, number of directors, nationality mix and network size. But does not hold for share of independent directors and mean age. Thus, the latter two do not satisfy the assumption for DiD.

The effect of the policy can be captured by the following regression on the treatment group with data from post 2019 or 2021 being the post-treatment periods, representing the first and second stage of the policy, respectively. Sector, firm and year fixed effects

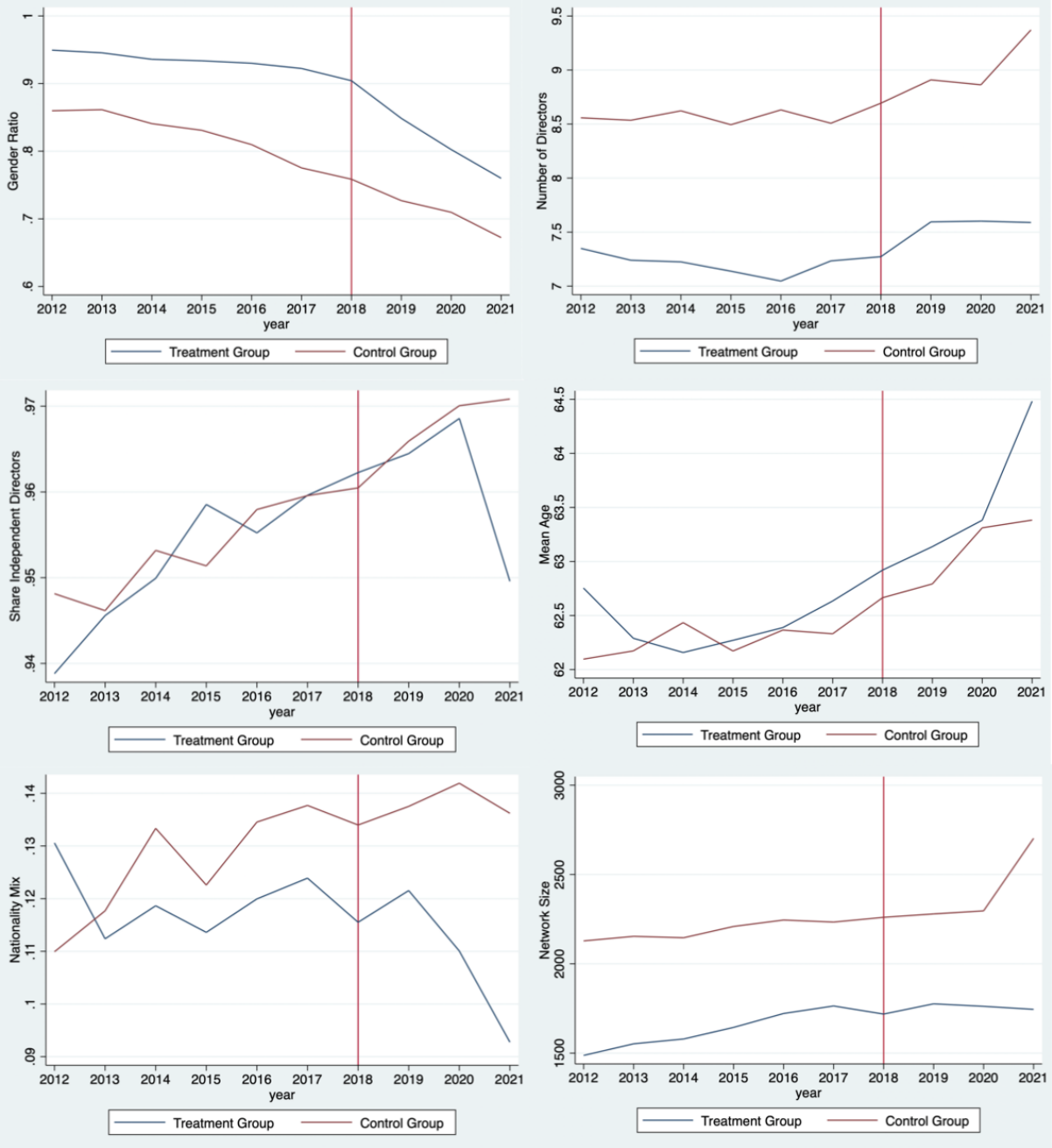


Figure 3: Parallel Trends Assumption of all the dependent variables, for control-and treatment group in California for the years 2012-2021.

are added as control variables:

$$\mathrm{Y}_{fst} = \beta_0 + \beta_1 \mathrm{T} * \mathrm{t} + \beta_2 \mathrm{T} + \delta_f + \delta_s + \delta_t + \epsilon_{fst} \tag{2}$$

$$\mathrm{Y}_{fst} = \beta_0 + \beta_1 \mathrm{TreatmentGroup} * \mathrm{PostReformYears} + \beta_2 \mathrm{TreatmentGroup} + \delta_f + \delta_s + \delta_t + \epsilon_{fst} \tag{3}$$

$\mathrm{Y}_{fst}$ denotes the various dependent variables, Gender Ratio, Number of Directors, Share of Independent Directors, Mean Age, Network Size and Nationality Mix, of firm f

in sector s at time t. $\beta_0$ is the constant. The dependent variable is driven by the treatment effect $\beta_1 \text{TreatmentGroup} * \text{PostReformYears}$ which is an interaction term. The variable treatment takes the value of 1 when the firm belongs to the treatment group and when the year is post reform. Besides that, I also include the firm, sector and time fixed effects which are held constant. Sector fixed effects, $\delta_s$, are included by adding each level from the categorical variable *Sector* in the regression. More on the categorical variable can be found in Table A2, Appendix A. Firm fixed effects, $\delta_f$, were also added by treating the board ID variable as a categorical variable and accounting for each level of it. Finally, year fixed effects, $\delta_t$, were included. The standard errors are computed with the standard error clustered on firm level, as firm-level data allows for arbitrarily correlated data within the clusters.

## 4.2 Linear Probability Model

Using LPM, I look at the likelihood of the director being a female, given the position of the director within the board over the time period 2017-2021. The results of the regression are estimated by the following conditional probability model:

$$\text{E}[\text{Y}|\text{X}_\text{i}] = P(Y = 1|X_i) = \beta_0 + \beta_1 \text{X}_\text{i} + \delta_t + \upsilon_i \tag{4}$$

$$\text{P}(\text{Y} = 1|\text{X}_\text{i}) = \beta_0 + \beta_1 \text{BoardPosition} + \delta_t + \upsilon_i \tag{5}$$

The dependent variable, Y, is the likelihood of the director being a female, considering the position of the director within the board, the main explanatory variable. P is the probability of $\text{Y} = 1$ happening. Board Position, the independent variable, is a categorical variable with rank (1-5), previously explained in section 3. Year fixed effects, $\delta_t$, are also accounted for in the regression. Finally, the error term $\upsilon_i$. The standard errors are computed with the standard error clustered on individual level.

The full equation with all control variables is:

$$\begin{aligned}\text{P}(\text{Y} = 1|\text{X}) = &\beta_0 + \beta_1 \text{BoardPosition} + \beta_2 \text{TreatmentGroup} * \text{Post2021} + \beta_3 \text{Age} + \beta_4 \text{Nationality} \\ &+ \beta_5 \text{TimeOnBoard} + \beta_6 \text{TimeInCompany} + \beta_7 \text{TimeToRetirement} \\ &+ \beta_8 \text{MultiplePositionsDummy} + \beta_9 \text{IndependentDummy} + \delta_t + \upsilon\end{aligned} \tag{6}$$

# 5 Results

In this section, I show the results of my twofold research by showing the regression coefficients as well as explaining the interpretation.

## 5.1 Board Structure

Firstly, I investigate the effect of the introduction of a gender board quota in California on various board characteristics, such as: gender ratio, number of directors, share of independent directors, mean age, nationality mix, and network size. The policy has two stages: (1) all publicly listed corporations in California had to have at least one female board member by the end of 2019, (2) all publicly listed corporations in California had to have at least two or three female board members when the number of directors is five, or more than five, respectively. Therefore, I study the stages separately. The control groups consist out of companies that that meet the above mentioned criteria, while the treatment groups consist out of companies that don't meet the criteria and thus have to hire additional female directors. Because of the nature of the policy, firms can choose to expand their board and thus hire additional female board members, or replace current male board members.

Table 2 shows the DiD regression results of the first stage of the policy. The results of the treatment can be interpreted as follows.

After 2019, the gender ratio for the treatment group decreased by 0.087 percentage points. This result is significant and means that the policy did what it intended to do. There is thus, on average, a larger share of women in the boards of Californian publicly listed companies. I hereby accept my first hypothesis that the Californian board gender quota increases the share of women.

Besides that, the number of directors increased, on average, by 0.291 percentage points for the treatment group such as in Yang et al. (2019), Matsa and Miller (2013) and Greene et al. (2020). Note that this result is less significant than for gender ratio, but still significant at 5% significance level. This means that the policy has, on average, increased the board size of Californian corporations after 2019. Some firms have thus chosen to expand the board over replacing a male director. Unfortunately, no significant results were obtained for share of independent directors. Therefore, I accept my second

hypothesis partially. On the basis of my results, the Californian board gender quota has increased the number of directors in the board. However, unlike in Boone et al. (2007), there no ground to accept the rest of the hypothesis, that the share of independent directors in the board increases, on the basis of these results.

Finally, my results indicate no significant change in mean age, nationality mix, or network size. Hereby, my third hypothesis is accepted as there are, as predicted, no significant changes in mean age, nationality mix or network size.

Table 2 shows the DiD regression results of the second stage of the policy. The results of the treatment can be interpreted as follows.

Table 2: Effect of the Board Gender Quota on Board Structure per reform

| **Dependent Variable** | **Gender Ratio** | **Number of Directors** | **Share Independent Directors** | **Mean Age** | **Nationality Mix** | **Network Size** |
|---|---|---|---|---|---|---|
| PANEL A: First Reform | | | | | | |
| Treatment 1 * Post 2019 | -0.087*** | 0.291** | -0.010 | -0.393 | -0.016 | 9.579 |
| | [0.009] | [0.126] | [0.006] | [0.371] | [0.015] | [60.716] |
| Treatment Group 1 | 0.246*** | -3.646*** | 0.074*** | -4.845*** | 0.008 | 2926.461*** |
| | [0.005] | [0.063] | [0.003] | [0.186] | [0.007] | [30.358] |
| R-squared | 0.8412 | 0.8881 | 0.8296 | 0.8876 | 0.8620 | 0.9347 |
| PANEL B: Second Reform | | | | | | |
| Treatment 1 * Post 2021 | -0.016 | 0.050 | -0.007 | 0.402 | 0.014 | 32.183 |
| | [0.016] | [0.184] | [0.011] | [0.575] | [0.016] | [97.191] |
| Treatment Group 2 | -0.202*** | 3.500*** | -0.069*** | 5.042*** | 0.000 | -2931.250*** |
| | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] | [0.000] |
| R-squared | 0.8161 | 0.8871 | 0.8290 | 0.8874 | 0.8617 | 0.9347 |

Note: The table shows the results of a DiD regression of 407 distinct companies and 1,733 observations. The dependent variables are board structure characteristics. The regressions were ran on the Treatment variables with years 2019- 2021 and 2019 respectively, being in the post-treatment periods. Treatment group is a dummy variable that includes all of the firms that are in the treatment group. Firm, Sector and Year Fixed Effects are included in all regressions. Standard errors are reported in parentheses below the coefficient and are clustered on firm level. Firm and sector, as well as year fixed effects are included in all regressions. The stars indicate the statistical significance, where *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Unfortunately, no significant results were obtained in my research. Therefore, no conclusions can be made about the effect of the second stage of the policy. The lack of significant results could be explained by the fact that the sample of companies has decreased over the years, having data on only 135 firms in 2021. As well as, the less reliable classification of companies to the control or treatment group. This could have resulted in companies that should have belonged to the control group, to find themselves in the treatment group. For the second stage of the policy, I only accept my third hypothesis, no significant change on mean age, nationality mix, and network size.

## 5.2 Female Leadership

Further, I research how likely females are to acquire certain positions within the board of directors, given the position, and the control variables. Board position is a categorical variable with the following categories: (1)President/ Chair(wo)man, (2)Vice- President/ Vice Chair (wo)man, (3)CEO, COO and CFO, (4)Secretary and Treasurer, and (5)Other management positions. For my research, group 5 is considered an inferior position (Hofstrand and Anders, 2009).

Table 3 shows the results of the LPM. The dependent variable is the likelihood of the director being a female given the board position. In Model 2, control variables are added: age, nationality, time on board, time in company, time to retirement, independent and multiple positions. These variables were added to prevent OVB.

Since the categorical variable, board position, cannot take on the value 0, the constant terms do not have a correct interpretation.

In Model 1, the category treasurer  secretary, and other, have significant results that can be interpreted as follows: compared to president, when a director is a treasurer or secretary, the director is 0.223 percentage points more likely to be female. Note that this result is only significant at a 5% significance level. Similarly, a director belonging to the 'other' category (compared to President), that in this research is an inferior category, the director is 0.167 percentage points more likely to be female.

In Model 2, the interpretations are the same as in the previous model, namely: (1) in comparison to a president, when a director has the position of treasurer or secretary, the director is 0.171 percentage points more likely to be female (however this result is less significant after adding control variables), (2) in comparison to president, when a director has a position that belongs to 'other', the director is 0.112 percentage points more likely to be female. Adding the control variables has decreased the magnitude of the coefficient. The treatment variable has a negative influence on the gender. Besides that, nationality has a small positive (0.035) influence on gender, and age has a small negative (0.011) influence on gender. Time on board, time in company, time to retirement and the independent dummy have a negative effect on gender, however the coefficient is not significant at a 5% significance level. Multiple Positions dummy has a positive but insignificant effect on gender.

Based on the above mentioned results, I accept my fourth hypothesis that female

Table 3: Linear Probability Model

| **Dependent Variable** | **Gender** | |
|---|---|---|
| | Model 1 | Model 2 |
| -Vice- President/ Chair | 0.044 | 0.042 |
| | [0.048] | [0.050] |
| -CEO, COO and CFO | 0.046 | -0.004 |
| | [0.054] | [0.057] |
| -Treasurer & Secretary | 0.223** | 0.171** |
| | [0.086] | [0.082] |
| -Other | 0.167*** | 0.112*** |
| | [0.019] | [0.020] |
| Treatment Group * Post 2021 | | -0.138*** |
| | | [0.016] |
| Age | | -0.011* |
| | | [0.007] |
| Nationality | | 0.035** |
| | | [0.016] |
| Time on Board | | -0.003 |
| | | [0.004] |
| Time in Company | | -0.006 |
| | | [0.004] |
| Time to Retirement | | -0.005 |
| | | [0.007] |
| Independent | | -0.031 |
| | | [0.040] |
| Multiple Positions | | 0.161 |
| | | [0.105] |
| Constant | 0.020 | 0.879** |
| | [0.018] | [0.443] |
| R-squared | 0.0251 | 0.0865 |

Note: The table shows the results of a LPM with the likelihood of a female acquiring a certain position within the board, given that position. There are 3,431 distinct individuals and 10,891 observations. Gender, the independent variable, takes the value of 1 when female, and 0 when male. Board Position, the independent variable, is a categorical variable with President as reference category. Age, time on board, time in company and time to retirement are numerical variable. Nationality,Independent and Multiple Positions are dummy variables with; 1 if the individual is a U.S. National; 1 if the individual is an independent director; 1 if the individual holds multiple positions within the board; respectively. Standard errors are reported in parentheses right of the coefficient and are clustered on individual level. Year fixed effects are included in all the regressions. The stars indicate the statistical significance, where *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

directors are more likely to have an inferior position within the board.

# 6 Conclusion

In this section, I will summarize the main results, discuss the limitations and critique of my research, and give ideas for future research.

In this paper, I first investigate using DiD, the effect of the Californian board gender quota ( Senate Bill No. 826) on board structure characteristics, such as: gender ratio, board size, share of independent directors, mean age, network size and nationality mix, of publicly listed corporations of California. My results show that the first stage of the policy, on average, increases the share of women in the board as well as the number of directors in the board. The latter result indicates that firms prefer to hire an additional female board member, instead of replacing a male board member. Besides that, I find no significant change in share of independent directors, mean age, network size, and nationality mix.

Further, I investigate using LPM, the likelihood of a female being appointed to various board positions, given the position of the director. I find that when a director holds the a position of treasurer/ secretary (role category 4) or other (role category 5), in comparison to president, the board member is more likely to be female.

Even though according to my results it may seem that firms are indeed trying to run away from affirmative action by expanding the board size, keeping the female proportion as low as possible, as well as appointing females to inferior positions within the board. Further research is strongly encourages to make this claim because of my limitations.

The first limitation of my research is the low external validity. Since California is the only state in the U.S. with a board gender quota and European countries use a differently structured reforms, my obtained results are only valid for the publicly listed corporations with headquarters in California, and cannot be generalized to the rest of the world and/or reforms.

Limitations regarding the classification of treatment and control groups in the DiD analysis are as follows. The second treatment group variable is not reliable as it was created by the number of females in the board, the total number of directors, and cross-referencing it against the second criteria. However, it is possible that the dataset did not include all of the directors in the board. Possibly over-or understating the number of females in the board. Because of this missing data problem, firms could have been misclassified to treatment or control group, resulting in insignificant results.

The insignificant results could have also been caused by the the smaller sample size in later years. Since the reform is so recent, there is less data on the last two years. Similarly, the effect of the first stage may be overstated as firms could have hired more female board members earlier on in preparation for the second stage. Another problem related to this is that the control group is also in the state of California. Therefore, even though the firms belong to the control group, they are already treated by knowing about the upcoming change in the policy. Therefore, the firms in the first control group may have made some changes beforehand in anticipation of the second stage of the reform. An analysis using the nearest neighbor that is not affected by the gender quota at all, as control group, may provide a better counterfactual. Therefore, I encourage to further research on the reform as well as use a different control group.

Further, the PTA assumption does not hold for independent directors as well as mean age. However, since no significant results were achieved, this does not pose a big problem.

Another critique can be found in the LPM, namely: there may be OVB. Variables that influence both gender and board positions, that were not in the database, could have been omitted, causing a correlation with the error term.

Finally, there are many papers researching the appointment of a female CEO. However, to as far as my knowledge goes, this was the first paper to research the likelihood of female being appointed to various positions, not only CEO. Therefore, more research is necessary on the topic of gender distribution within the board.

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# A Appendix

Table A1: Correlation Matrix Board Dataset

| Variable | Treatment Group 1 x Post 2019 | Treatment Group 1 | Treatment Group 2 x Post 2021 | Treatment Group 2 | Gender Ratio | Number of Directors | Share Independent | Nationality Mix | Mean Age | Network Size | Number of Employees | Sector |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Treatment Group 1 x Post 2019** | 1.000 | | | | | | | | | | | |
| **Treatment Group 1** | 0.667 | 1.000 | | | | | | | | | | |
| **Treatment Group 2 x Post 2021** | 0.073 | 0.005 | 1.000 | | | | | | | | | |
| **Treatment Group 2** | 0.040 | 0.070 | 0.212 | 1.000 | | | | | | | | |
| **Gender Ratio** | 0.130 | 0.535 | -0.111 | 0.194 | 1.000 | | | | | | | |
| **Number of Directors** | -0.217 | -0.398 | -0.009 | -0.105 | -0.263 | 1.000 | | | | | | |
| **Share Independent** | 0.021 | 0.031 | -0.045 | -0.038 | -0.072 | -0.144 | 1.000 | | | | | |
| **Nationality Mix** | -0.084 | -0.103 | -0.027 | -0.011 | -0.052 | 0.146 | -0.059 | 1.000 | | | | |
| **Mean Age** | 0.050 | 0.051 | 0.047 | 0.001 | 0.087 | -0.001 | 0.068 | 0.010 | 1.000 | | | |
| **Network Size** | -0.147 | -0.231 | -0.022 | -0.092 | -0.266 | 0.305 | -0.026 | 0.169 | -0.183 | 1.000 | | |
| **Number of Employees** | -0.104 | -0.158 | -0.026 | -0.155 | -0.172 | 0.281 | -0.113 | 0.027 | 0.014 | 0.370 | 1.000 | |
| **Sector** | -0.006 | -0.008 | 0.021 | 0.035 | 0.028 | -0.049 | 0.045 | -0.011 | 0.035 | 0.024 | -0.023 | 1.000 |

Note: Table contains the correlation between the dependent variables that are measure of board composition, and sector.

Table A2: Sectors

| **1- Goods & Services** | **2- Finance** | **3- Other** | **4- Compliance** | **5- Industrial** |
|---|---|---|---|---|
| Food & Drug Retailers | Banks | Utilities - Other | Insurance | Electronic & Electrical Equipment |
| Beverages | Speciality & Other Finance | Education | Legal | Oil & Gas |
| Food Producers & Processors | Business Services | Real Estate | Life Assurance | Engineering & Machinery |
| Tobacco | Private Equity | Publishing | Think Tank | Mining |
| Wholesale Trade | Investment Companies | Leisure & Hotels | Government | Transport |
| Leisure Goods | Sovereign Wealth Fund | Media & Entertainment | Regulators | Chemicals |
| Consumer Services | Blank Check / Shell Companies | Pharmaceuticals and Biotechnology | | Construction & Building Materials |
| Clothing & Personal Products | Trade Association | Health | | Electricity |
| General Retailers | | Software & Computer Services | | Automobiles & Parts |
| Leisure Goods | | Information Technology Hardware | | Renewable Energy |
| Household Products | | Aerospace & Defence | | Steel & Other Metals |
| Telecommunication Services | | | | Diversified Industrials |
| | | | | Containers & Packaging |

Table A3: Correlation Matrix Individual Dataset

| Variable | Treatment Group x Post 2021 | Treatment Group | Role | Gender | Age | Nationality | Time on Board | Time in Company | Time to Retirement | Independent | Multiple Positions |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Treatment Group x Post 2021** | 1.000 | | | | | | | | | | |
| **Treatment Group** | 0.693 | 1.000 | | | | | | | | | |
| **Role** | -0.008 | -0.016 | 1.000 | | | | | | | | |
| **Gender** | -0.066 | -0.180 | 0.102 | 1.000 | | | | | | | |
| **Age** | 0.026 | 0.026 | -0.111 | -0.193 | 1.000 | | | | | | |
| **Nationality** | -0.063 | -0.079 | -0.048 | -0.013 | 0.206 | 1.000 | | | | | |
| **Time on Board** | -0.018 | -0.043 | -0.147 | -0.182 | 0.420 | 0.156 | 1.000 | | | | |
| **Time in Company** | -0.019 | -0.046 | -0.163 | -0.186 | 0.424 | 0.166 | 0.984 | 1.000 | | | |
| **Time to Retirement** | -0.024 | -0.024 | 0.112 | 0.190 | -0.991 | -0.194 | -0.422 | -0.412 | 1.000 | | |
| **Independent** | 0.029 | 0.025 | 0.099 | -0.001 | 0.005 | 0.033 | -0.094 | -0.108 | 0.043 | 1.000 | |
| **Multiple Positions** | -0.011 | -0.023 | -0.085 | 0.019 | 0.030 | -0.001 | 0.048 | 0.057 | -0.030 | -0.087 | 1.000 |

Note: Table contains the correlation between the dependent variable, gender, the independent variable, role, and other explanatory variables.