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The effect of female directors on CEO power: The impact of a female friendly environment in the upper echelons of a firm

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Abstract

This thesis aims to analyze the effect of gender diversity in the boardroom on CEO power. In addition, this thesis also aims to analyze the impact of a female friendly environment in the upper echelons of a firm, on the relationship between female directors and CEO power. Data of firms from the S&P 1500 is used from 2007 to 2017. I find a no significant relationship between the proportion of female directors and CEO power. However, I do find a critical mass of one female director, in order to positively influence CEO power. My results may suggest that, at the board level, the power imbalances between men and women in the boardroom reduce the monitoring effect of female board members. In contrast, on committee level, I do find a negative relationship between the proportion of female directors on the compensation committee and CEO power. In addition, I find that two female directors on the compensation committee, is the critical mass required in order to negatively influence CEO power. This results may suggest that female directors strengthen the monitoring effect of the compensation committee, thereby reducing CEO power. Lastly, I find no evidence that a female friendly environment in the upper echelons of a firm strengthens the relationship between female directors and CEO power.

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1. Introduction

For decades, more men than women can be found at the top of corporate business life. However, gender diversity in business has received increasing attention and advocacy in the last decade. In correspondence to this development, an increase in the percentage of women in the top of businesses can be found over the last few years. The 2020 Gender Diversity Index (2020) shows that boards of the companies in the Russell 3000 consist of 22.6% out of women, whereas in 2019 this was equal to 20.4% and in 2017 equal to 16.0%. Although these numbers display a strong increase, several studies have shown that the number of successful women in business is still too low (Coury et al., 2020; Inside Higher Ed, 2020). For example, when looking at the top executives of these Russell 3000 companies, the percentage of women is only 9% (Papadopoulos, n.d.).

The lack of gender diversity within boards and the top of bussiness is a longstanding problem that has not yet been solved. From different perspectives it is advocated that more women should be on boards, in order to create a more gender diverse environment at the top of business. For example, recently, a law was passed that sets a quota for the number of women on boards of German companies. It states that boards should include at least one woman, when they consist of more than three members (Deutsche Welle, 2021)

With gender diversity at top of business being more relevant than ever before, and the increasing level of women on boards over the past decades, it is of particular interest to gather a greater understanding of the implications this has for firms on an economical level. My thesis answers the question: what the effect is of female directors on CEO power, and how is this impacted by the presence of a female friendly environment in the upper echelons of a firm? Consequently, it combines two topics studied in the literature. First, the effect of female directors on CEO power. Second, the effect of a firm's openness to gender diversity on the influence that female directors exert in board's decision making.

Usman, Zhang, Farooq, Makki & Dong (2018) shed the first light on the relationship between female directors and CEO power. In their study based on a sample of companies from the Chinese stock exchanges of Shanghai and Shenzhen, they find a positive relationship between a gender diverse board and CEO power. Their finding could be the result of a commonly occurring power imbalance between men and women on a board (Eagly and Carli, 2003; Usman, Zhang, Farooq et al., 2018). This is an interesting finding, because other studies on the effect of female directors on other firm economics suggest contrasting results. Namely, other studies suggest that the participation of women on a board increases the monitoring effect of a board, and would thereby acts as a governance mechanism, which could reduce managerial power (Adams and Ferreira, 2009; Post and Byron, 2015; Solakoglu and Demir, 2016). For example, Adams and Ferreira (2009) study the effect of gender diverse boards on the performance of a company. Although they did not find evidence of an effect of gender diverse boards on the performance of firms, they did find results indicating that a higher percentage of female directors could have a monitoring effect on the firm's governance, and thereby resulting in reduced managerial power.

To illuminate this uncharted area, my thesis extends the research of Usman, Zhang, Farooq et al. (2018) to firms in the United States, by examining if a similar positive relationship between female directors and CEO power can be found. Both in my thesis and the paper of Usman, Zhang, Farooq et al. (2018) a popular proxy for CEO power is used, namely the CEO pay slice from Bebchuk, Cremers, and Peyer (2011). The CEO pay slice is measured as the fraction of the total compensation of the top 5 executives which is captured by the CEO. As most decisions regarding executive compensations are not made at board level, but at compensation committee level instead (Kesner, 1988), I also examine the effect of female directors on the compensation committee on CEO power.

In addition, I examine whether these relationships are impacted, when the environment of the upper echelons of a firm is considered female friendly. In her paper, You (2019) finds that a firm's openness to gender diversity increases the influence of female directors on the appointment of a female CEO. Therefore, it is interesting to assess whether a firm's openness to gender diversity strengthens the effect of female directors on CEO power.

I find no significant relationship between the proportion of female directors and CEO power. However, I do find a critical mass of one female director required, in order to positively influence CEO power. My results may suggest that, at the board level, the power imbalances between men and women in the boardroom reduce the monitoring effect of female board members.

In contrast, on committee level, I find a negative relationship between the proportion of female directors on the compensation committee. In addition, I find that two female directors on the compensation committee is the required critical mass, in order to influence CEO power. These results suggest that the monitoring effect of female directors is stronger on committee level than on board level, with regard to CEO power. This discrepancy between the positive effect of at least one female director on the board on CEO power, and the negative relationship of at least two female directors on the compensation committee, may be explained by two phenomena. Firstly, the results may imply that the power imbalance between men and women becomes exaggerated in a larger group (Eagly and Carli, 2003). Secondly, the concept of female rivalry could weaken a female alliance within a larger group (Ely, 1994). Overall, these phenomena may explain the stronger monitoring effect of female directors on the 'smaller' compensation committee.

Moreover, I show no effect of a female friendly environment in the upper echelons of a firm on the relationship between female directors and CEO power. More specifically, when the connectedness of male directors to Female CEOs increases, or the gender gap in executive pay decreases, the effect of female directors on CEO power is not strengthened. Consequently, it is still unclear whether a firm's openness to gender diversity strengthens the monitoring effect of female directors on CEO power.

The contributions of this work are presented as follows: firstly, my thesis will be an addition to the increased attention and relevancy that the subject of gender diversity on boards has been given in the last decade. Secondly, it will contribute to the research of the effect of the openness to gender

diversity in the upper echelons on corporate governance. Finally, it will contribute to the existing literature regarding the determinants of CEO power.

This proposal is organized as follows. Section 2 describes the existing literature on the topic. Section 3 describes the main research question and the corresponding hypotheses. Section 4 describes the research methodology. Section 5 describes the data that is collected and the data sources. Section 6 describes the results. In Section 7, I perform robustness checks in order to address endogeneity issues. In Section 8, I compare my results to other studies. Finally, Section 9 presents my conclusion.

2. Literature

In order to answer my research question, I specifically investigate the underlying theory regarding the effect of female directors on CEO power. More particularly, there are two major concepts of importance that could influence CEO power through female directors, namely the monitoring effect and the power imbalance between men and women. On the one hand, more female directors may result in a greater monitoring effect by the board, thereby reducing CEO power. On the other hand, due to a power imbalance between men and women on the board, i.e., women's opinions are overruled by those of men, the monitoring effect of women may not be strong enough to reduce CEO power and can even have an opposite effect.

2.1. Monitoring Effect vs. Power Imbalance between Men and Women

The monitoring effect of female directors has been studied substantially. Extensive literature shows that a gender diverse board is positively associated with the monitoring effect of the board on the firm, as outlined below. As previously mentioned, due to the presence of women on boards, the dynamics within a board change. An example is the study of Adams and Ferreira (2009), which looks at the relation between gender diversity in boards and certain board characteristics, e.g., the attendance of members of the board at board meetings, and their relatively higher participation in monitoring committees. Their research concludes that besides the fact that female directors have a higher attendance rate of board meetings, they additionally also increase the presence of male members. Consequently, increasing the overall attendance at board meetings. In summary, these three factors increase the overall monitoring effect.

Other studies analyzing the monitoring effect of a gender diverse board, investigating other firm characteristics, show similar results when taking into account different factors, such as, earnings quality management (García-Sánchez, Martínez-Ferrero, García-Meca, 2017; Luo, Xiang & Huang,2017), CEO compensation (Usman, Zhang, Wang, Sun & Makki, 2018), and liquidity of stocks (Ahmed and Ali, 2017). A shared insight of these studies is that a gender diverse board operates as a governance mechanism improving internal governance. Consequently, this improved internal governance allows for enhanced control and monitoring by the board on the executive team. This in turn results in greater control over managers, and reduces conflicting interests regarding risk taking (Lara,

Osma, & Penalva, 2009). Additionally, these stronger governance mechanisms are often associated with less managerial power (Elloumi and Gueyié, 2001; Oler, Olson & Skousen, 2009; Li, 2014).

An opposed effect to the monitoring effect is power imbalances between men and women on the board, which leads to increase in CEO power (Eagly and Carli, 2003; Usman, Zhang, Farooq et al., 2018). In particular, male members of the board would dominate female directors, thereby weakening the monitoring effect that those females could have. Due to the weakening of the monitoring effect by male domination, the negative effect that female directors have on CEO power may diminish. For example, the research conducted by Usman, Zhang, Farooq et al. (2018) on the effect of gender diversity in boards on CEO power for companies in the Chinese market shows a positive relation between these two factors. According to their results, the power of a CEO increases when the corresponding board is gender diverse. They argue that this finding can be the result of a power imbalance between men and women in the board. In particular, female directors would experience more pressure, and thereby vote more likely in the thinking of the rest of the board.

Additionally, Eagly and Carli (2003) argue that for women it is harder to experience a sense of belonging when part of a board. They are under more pressure to behave in an agreeable manner, in order to become an accepted and established member of the group, as the acceptance of female members in general is lower within the established social dynamic of the boards. In general women have to be more accomplished and work harder as there is a negative bias towards the leadership qualities of women, when compared to their male peers. Due to this pressure, women take less decisive action against CEOs and this would explain the positive effect of gender diversity in boards on CEO power. In an interview with the New York Times the vice chairwoman at Value Edge Advisors, a consulting firm that works with shareholder groups on compensation and other issues, stated:

"It's very difficult for women to get on boards, and I think they are under even more pressure to go along and get along [because] the culture of the boardroom is to vote yes. You want to stay on the board, don't you?" (Minow, 2016, as cited in Morgenson, 2016, para. 7).

Moreover, the power imbalances between men and women could be further strengthened the concept of female rivalry in boards. A questionnaire-based study by Ely (1994) showed that women in male dominant business environments, for example boards, are more likely to identify other women as competition, and are thereby less likely to support each other. In addition, Ely (1994) found that women are not willing to identify themselves with an as 'weak' perceived minority group of women. To differentiate themselves from this 'weak' group, they consequently obstruct other women, and even denigrate their ideas. Overall, the monitoring effect of female directors could be reduced by these issues.

2.2. Critical Mass of Female Directors

One interesting area to further research is to examine, whether there is a certain threshold regarding the number of female directors, at which the effect of female directors on CEO power is significant. A question that needs to be asked is, whether a minority of female directors could affect CEO power, or if

they are more considered as tokens? In 1978, Granovetter published a paper in which he describes the critical mass theory. This theory gives an explanation on how the lack of balance between a minority and a majority of members within a group can change, when the minority group increases in size. More specifically, increasing the size of the minority group to a certain threshold will significantly increase the power of the minority group. Thus far, several studies have begun to examine the use of female directors as tokens (Elstad & Ladegard, 2010; Torchia, Calabrò, & Huse, 2011; You, 2019). In a recent study which set out to determine the effect of the presence of female directors on the appointment of a female CEO, You (2019) describes that regarding the critical mass of women on a board, one female director can be seen as a token, two female directors can be seen as a minority, and three or more female directors can be seen as a voice. Therefore, the hypothesis is that when a board consists of at least three women they become influential and will affect decisions made by the board. I am specifically interested in the critical mass of female directors and how it relates to CEO power.

2.3. Female Friendly Environment on Female Directors

Another significant aspect of the critical mass of female directors is the openness to gender diversity, especially in the upper echelons of a firm. A female friendly environment may cause female directors' opinions to be more respected, and consequently influences the outcomes of board decisions.

In her paper, You (2019) studies the critical mass of female directors on the likelihood of the appointment of a female CEO. When a firm is perceived as less open to gender diversity, her results show that the threshold at which female directors significantly increase the likelihood of the appointment of a female CEO is at three female directors. However, when there are indications that a firm has a more female friendly environment, this threshold lowers to only one or two female director(s) to influence the decision making in the board. You (2019) classifies three measurements for a female friendly environment: (1) The percentage of male directors who sit on other boards of which the firms are represented by a female CEO, (2) the gender gap in the compensation of executives, and lastly, (3) the percentage of female executives in the top management team. As a female friendly environment strengthens the monitoring effect of female directors, it of interest to analyze how these measurements affect the relation between female directors and CEO power.

In conclusion, there are mixed results and theories regarding the effect of female directors on CEO power. More specifically, it is not clear whether the monitoring effect of women in the board is strong enough to reduce managerial power. Additionally, it is not clear at which number of female directors their power becomes influential. Lastly, it is not clear whether a female friendly environment in the upper echelons of a firm influences the effect of female directors on CEO power.

3. Hypotheses

The aim of this thesis is to answer the following research question:

What is the effect of female directors on CEO power, and how is this effect impacted by the presence of a female friendly environment in the upper echelons of a firm?

In order to address this question, I further extend the research on the effect of female directors on CEO power by Usman, Zhang, Farooq et al. (2018). The extensions presented in this thesis are divided into four major parts. Firstly, I analyze the effect of female directors on CEO power for firms in the US market, whereas the research by Usman, Zhang, Farooq et al. (2018) is performed with a dataset of Chinese firms. Secondly, I analyze the effect of female directors on the compensation committee on CEO power. A closer look at the literature shows most decisions within a firm regarding executive compensation are not made at board level, but rather at compensation committee level. Therefore, it is essential to also focus on the effect of gender diversity in the compensation committee on CEO power, in order to gain a deeper understanding (Kesner, 1988). Thirdly, I examine if the critical mass theory holds true for the effect of female directors on CEO power. In order for female directors' opinions to be influential, a minimal group size of women may be required, otherwise, they may be seen as tokens (Granovetter, 1978). Fourthly, I investigate if a female friendly environment in the upper echelons of a firm influences the effect of the presence of female directors on CEO power. As firms are more open towards gender diversity, this openness could positively affect the willingness to listen to female directors and value their opinions.

The objective of this thesis is to answer the stated research question, by testing hypotheses for these extensions. Regarding the effect of female directors on the board and the compensation committee, I will test the following hypotheses:

Hypothesis 1: The proportion of female directors on the board is negatively correlated with CEO power.

Hypothesis 2: The proportion of female directors on the compensation committee is negatively correlated with CEO power

My hypotheses follow the vast majority of studies included in the literature review, that predict a monitoring effect of the presence of female directors on board decisions and firm economics (Adams and Ferreira, 2009; Ahmed and Ali, 2017; García-Sánchez et al., 2017; Luo et al., 2017; Usman, Zhang, Wang, et al., 2018). However, in contradictory fashion, Usman, Zhang, Farooq et al. (2018) found a positive relationship between the proportion of female directors and CEO power. Therefore, their results could be an exception. They argue that this finding could be the result of skewed balance of power between men and women on the board. In particular, female directors would experience more pressure and thereby vote more likely in the thinking of the rest of the board.

This influence of skewed balance of power is an interesting argument, and in a similar vein, it could be hypothesized that a small proportion of female directors does not have influential power due to its minority status. Therefore, it is of interest to know whether the critical mass theory still holds true for the effect of female directors on CEO power. The critical mass theory states that for a minority a minimum group size of three is required in order to influence group decisions (Granovetter, 1978). Therefore, I will test the following hypothesis:

Hypothesis 3: The effect of female directors on the board on CEO power, when there are three or more female directors, is significantly stronger than the effect of female directors on CEO power when there are fewer than three directors.

In order to measure a female friendly environment in the upper echelons, You (2019) classifies three measurements: (1) The percentage of male directors who sit on other boards of which the firms are represented by a female CEO, (2) the gender gap in the compensation of executives, and (3) the percentage of female executives in the top management team. The first two of this measures are used in this thesis. The third measurement will not be used, as the percentage of female executives in top management directly influences the measurement of CPS. I.e., as female executives on average receive less compensation than male executives, and the gender of the CEO is generally male, an increase in the percentage of female executives would thereby automatically result in a higher CPS.

This thesis suggests that these measurements for a female friendly environment will strengthen the effect of female directors on CEO power. Therefore, I will test the following hypotheses:

Hypothesis 4: The effect of female directors on the CEO power will be stronger when more male directors sit on other boards of firms that are led by female CEOs.

Hypothesis 5: The effect of female directors on CEO power will be stronger as the gender gap between male and female executives decreases.

4. Research Methodology

This section describes the methodology and methods that I use in order to answer the research question of this thesis. I replicate the methodology of the paper by Usman, Zhang, Farooq et al. (2018) for US firms, and I extend it in three areas. First of all, I include the proportion of female directors on the compensation committee as an extra independent variable. Secondly, I examine whether the critical mass of three female directors in order to influence board decision-making holds the effect on CEO power. Thirdly, I examine if a female friendly environment in the upper echelons of a firm influences the effect of the presence of female directors on CEO power.

I start by replicating the methodology from Usman, Zhang, Farooq et al. (2018). To answer Hypothesis 1, I examine the effect of women on the board on CEO power via an OLS regression. As it will take time for female directors and other compensation-related characteristics to influence compensation decisions and have visible impact, it is necessary to control for time, by using one-year lagged variables for the variables related to gender diversity. Therefore, I define the following OLS regression:

$$CPS_{it} = \beta_0 + \beta_1 Proportion\ of\ Female\ Directors_{it} + \sum_{j=1}^{n} \beta_j Control\ variables_{it} + \varepsilon_{it} \quad (1)$$

The method proposed by Usman, Zhang, Farooq et al. (2018) is further extended by examining the effect of women on the compensation committee on CEO power to answer Hypothesis 2. Therefore, I define the following OLS regression:

$$CPS_{it} = \beta_0 + \beta_1 Proportion\ of\ Female\ Directors\ on\ the\ Copmensation\ Committee_{it} + \sum_{j=1}^{n} \beta_j Control\ variables_{it} + \varepsilon_{it} \quad (2)$$

Next, I explore whether the critical mass theory holds true for the sample of this thesis. Asch and Guetzkow (1951) state that in order for a minority group to be influential in group decisions, three is the magic number. In a more recent study, Konrad et al. (2008) found that in a board setting this number also holds true. Therefore, I examine if three is also the threshold at which the effect of female directors on CEO power will be significant. I test several female directors' dummies in order to find the threshold that works best for my dataset. As a method to identify the tipping point, I make classifications of the number of female directors.

Since boards vary in size, it may make sense to examine what the proportion of female directors needs to be in order to affect CEO power rather than an absolute number. However, it is worth to note that multiple studies suggest that the threshold for a minority group to become influential is rather based on the absolute number of three and not on a proportion of the total group size (Bond, 2005; Erkut, Kramer, & Konrad, 2008; Nemeth, 1986; Tanford & Penrod, 1984). Therefore, I only examine the absolute number of female directors as a threshold.

I perform OLS regressions including several dummy variables. A dummy variable is included that equals one when a board consists of certain number of women or more, and zero otherwise. As an example, for the threshold of three or more women, I define the following OLS regression:

$$CPS_{it} = \beta_0 + \beta_1 One\ Female\ Director_{it} + \beta_1 Two\ Female\ Directors_{it} + \beta_1 Three\ or\ More\ Female\ Directors_{it} + \sum_{j=1}^{n} \beta_j Control\ variables_{it} + \varepsilon_{it} \quad (3)$$

The effect of female directors on CEO power can be further strengthened, if there are organizational factors in place that increase the influential power that a minority of female directors can have. I examine if the effect of female board representation is stronger when a firm has a female friendly environment in the top of management. Along lines of previous research of You (2019), I make the assumption that the influential power of a minority of female directors increases, when a firm is more open to gender diversity. As the measures for the openness to gender diversity, I use two proxies from the study of You (2019). First, *Board Ties to Female CEOs,* which is the proportion of male directors who sit on at least one other board of a firm that is led by a female CEO. Second, *Gender Gap in Executive Pay,* which is the difference in the average compensation of the male and female executives, excluding the CEO. Therefore, I define the following OLS regressions with the interaction between the proportion of female directors and the measurements of a female friendly environment:

$$CPS_{it} = \beta_0 + \beta_1 Proportion\ of\ Female\ Directors_{it} + \beta_2 Board\ ties\ to\ female\ CEOs_{it}$$
$$+ Proportion\ of\ Female\ Directors_{it} \times Board\ ties\ to\ Female_{it}$$
$$+ \sum_{j=1}^{n} \beta_j Control\ variables_{it} + \varepsilon_{it} \quad (4)$$

$$CPS_{it} = \beta_0 + \beta_1 Proportion\ of\ Female\ Directors_{it} + \beta_2 Gender\ Gap\ in\ Executive\ Pay_{it}$$
$$+ \beta_3 Proportion\ of\ Female\ Directors_{it} \times Gender\ Gap\ in\ Executive\ Pay_{it}$$
$$+ \sum_{j=1}^{n} \beta_j Control\ variables_{it} + \varepsilon_{it} \quad (5)$$

For an accurate prediction of the proposed methodology, one should, in principle, make an adjustment to address endogeneity concerns. The analysis of the effect of female directors on CEO power is sensitive to endogeneity issues in two ways.

First, there could be omitted variables that affect both the proportion of female directors and CEO power. These omitted variables could be (a) constant at the industry level, (b) constant at the firm level, and (c) time varying. For example, corporate culture could affect the proportion of female directors as well as the power a CEO has (Bernardi, Bosco, & Vassill, 2006). To address the problem of such omitted variables, two models for each regression are used. One model with firm fixed effects and year dummies. Another model with industry fixed effects and year dummies. For example, corporate culture may vary over time and between the firms in the sample.

Second, reverse causality could be a concern in isolating the effect of female directors on CEO power. More specifically, CEO power could also influence the gender diversity of a board, since a dominant CEO is more likely to have a strong influence on who is part of the board in the first place.

For example, CEO power may influence the decision of women on which boards they prefer to join. In addition, CEOs also have larger control related to the appointment of members to the different committees of the board, including the compensation committee (Strobl et al., 2018).

Moreover, in their study Westphal and Zajac (1995) find that the perceived similarity to the CEO of candidates for the board and compensation committee, played an important role in their selection process. Since most CEOs are male, they more often prefer candidates that are male. Additionally, their theory suggests that this similarity effect results in directors voting in support of the CEO, which also includes favorable decisions on the compensation of the executives. In conclusion, I assume that CEOs heavily influence the gender composition of the board.

In order to address the problem of reverse causality, I use a 2SLS regression with an instrument variable (IV). The IV that I use in this thesis is derived from the study of Adams and Ferreira (2009). In their study, which set out to determine the effect of the presence of female directors and their impact on corporate governance, the authors use an IV to solve this same reverse causality problem. They define the IV as "the fraction of male directors on the board who sit on other boards on which there are female directors" (Adams and Ferreira, 2009, p. 306). The rationale behind the IV is given by Medland (2004). This study states that the absence of female directors is explained by the fact that in the corporate environment women lack the connections that men have. This theory suggests that when male directors are more connected to female directors on other boards, it would be expected to observe more female directors on the board. When the fraction of male directors who sit on other boards with female directors is larger, the gender diversity of boards should be more prominent.

In order to strengthen the line of reasoning behind this IV, I perform two tests, and include extra control variables. First, I test if the IV correlates with the proportion of female directors. Second, I test if the IV is uncorrelated with CEO power. Furthermore, Adams and Ferreira (2009) argue that there are two main concerns regarding the validity of this IV. Firstly, it is plausible that through industry effects, the fraction of men connected to women on other boards is correlated with CEO power. In order to overcome this issue, I control for industry effects. Secondly, it is plausible that the IV correlates with CEO power, when the IV can be seen as a proxy for the board connectedness. To address this concern, I include two more variables which control for the connectedness of a board in the 2SLS regressions, namely the number of external board seats per director and the total number of external board seats per director. In conclusion, I define the following two stages of the 2SLS regression:

$$
\begin{aligned}
\textit{Proportion of Female Directors}_{it} \\
= \gamma_0 + \gamma_1 \textit{Board Ties to Female Directors}_{it} + \sum_{j=1}^{n} \beta_j \textit{Control variables}_{it} \\
+ \varepsilon_{it} \quad (6)
\end{aligned}
$$

$$CPS_{it} = \beta_0 + \beta_1 Proportion\ of\ \widehat{Female\ Directors}_{it} + \sum_{j=1}^{n} \beta_j Control\ variables_{it} + v_{it} \quad (7)$$

5. Data

This section describes the data collection, construction of variables, and discusses the most relevant summary statistics.

5.1. Data Collection and Construction of Variables

I aim to find evidence on the effect of female directors on CEO power by using panel data. As CEO power is an unobservable variable, a proxy is needed. To measure the dependent variable CEO power, a common proxy is used, namely the CEO Pay Slice (CPS), first coined by Bebchuk et al. (2011). In their paper they define CPS as "the fraction of the aggregate compensation of the firm's top-five executive team captured by the CEO" (Bebchuk et al., 2011, p. 200). Their findings imply that if the CEO receives a relatively high salary in comparison to the four executives ranking below them, the CEO has a relatively large amount of power.

The dependent variable, *CPS,* is computed by using data from Compustat's Execucomp database from 2007 to 2017. This measure is based on the total compensation of each of the top five executives, as reported by item TDC1 in ExecuComp. The total compensation includes salary, bonusses, other annual payments, total value of restricted stock grants, total value of stock options granted, long-term incentive payouts, and all other compensation.

The first caveat is that *CPS* has been restricted to the years in which the CEO was in charge the entire year. Thereby, it filters out years in which *CPS* would be unnaturally low, as the CEO did not receive compensation for the entire year. The second caveat is that some firms listed more than five executives in a certain year. For these cases I only use the top 5 executives in terms of compensation for that year.

The experimental variables, *Proportion of Female Directors* and *Proportion of Female Directors on the Compensation Committee,* are in line with previous studies (García-Sánchez et al., 2017; Luo et al., 2017) as measurements for the gender diversity on boards. Additionally, I make no distinction between inside and outside female directors. Data on the composition of boards and the compensation committees is obtained from the Institutional Shareholder Services (ISS) database from 2007 to 2017.

In order to test the critical mass of female directors to exert influence on CEO power, I create additional experimental variables. *One or More Female Directors*, *Two or More Female Directors*, *Three or more Female Directors*, *One Female Director*, and *Two Female Directors* are dummy variables that refer to the number of female directors on the board. In addition, *One or More Female Directors on the Compensation Committee*, *Two or More Female Directors on the Compensation Committee*, *Three or More Female Directors on the Compensation Committee*, *One Female Director*

on the Compensation Committee, and *Two Female Directors on the Compensation Committee* are dummy variables that refer to the number of female directors on the compensation committee.

For the extension of this thesis, it is necessary to construct variables which are measurements of the female friendliness in the upper echelons of a firm. To examine whether a female friendly environment in the upper echelons of a firm impacts the effect of female directors on CEO power, two moderating variables are used as measurements for the openness to gender diversity.

First, I construct *Board Ties to Female CEOs,* a variable that equals the percentage of male directors who sit on other boards of which the firms are represented by a female CEO. The opinions of female directors may be taken more serious by their male peers, when they work with women that are seen as powerful as men, in this case a female CEO (You, 2019).

Second, I construct *Gender Gap in Executive Pay,* a variable that equals the difference between the average compensation of males and females of the top five executives, excluding the CEO. I exclude the CEO, because otherwise this variable would directly influence the determinants of CPS, the measurement for CEO power. A higher *Gender Gap in Executive Pay* implies that the corporate culture of firm is less open to gender diversity, while a smaller gap implies that men and women are seen as more equal (You, 2019). A lower *Gender Gap in Executive Pay* gives the suggestion that a firm values gender equality, resulting in a better balance between men and women including the board. Therefore, I expect that the willingness of male directors to value the opinions of female directors increases.

The analyses of this thesis includes various control variables to overcome the potential effects of other variables that influence CEO power. The control variables can be broadly divided in to four categories: (1) CEO characteristics, (2) board and compensation committee structure, (3) firm economics, and (4) connectedness of the board.

The data for these control variables is obtained from various sources. Firstly, data on CEO characteristics is obtained from Compustat's Execucomp database. Secondly, data on board structure, compensation committee structure, and the connectedness of the board is obtained from the Institutional Shareholder Services (ISS) database. Lastly, data on firm economics is obtained from the Compustat database. The relevance of the individual control variables will be discussed below.

5.1.1. CEO Characteristics

CEO is Chair is a dummy variable, which equals 1 if the CEO is also chairman of the board, and 0 otherwise. This CEO duality is a common proxy for the relative power a CEO has in a firm (Adams, Almeida, & Ferreira, 2005). Therefore, I expect that when the CEO is also chairman at the board, this is positively associated with CEO power.

CEO Tenure equals the number of years the CEO has served as the company's CEO. CEO power is expected to increase when the tenure of the CEO is longer.

CEO Ownership is a dummy variable, which equals 1 if the CEO holds at least 20% of the outstanding shares, and 0 otherwise. Bugeja et al. (2016) argues that the incentives of CEOs, which own

a higher percentage of the company's outstanding shares, are more in alignment with the interests of shareholders. Therefore, rent extraction by the CEO is less likely. Additionally, Gomez-Mejia, Tosi, & Hinkin (1987) argue that CEOs are more likely to agree on lower compensation when they have a higher portion of ownership in the firm. Lower CEO compensation, could result in lower CPS, and thereby result in less CEO power. Therefore, I control for *CEO ownership*, because I expect it to be negatively correlated with CEO power.

Relative Equity Compensation equals the ratio of the fraction of the equity compensation of the CEO in comparison with other executives in the top five executives. The study of Aggarwal and Samwick (2003) demonstrates that CEOs receive a relatively large amount of the equity that is divided between the top 5 executive team, because the CEO holds the largest decision making power, and thereby has the most influence on the performance of a company. More specifically, if a manager receives a relatively large part of their compensation in equity, then they wish to receive a higher salary, in order to compensate for the risk associated to equity based rewards. Their theory explains that as CEOs receive the largest proportion of incentive pay in relative terms, this will also make their compensation relatively the highest. Therefore, *CPS* could increase if the CEO receives a salary package that is relatively more focused on the performance of the company than that of other managers (Bebchuk et al., 2011).

5.1.2. Board and Compensation Committee Structure

Board Size equals the number of directors on the board. Jensen (1993) finds that the monitoring effect of boards becomes less efficient when number of directors on a board surpasses seven or eight. Therefore, I expect that CEO power decreases with board size. For the same reason that I include *Board Size* as a control variable, I include the size of the compensation committee. *Compensation Committee Size* equals the number of directors on the compensation committee.

Additionally, I include control variables for the degree of independence of the board. *Board Independence* equals the proportion of independent directors on the board, and *Compensation Committee Independence* equals the proportion of independent directors on the compensation committee. The evidence regarding the effect of independent directors on CEO power is mixed. More specifically, there are two possible effects of independent directors on CEO power. On the one hand, independent directors are associated with an more effective monitoring role due to their more distant relation to the CEO in comparison to inside directors (Coles, Daniel, & Naveen, 2008; Jiraporn, Jumreornvong, Jiraporn, & Singh, 2016; Pfeffer, 1981) On the other hand, there is some evidence which suggest that monitoring effect of independent directors is reduced due to their lack of ownership in the firm, resulting in less conflicts with the incentives of the CEO (Finkelstein and Hambrick, 1996). Due to mixed evidence in the literature, I make no prediction on the sign or significance of the coefficients of the independence variables.

5.1.3. Firm Economics

Firm Age equals the difference between the fiscal year and the moment when data was available on Compustat. Bebchuk et al. (2011) show that firm age is positively associated with *CPS*. Therefore, include *Firm Age* as a control variable.

Firm Size equals the log of total assets. Smiths and Watts (1992) argue that in larger firms the decisions of CEOs have more consequences. Therefore, the added value of the CEO is higher in comparison to smaller firms, in turn resulting in higher CEO compensation. Higher CEO compensation relative to the other executives, suggests that the *CPS* increases. Therefore, I expect that CEO power increases with *Firm Size*.

Firm Growth is constructed as the current year's assets minus previous year's assets, divided by the current year's assets. Usman, Zhang, Wang et al. (2018) showed a negative relation between firm growth and CEO compensation. This negative relation on CEO compensation, may influence *CPS*. Therefore, I included *Firm Growth* as a control variable. Due to the lack of research on the relationship between *Firm Growth* and *CPS*, I have no expectations on the sign or significance of the coefficient.

Growth Opportunity equals the book-to-market ratio. Murphy (1985) argues that firms that have a broader set of investment opportunities, wish to have good management in order to fully utilize these opportunities. Therefore, they aim to attract more talented CEOs, which demand higher compensation (Bugeja et al., 2016). Higher CEO compensation could result in a higher *CPS*. As a higher book-to-market ratio indicates less investment opportunities, I expect that the *Growth Opportunity* of a firm is negatively correlated with CEO power.

Firm Leverage equals the ratio of total debt to total assets. *CPS* is shown to be negatively associated with *Firm Leverage* (Chintrakarn, Jiraporn, & Singh, 2014). Therefore, I include *Firm Leverage* as a control variable.

Executive compensation is partly determined by firm performance (Core et al. 1999). Therefore, I include controls for the market and accounting measures of the performance of a firm. First, I include *Industry Adjusted Tobin's Q*, which is computed as the book value of assets plus the market value of equity minus the book value of equity, which is all divided by the book value of assets. Tobin's Q is industry adjusted at the four digit SIC level. Second, I include *Industry Adjusted ROA*, which is computed as the net income divided by the book value of assets. ROA is industry adjusted at the four digit SIC level.

5.1.4. Connectedness of the Board

In Section 7, I address the endogeneity concerns of my methodology by performing a 2SLS regression with the use of the instrument from the paper of Adams and Ferreira (2009). Namely, *Board Ties to Female Directors,* which equals the proportion of male directors who have board ties to boards on which there sits at least one female director. The rationale behind this IV has been discussed in Section 4. It is plausible that the instrument correlates with CEO power, when the instrument can be

seen as a proxy for the board connectedness. Therefore, I include two additional variables which control for the connectedness of a board in the 2SLS regressions.

First, *External Board Seats by Directors* equals the total number of external board seats by directors. The more external board seats by directors, the more connected a board is to other boards.

Second, *Male External Board Seats* equals the average number of male external board seats. The higher the average number of male external board seats, the more connected a board is to other boards. More specifically, it controls for the 'old boys network' effect.

To control for outliers, I winsorized the data of the following variables at the 1% level: *Gender Gap in Executive Pay, Relative Equity Compensation, Firm Size, Firm Growth, Growth Opportunity, Firm Leverage, Industry Adjusted Tobin's Q, and Industry Adjusted ROA*. After excluding firm-year observations in which data on the variables is missing, my final sample consists of 8,918 firm-year observations.

All data is collected for the years 2007 to 2017, which allows for a comparison of the results with the paper of Usman, Zhang, Farooq et al. (2018) that investigated the effect of female directors on CEO power for the Chinese market. An overview of all variables and their descriptions is presented in Table A1 (see Appendix A).

5.2. Summary Statistics

Table 1 shows the descriptive statistics, reporting the means, median, standard deviations, minima, and maxima of the variables used in the analyses on the firm-year level. From Table 1, three variables require closer examination. First, we observe that the average *CPS* is about 0.39, indicating that the CEO captures on average 39% of the total salary of the top 5 executives of a firm. This is in line with the observed average *CPS* from the paper of Bebchuk et al. (2011), which reported a mean of 36%. It is interesting to note that the average *CPS* for the sample of Chinese firms from the paper of Usman, Zhang, Farooq et al. (2018) is only 23%. Second, the average *Proportion of Female Directors* is about 14% with an average board size of 10. This is in line with the paper by Usman, Zhang, Farooq et al. (2018) which reports an average percentage of female directors of 12%, with a similar *Board Size* average of 10. Third, The average *Proportion of Female Directors on the Compensation Committee* is circa 15% with an average *Compensation Committee Size* of 4.

Figure 1 shows a visualization of the distribution of *CPS* on firm-year level. It shows that most observations of *CPS* are between 20% and 60%.

Figure 1

Distribution of CPS on firm-year level
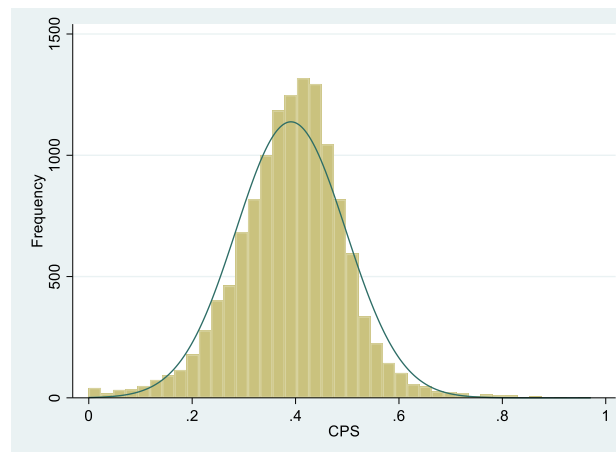
Figure 2 shows a visualization of the distribution of the number of female directors on firm-year level. It shows the number of female directors is right skewed. Additionally, it shows that about 22% of the sample firms have zero female directors, 35% one female director, 29% two female directors, and 10% three female directors.

Figure 2

Distribution of the number of female directors on firm-year level
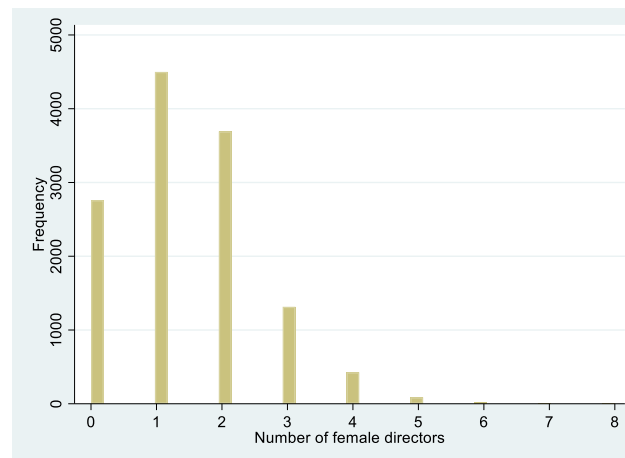
Figure 3 shows a visualization of the distribution of the number of female directors on the compensation committee. It shows that about 53% of the sample firms have zero female directors on the compensation committee, 38% one female director, and 9% two female directors.

Figure 3

Distribution of the number of female directors on the compensation committee on firm-year level
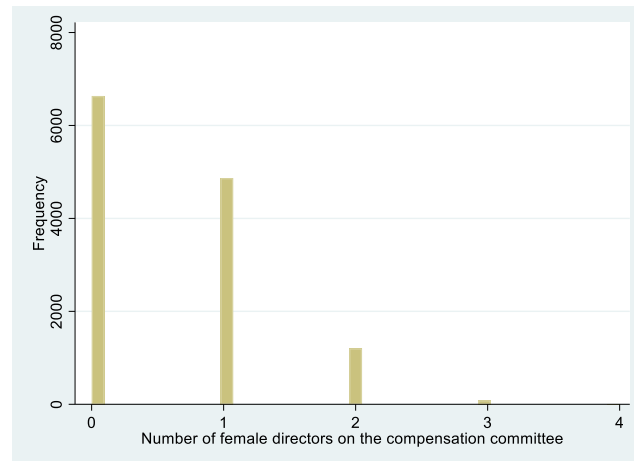
Table 1

Overview of the summary statistics of all used variables on firm-year level.

Variable	Observations	Mean	Median	SD	Minimum	Maximum
CPS	12,806	.39	.40	.11	0	.87
Proportion of Female Directors	12,806	.14	.125	.10	0	0.75
Proportion of Female Directors on Compensation Committee	12,799	.15	0	.18	0	1
One Female Director	12,806	.35	0	.48	0	1
Two Female Directors	12,806	.29	0	.45	0	1
One or More Female Directors	12,806	.78	1	.41	0	1
Two or More Female Directors	12,806	.43	0	.50	0	1
Three or More Female Directors	12,806	.14	0	.35	0	1
One Female Director on the Compensation Committee	12,799	.38	0	.49	0	1
Two Female Directors on the Compensation Committee	12,799	.09	0	.29	0	1
One or More Female Directors on the Compensation Committee	12,806	.48	0	.50	0	1
Two or More Female Directors on the Compensation Committee	12,806	.10	0	.30	0	1
Three or More Female Directors on the Compensation Committee	12,806	.01	0	.08	0	1
Board Ties to Female CEOs	12,806	.02	0	.05	0	.67
Gender Gap in Executive Pay ('000 $)	4,058	355.08	172.60	1313.17	-4518.53	6513.34
Proportion of Female Executives	12,806	.08	0	0.13	0	0.80
CEO is Chair	12,806	.41	0	.49	0	1
CEO Tenure	12,433	7.60	6	7.16	0	54
CEO Ownership	12,469	.02	0	.13	0	1
Relative Equity Compensation	10,952	.21	.22	.13	0	.81
Board Size	12,806	9.54	9	2.33	3	34
Board Independence	12,803	.80	.82	.11	.22	1
Compensation Committee Size	12,799	3.80	4	1.09	1	10
Compensation Committee Independence	12,788	.99	1	.06	.29	1
Firm Age	12,763	30.19	24	18.00	0	67
Firm Size ('000 $)	12,740	8.28	8.17	1.65	5.05	12.72

(Continued)

Table 1 (Continued)

Variable	Observations	Mean	Median	SD	Minimum	Maximum
Firm Growth	12,740	0.05	0.05	0.14	-0.44	.054
Growth Opportunity	12,726	0.52	0.45	0.36	-0.07	1.96
Firm Leverage	12,688	0.84	0.53	1.52	-4.18	10.07
Industry Adjusted Tobin's Q	12,735	0.17	0	0.86	-3.01	5.34
Industry Adjusted ROA	12,740	-0.004	0	0.06	-0.40	0.23
Board Ties to Female Directors	10,506	.32	.29	0.20	0	1
External Board Seats by Directors	12,806	4.23	3	3.75	0	30
Male External Board Seats	12,803	6.32	6	1.85	1	26

6. Results

In this section I discuss the results of the relationship between female directors and CEO power. Additionally, I examine this relationship on the compensation committee level. Moreover, I discuss how the presence of a female friendly environment in the upper echelons of a firm affects this relationship.

6.1. The Proportion of Female Directors and CEO Power

Hypothesis 1 predicts that the proportion of female directors on the board is negatively correlated with CEO power. In Table 2, Model 1, with firm fixed effects, shows that the *Proportion of Female Directors* is not correlated with *CPS*, the proxy for CEO power. In Table 2, Model 2, with industry fixed effects, also shows that the *Proportion of Female Directors* is not correlated with *CPS*. These results are not in line with my expectations.

6.1.1. CEO is Chair

In Table 2, Model 1 shows that *CEO is Chair* is positively correlated with *CPS*, and statistically significant at the 1% level This result is in line with my expectations that the important position of the CEO has a positive effect on CEO power. More specifically, the result is in full agreement with the previous study by Bebchuk et al. (2011).

6.1.2. CEO Tenure

In Table 2, Model 1 shows that *CEO Tenure* is positively correlated with *CPS*, and statistically significant at the 5% level. This result is in agreement with my expectations that the number of years the CEO has served as the company's CEO positively influences CEO power. The result is in line with those found in the paper by Cremers and Palia (2010), which examined the relationship of CEO tenure and CEO pay.

6.1.3. Relative Equity Compensation

In Table 2, Model 1 shows that *Relative Equity Compensation* is positively correlated with *CPS*, and statistically significant at the 1% level. The results are compatible with my expectations that *CPS* increases due to the more performance-based equity compensation a CEO receives in comparison to other executives. This is consistent with the findings of Bebchuk et al. (2011) which suggest that *CPS* is positively associated with the *Relative Equity Compensation* of the CEO.

6.1.4. Board Size

In Table 2, Model 1 shows that *Board Size* is negatively correlated with *CPS*, and statistically significant at the 1% level. This result is in line with my expectations that the companies with relatively large boards have a stronger monitoring effect on the CEO, thereby resulting in less CEO power. This finding is in

line with previous studies of Al-Najjar et al. (2016) and Usman, Zhang, Farooq et al. (2018) who reported similar results.

6.1.5. Board Independence

In Table 2, Model 1 shows that *Board Independence* is positively correlated with *CPS*, and statistically significant at the 1% level. This result is in line with the theory by Finkelstein and Hambrick (1996) which states that the monitoring effect of independent directors is reduced due to their lack of ownership in the firm, resulting in less conflicts with the incentives of the CEO.

6.1.6. Firm Age

In Table 2, Model 1 shows that *Firm Age* is positively correlated with *CPS*, and statistically significant at the 1% level. The result is in agreement with my expectations that the age of a company positively influences CEO power. This result is consistent with the findings of both the studies of Bebchuk et al. (2011) and Usman, Zhang, Farooq et al. (2018).

6.1.7. Growth Opportunity

In Table 2, Model 1 shows that *Growth Opportunity* is negatively correlated with *CPS*, and statistically significant at the 5% level. As discussed in Section 5, the *Growth Opportunity* equals the book-to-market ratio, and not the market-to-book ratio. Thus, the higher this ratio, the less investment opportunities a firm has. This result is consistent with the findings of Murphy (1985) which suggest that firms with more investment opportunities, wish to have good management in order to fully utilize these opportunities. More talented CEOs demand higher CEO compensation, resulting in a higher *CPS*. Therefore, my results are in agreement with my expectations that firms with less growth opportunities are expected to negatively correlated with CEO power.

6.1.8. Industry Adjusted Tobin's Q

In Table 2, Model 1 shows that *Industry Adjusted Tobin's Q* is positively correlated with *CPS*, and statistically significant at the 5% level. The result is in line with the paper by Core et al. (1999), which determined that firm performance positively influences CEO compensation.

6.1.9. Industry Adjusted ROA

In Table 2, Model 1 shows that *Industry Adjusted ROA* is positively correlated with *CPS*, and statistically significant at the 5% level. This result is also in line with the paper by Core et al. (1999), which determined that firm performance positively influences CEO compensation.

Compared to Model 1, Model 2, which uses industry fixed effects instead of firm fixed effects, shows four changes in significance levels and signs of the coefficients of the control variables. First, *CEO*

Tenure is not significant anymore. Second, *Firm Age* is also not significant anymore. Third, *CEO Ownership* is now negatively correlated with CPS, and statistically significant at the 1% level, whereas it was not statistically significant in the model with firm fixed effects. This negative correlation is in agreement with my expectations that *CEO Ownership* is negatively correlated with CEO power. Fourth, the sign of the statistically significant coefficient of *Industry Adjusted Tobin's Q* changes from positive to negative.

6.2. The Proportion of Female Directors on the Compensation Committee and CEO Power

Hypothesis 2 predicts that the proportion of female directors on the compensation committee is negatively correlated with CEO power. In Table 2, Model 3, with firm fixed effects, shows that the *Proportion of Female Directors on the Compensation Committee* is not correlated with *CPS*, the proxy for CEO power. This result is not in line with my expectations. However, in Table 2, Model 4, with industry fixed effects, shows that the *Proportion of Female Directors on the Compensation Committee* is negatively correlated with *CPS*. More specifically, an increase of one standard deviation of the *Proportion of Female Directors on the Compensation Committee* leads to a decrease of *CPS* of -0.003078 percentage points (-0.0171 * 0.18 = -0.003078, where -0.0171 is the coefficient for the *Proportion of Female Directors on the Compensation Committee*). This result is in agreement with my expectations.

Compared to Model 1 of Table 1, Model 1 of Table 2 shows that the relationship between female directors and CEO power stays uncorrelated, when assessing the relationship on the compensation committee level. However, when comparing the Models with industry effects, Model 2 of Table 1 and Model 2 of Table 2, I find that the relationship between female directors and CEO power becomes negatively correlated, when assessing the relationship on the compensation committee level. These results seem to suggest that female directors on the compensation committee are stricter monitors and allow for relatively less CEO compensation. Another aspect that should be taken into account is that the compensation committee usually has more direct decision-making power with regard to the compensation of the CEO. Thereby, allowing for a stronger monitoring effect of female directors in the compensation committee, on CEO power.

Compared to Model 1 and 2 of Table 2, Model 3 and 4 show no changes in the significancy or signs of the coefficients of the control variables.

Table 2

The effect of the proportion of female directors on CPS

Variables	(1) CPS	(2) CPS	(3) CPS	(4) CPS
Proportion of Female Directors, *t - 1*	0.00787	0.00574		
	(0.0216)	(0.0177)		
Proportion of Female Directors on Compensation Committee, *t – 1*			0.00756	-0.0185*
			(0.00917)	(0.00958)
CEO is Chair	0.0138***	0.0115***	0.0137***	0.0115***
	(0.00444)	(0.00372)	(0.00443)	(0.00367)
CEO Tenure	0.000925**	0.000305	0.000931**	0.000285
	(0.000408)	(0.000347)	(0.000408)	(0.000341)
CEO Ownership	-0.00349	-0.0707***	-0.00343	-0.0708***
	(0.0228)	(0.0225)	(0.0228)	(0.0224)
Relative Equity Compensation	0.206***	0.237***	0.206***	0.238***
	(0.0133)	(0.0148)	(0.0133)	(0.0148)
Board Size	-0.00365***	-0.00307***	-0.00363***	-0.00302***
	(0.00105)	(0.000964)	(0.00105)	(0.000952)
Board Independence	0.0723***	0.162***	0.0721***	0.167***
	(0.0225)	(0.0192)	(0.0225)	(0.0191)
Compensation Committee Size	-0.000852	0.000998	-0.000911	0.00104
	(0.00162)	(0.00162)	(0.00162)	(0.00161)
Compensation Committee Independence	-0.0343	-0.0375	-0.0342	-0.0402
	(0.0301)	(0.0337)	(0.0299)	(0.0332)
Firm Age	0.00189***	0.000109	0.00189***	0.000119
	(0.000624)	(0.000114)	(0.000607)	(0.000114)
Firm Size	-0.00623	0.00173	-0.00618	0.00199
	(0.00521)	(0.00165)	(0.00521)	(0.00163)
Firm Growth	0.0148	0.0123	0.0146	0.0112
	(0.00901)	(0.00932)	(0.00901)	(0.00929)
Growth Opportunity	-0.0150**	-0.0270***	-0.0150**	-0.0275***
	(0.00629)	(0.00577)	(0.00630)	(0.00575)
Firm Leverage	-0.000886	-0.000634	-0.000879	-0.000645
	(0.000911)	(0.000857)	(0.000911)	(0.000862)
Industry Adjusted Tobin's Q	0.00499*	-0.00601**	0.00496*	-0.00611**
	(0.00276)	(0.00262)	(0.00276)	(0.00262)
Industry Adjusted ROA	0.0553**	0.0624**	0.0557**	0.0620**
	(0.0248)	(0.0250)	(0.0248)	(0.0250)
Firm fixed effects	Yes	No	Yes	No
Industry fixed effects	No	Yes	No	Yes
Year dummies	Yes	Yes	Yes	Yes
Observations	8,918	8,809	8,913	8,804
R-squared	0.113	0.202	0.113	0.203

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

6.3. The Critical Mass of Female Directors and CEO Power

In order to identify a tipping point in the number of female directors that are required in order to influence CEO power (critical mass), I test the effect of the number of female directors in a multi-step process. I first test if one female director is the critical mass, however, if no significant result is found, I increase the number of female directors to respectively two and three.

Hypothesis 3 predicts that the effect of female directors on the board on CEO power is significantly stronger when there are three or more female directors on the board, compared to when there are fewer than three female directors. In contrast to my expectations, Table 3, Model 1, with firm fixed effects, shows that none of coefficients of the dummies for the number of female directors are significant. The firm fixed effects model shows no critical mass or tipping point for the number of female directors needed to influence CEO power. In addition, in Table A2, Model 1 and 2, with firm fixed effects, (see Appendix A) show that there is also no critical mass at one or more female directors, or at two or more female directors. These results are not in line with my expectations.

However, in Table 3, Model 2, with industry fixed effects, shows that the coefficient of *One or More Female Directors* is positively correlated with *CPS*, and statistically significant at the 10% level.. More specifically, having at least one female director on the board leads to an increase of *CPS* of 0.00895 percentage points. This result is not in line with my expectations of a critical mass of three female directors In addition, the positive sign of the coefficient is not in line with Hypothesis 1, which predicts a negative relationship between the proportion of female directors and CEO power. The positive direction of the relationship could be explained due to power imbalances between men and women on the board (Eagly and Carli, 2003; Usman, Zhang, Farooq et al., 2018).

To further investigate this effect, an additional analysis on female directors on the compensation committee on CEO power is performed. Since, *CPS* is dependent on the executive compensation, and most decisions regarding executive compensation are not made at board level, but at the compensation committee level, it is interesting to analyze the critical mass of female directors in the compensation committee on CPS (Kesner, 1988). In Table 3, Model 3, with firm fixed effects, shows that none of the dummies for the number of female directors on the compensation committee are correlated with *CPS*. In addition, in Table A3, Model 1 and 2, with firm fixed effects, (see Appendix A) show that there is also no critical mass at one or more female directors on the compensation committee, or at two or more female directors on the compensation committee. The firm fixed effects models show that there is no critical mass of the number of female directors on the compensation committee to exert influence on CEO power.

However, in Table 3, Model 4, with industry fixed effects, shows that the coefficient of *Two or More Female Directors on the Compensation Committee* is negatively correlated with *CPS*, and statistically significant at the 1% level. More specifically, having at least two female directors on the compensation committee leads to a decrease of *CPS* of -0.0145 percentage points. In addition, in Table A3, Model 3, with industry fixed effects, shows that the coefficient of *One or More Female Directors*

on the Compensation Committee is not correlated with *CPS*. These results indicate that for the compensation committee, there is a critical mass of two female directors in order to exert influence on CEO power. In Table 3, Model 4, the negative sign of the coefficient of *Two or More Female Directors* is in agreement with Hypothesis 2, which predicts that the proportion of female directors on the compensation committee is negatively correlated with CEO power.

Another noteworthy finding are the opposite signs of the critical mass of female directors, when comparing the negative effect of the critical mass in compensation committee (Model 4), with the positive sign of the critical mass in the board (Model 3). This finding may be a consequence of the changes in group size, when comparing the board with the compensation committee. More specifically, the significant negative influence of female directors on the compensation committee could be explained due to women being a relatively larger proportion of the committee (avg. 4 directors), compared to boards (avg. 10 directors), which in turn decreases the power imbalances between men and women (Eagly and Carli, 2003). Additionally, in smaller groups there may be less female rivalry (Ely, 1994) . Consequently, a smaller group size may strengthen the monitoring effect of female directors. I will further address the possible mechanisms behind this finding in Section 9.

Compared to Table 2, Table 3 shows no changes in the significancy or signs of the coefficients of the control variables.

Table 3

The critical mass of female directors on CPS

Variables	(1) CPS	(2) CPS	(3) CPS	(4) CPS
One or More Female Directors, *t - 1*		0.00895*		
		(0.00460)		
One Female Director, *t - 1*	0.000179			
	(0.00519)			
Two Female Directors, *t - 1*	0.00133			
	(0.00616)			
Three or More Female Directors, *t – 1*	-0.000442			
	(0.00750)			
One Female Director on Compensation Committee, *t - 1*			0.000929	-0.00227
			(0.00317)	(0.00312)
Two or More Female Directors on Compensation Committee, *t - 1*				-0.0145***
				(0.00542)
Two Female Directors on Compensation Committee, *t - 1*			-0.00107	
			(0.00501)	
Three or More Female Directors on Compensation Committee, *t - 1*			-0.0178	
			(0.0144)	
CEO is Chair	0.0139***	0.0114***	0.0139***	0.0115***
	(0.00444)	(0.00370)	(0.00443)	(0.00367)
CEO Tenure	0.000925**	0.000331	0.000926**	0.000286
	(0.000409)	(0.000348)	(0.000408)	(0.000343)
CEO Ownership	-0.00355	-0.0712***	-0.00340	-0.0711***
	(0.0228)	(0.0226)	(0.0229)	(0.0225)
Relative Equity Compensation	0.206***	0.237***	0.206***	0.238***
	(0.0133)	(0.0148)	(0.0133)	(0.0147)
Board Size	-0.00365***	-0.00342***	-0.00367***	-0.00305***
	(0.00104)	(0.000987)	(0.00106)	(0.000951)
Board Independence	0.0722***	0.157***	0.0722***	0.166***
	(0.0226)	(0.0191)	(0.0225)	(0.0191)
Compensation Committee Size	-0.000844	0.00105	-0.000820	0.00157
	(0.00162)	(0.00162)	(0.00163)	(0.00161)
Compensation Committee Independence	-0.0348	-0.0359	-0.0344	-0.0402
	(0.0300)	(0.0337)	(0.0299)	(0.0330)
Firm Age	0.00195***	9.64e-05	0.00199***	0.000122
	(0.000621)	(0.000114)	(0.000605)	(0.000113)
Firm Size	-0.00634	0.00146	-0.00641	0.00202
	(0.00521)	(0.00164)	(0.00521)	(0.00163)
Firm Growth	0.0148	0.0129	0.0148	0.0110
	(0.00901)	(0.00935)	(0.00902)	(0.00929)
Growth Opportunity	-0.0151**	-0.0269***	-0.0151**	-0.0275***
	(0.00631)	(0.00573)	(0.00629)	(0.00575)
Firm Leverage	-0.000883	-0.000626	-0.000882	-0.000684
	(0.000910)	(0.000855)	(0.000909)	(0.000861)
Industry Adjusted Tobin's Q	0.00495*	-0.00603**	0.00491*	-0.00622**
	(0.00276)	(0.00262)	(0.00275)	(0.00262)
Industry Adjusted ROA	0.0554**	0.0622**	0.0556**	0.0629**
	(0.0248)	(0.0249)	(0.0248)	(0.0249)
Firm fixed effects	Yes	No	Yes	No
Industry fixed effects	No	Yes	No	Yes

(Continued)

Table 3 (Continued)

Variables	(1) CPS	(2) CPS	(3) CPS	(4) CPS
Year dummies	Yes	Yes	Yes	Yes
Observations	8,918	8,809	8,913	8,804
R-squared	0.113	0.203	0.113	0.203

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

6.4. Measurements of Openness to Gender Diversity and CEO Power

The main purpose of this thesis is to not only assess the relationship between female directors and CEO power, but to also evaluate the effect of a female friendly environment in the upper echelons of a firm on the relationship between female directors and CEO power. This is assessed by including the connectedness of male directors to female CEOs, and the gender gap in executive pay as measurements of openness to gender diversity in the analyses.

6.4.1. Connectedness of Male Directors to Female CEOs and CEO Power

Hypothesis 4 predicts that the effect of female directors on CEO power will be stronger, when more male directors sit on boards of firms that are led by female CEOs. However, in Table 4, Model 1, with firm fixed effects, shows that effect of the interaction between the *Proportion of Female Directors* and *Board Ties to Female CEOs* on CPS, is not statistically significant. In addition, in Table 4, Model 2, with industry fixed effects, this effect is also not statistically significant. This results suggest that when male directors are more connected to female CEOs, it does not strengthen the relation between the proportion of female directors and CEO power.

To further investigate this relationship on the compensation committee level, I perform two additional tests. In Table 4, Model 3, with firm fixed effects, shows that there is also no statistically significant effect of the interaction between the *Proportion of Female Directors on the Compensation Committee*, and *Board Ties to Female CEOs* on *CPS*. In addition, in Table 4, Model 4, with industry fixed effects, shows no significant relationship between this interaction variable and *CPS*. This results suggest that when male directors are more connected to female CEO, it does not strengthen the relation between the proportion of female directors on the compensation committee and CEO power.

Overall, these results are not in line with my expectations. The connectedness of male directors to female CEOs seems to have no influence on the effect of female directors on CEO power.

In Table 4, Model 3, with firm fixed effects, shows that the *Board Ties to Female CEOs* is negatively correlated with *CPS*, and statistically significant at the 10% level. The precise mechanisms behind this effect are unclear and require future research. In current literature, no existing theories cover the topic of board ties to female CEO's and their effect on CPS that could aide the interpretation of this effect.

Compared to Table 2, in Table 4, Model 1 and Model 3, with firm fixed effects, now show that *Firm Growth* is positively correlated with *CPS*, and statistically significant at the 10% level. This result is not in line with the previous study by Usman, Zhang, Wang et al. (2018). However, this relationship has not been studied as rigorously and thoroughly in literature. Therefore, it remains unclear to which degree *Firm Growth* relates to CEO power.

Table 4

The effect of the interaction between the connectedness of male directors to female CEOs and female directors on CPS

Variables	(1) CPS	(2) CPS	(3) CPS	(4) CPS
Proportion of Female Directors, *t - 1*	0.0110	0.00842		
	(0.0218)	(0.0181)		
Proportion of Female Directors on Compensation Committee, *t - 1*			0.00824	-0.0171*
			(0.00967)	(0.0103)
Board Ties to Female CEOs	-0.0341	0.0346	-0.0576*	0.0248
	(0.0391)	(0.0397)	(0.0325)	(0.0343)
Proportion of Female Directors X Board Ties to Female CEOs, *t - 1*	-0.174	-0.152		
	(0.215)	(0.197)		
Proportion of Female Directors on Compensation Committee X Board Ties to Female CEOs, *t - 1*			-0.0282	-0.0824
			(0.129)	(0.129)
CEO is Chair	0.0136***	0.0114***	0.0135***	0.0114***
	(0.00443)	(0.00372)	(0.00441)	(0.00367)
CEO Tenure	0.000946**	0.000310	0.000948**	0.000288
	(0.000408)	(0.000347)	(0.000408)	(0.000341)
CEO Ownership	-0.00359	-0.0706***	-0.00362	-0.0707***
	(0.0228)	(0.0225)	(0.0228)	(0.0224)
Relative Equity Compensation	0.206***	0.238***	0.206***	0.238***
	(0.0133)	(0.0148)	(0.0133)	(0.0148)
Board Size	-0.00370***	-0.00307***	-0.00367***	-0.00301***
	(0.00105)	(0.000964)	(0.00105)	(0.000953)
Board Independence	0.0725***	0.161***	0.0724***	0.167***
	(0.0225)	(0.0192)	(0.0225)	(0.0191)
Compensation Committee Size	-0.000879	0.000998	-0.000938	0.00101
	(0.00162)	(0.00162)	(0.00162)	(0.00162)
Compensation Committee Independence	-0.0347	-0.0374	-0.0345	-0.0400
	(0.0299)	(0.0337)	(0.0297)	(0.0332)
Firm Age	0.00208***	0.000110	0.00206***	0.000118
	(0.000631)	(0.000114)	(0.000610)	(0.000113)
Firm Size	-0.00685	0.00171	-0.00670	0.00194
	(0.00519)	(0.00166)	(0.00519)	(0.00163)
Firm Growth	0.0151*	0.0125	0.0148*	0.0115
	(0.00900)	(0.00932)	(0.00899)	(0.00929)
Growth Opportunity	-0.0148**	-0.0269***	-0.0149**	-0.0274***
	(0.00628)	(0.00577)	(0.00628)	(0.00575)
Firm Leverage	-0.000859	-0.000641	-0.000863	-0.000641
	(0.000911)	(0.000856)	(0.000911)	(0.000861)
Industry Adjusted Tobin's Q	0.00496*	-0.00597**	0.00496*	-0.00609**
	(0.00276)	(0.00262)	(0.00276)	(0.00262)
Industry Adjusted ROA	0.0558**	0.0620**	0.0564**	0.0617**
	(0.0249)	(0.0250)	(0.0249)	(0.0250)
Firm fixed effects	Yes	No	Yes	No
Industry fixed effects	No	Yes	No	Yes
Year dummies	Yes	Yes	Yes	Yes
Observations	8,918	8,809	8,913	8,804
R-squared	0.114	0.202	0.114	0.203

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

6.4.2. Gender Gap in Executive Pay and CEO Power

Hypothesis 5 predicts that the effect of female directors on CEO power will be stronger as the gender gap in between male and female executives decreases. In Table 5, Model 1, with firm fixed effects, shows that the effect of the interaction between the *Proportion of Female Directors* and the *Gender Gap in Executive Pay* on *CPS* is not statistically significant. In addition, in Table 5, Model 2, with industry fixed effects, this effect is also not statistically significant. These results are not in line with my expectations.

To further investigate this relationship on the compensation committee level, I performed two additional tests. In Table 5, Model 3, with firm fixed effects, shows that there is also no statistically significant effect of the interaction between *Proportion of Female Directors on the Compensation Committee* and the *Gender Gap in Executive Pay* on *CPS*. In addition, in Table 5, Model 4, with industry fixed effects, shows no significant relationship between this interaction variable and *CPS*. These results are not in line with my expectations.

Overall, these results suggest that when the differences in compensation of male and female executives decrease, it does not strengthen the relation between the proportion of female directors and CEO power.

In Table 5, all Models show a negative correlation between the *Gender Gap in Executive Pay* and *CPS*. However, conclusions are difficult to draw, as this thesis was the first to investigate this effect, and current research does not specifically address this topic. Therefore, more research is needed to understand the full implications of gender gap in executive pay and its effect on CPS.

Compared to Table 2, Table 5 shows less significant control variables. The discrepancies deviate more considerably from the previous Tables, because Table 5 includes around 2,850 observations while the previous Tables include around 8,850 observations. This differences in the number of observations occur due to missing values in the *Gender Gap in Executive Pay*. Obviously, the *Gender Gap in Executive Pay* is missing for firms that do not have a female in top 5 executive team, excluding the CEO.

CEO is Chair and *Industry Adjusted Tobin's Q* are not statistically significant anymore in all 4 Models. This is not in line with my expectations, however this could be due to the limited number of observations.

In Models 2 and 4, *CEO Tenure* is now also positively correlated with CPS, and statistically significant at the 1% level. This is in agreement with my expectations, as I expected that CEO power increases with the number of years a CEO has served as the company's CEO.

Board Size, *Board Independence*, and *Firm Age* are not statistically significant anymore in Models 1 and 3. In addition, *Industry Adjusted ROA* is not statistically significant anymore in Models 2 and 4. Again, this may be explained by the limited number of observations.

Table 5

The effect of the interaction between the gender gap in executive pay and female directors on CPS

Variables	(1) CPS	(2) CPS	(3) CPS	(4) CPS
Proportion of Female Directors, t - 1	-0.0112	-0.0120		
	(0.0376)	(0.0284)		
Proportion of Female Directors on Compensation Committee, t - 1			0.0129	-0.0127
			(0.0188)	(0.0155)
Gender Gap in Executive Pay	-1.64e-05***	-9.44e-06**	-1.10e-05***	-8.94e-06***
	(5.49e-06)	(4.31e-06)	(3.11e-06)	(2.65e-06)
Proportion of Female Directors X Gender Gap in Executive Pay, t - 1	2.78e-05	1.53e-05		
	(2.75e-05)	(2.19e-05)		
Proportion of Female Directors on Compensation Committee X Gender Gap in Executive Pay, t - 1			-9.24e-07	1.37e-05
			(1.35e-05)	(1.09e-05)
CEO is Chair	0.00184	-0.000162	0.00140	-0.000379
	(0.00903)	(0.00591)	(0.00907)	(0.00584)
CEO Tenure	0.00199**	0.00180***	0.00198**	0.00178***
	(0.000842)	(0.000590)	(0.000846)	(0.000588)
CEO Ownership	-0.00142	-0.0748*	-0.00132	-0.0742*
	(0.0276)	(0.0383)	(0.0276)	(0.0384)
Relative Equity Compensation	0.250***	0.253***	0.249***	0.254***
	(0.0226)	(0.0245)	(0.0225)	(0.0245)
Board Size	-0.00144	-0.00245*	-0.00145	-0.00253*
	(0.00189)	(0.00137)	(0.00189)	(0.00136)
Board Independence	0.0194	0.130***	0.0205	0.130***
	(0.0417)	(0.0331)	(0.0418)	(0.0332)
Compensation Committee Size	0.00141	-0.000564	0.00126	-0.000501
	(0.00306)	(0.00249)	(0.00305)	(0.00249)
Compensation Committee Independence	-0.0486	-0.0194	-0.0494	-0.0207
	(0.0541)	(0.0559)	(0.0541)	(0.0553)
Firm Age	-0.000201	0.000406**	-0.000276	0.000398**
	(0.00121)	(0.000195)	(0.00121)	(0.000192)
Firm Size	0.00663	0.00199	0.00632	0.00215
	(0.00887)	(0.00220)	(0.00879)	(0.00218)
Firm Growth	0.0149	0.0148	0.0155	0.0145
	(0.0167)	(0.0174)	(0.0167)	(0.0174)
Growth Opportunity	-0.0425***	-0.0323***	-0.0430***	-0.0324***
	(0.0115)	(0.00948)	(0.0116)	(0.00944)
Firm Leverage	-0.00103	-0.000673	-0.00101	-0.000666
	(0.00130)	(0.00110)	(0.00130)	(0.00109)
Industry Adjusted Tobin's Q	0.00335	-0.00385	0.00308	-0.00384
	(0.00408)	(0.00355)	(0.00405)	(0.00356)
Industry Adjusted ROA	0.0875*	0.0671	0.0841*	0.0661
	(0.0455)	(0.0469)	(0.0458)	(0.0470)
Firm fixed effects	Yes	No	Yes	No
Industry fixed effects	No	Yes	No	Yes
Year dummies	Yes	Yes	Yes	Yes
Observations	2,885	2,824	2,884	2,823
R-squared	0.176	0.251	0.175	0.252

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

7. Robustness Checks

In this section I will perform additional tests in order to check the robustness of the found results. I will address endogeneity issues by performing Two-Stage Least Squares (2SLS) regressions.

7.1. Endogeneity Issues

In this thesis my main prediction is that the proportion of female directors is negatively correlated with CEO power due to their monitoring effect. More specifically, I find a negative correlation between the proportion of female directors on the compensation committee and CEO power. However, endogeneity issues arise when trying to make accurate predictions with regard to the causality of this relationship. As discussed in Section 4 the analysis of the effect of female directors on CEO power, is prone to endogeneity issues in two ways. First, by unobservable variables that affect both the proportion of female directors and CEO power could be omitted, such as corporate culture. Second, reverse causality, which could explain the relation between the proportion of female directors and CEO power. The proportion of female directors may influence CEO power, but the amount of power a CEO has in itself, could also affect the decision of women to join a certain board.

I will address this issue by estimating a Two-Stage Least Squares (2SLS) regression by using "the fraction of male directors on the board who sit on other boards on which there are female directors" (Adams and Ferreira, 2009, p. 306) as the IV. This is a proxy for the connectedness of male directors to other female directors. The more connections male directors have to female directors, the more female directors are expected to sit on a board.

In Table 6, Model 1, with firm fixed effects, shows that the instrument, *Board Ties to Female Directors*, is not correlated with *CPS*. In addition, in Table 7, Model 1, with industry fixed effects, also shows no correlation between the instrument and *CPS*. In Table 6, Model 2 shows the first stage of the 2SLS regression with firm fixed effects, I find that the instrument is not correlated with the *Proportion of Female Directors*. However, in Table 7, Model 2 shows the first stage of the 2SLS regression with industry effects, I find that the instrument is positively correlated with the *Proportion of Female Directors* at the 10% level. Overall, these results could be evidence that the rationale behind the instrument is credible, because I find no correlation between the instrument and the dependent variable for both Models, and I find a positive correlation between the instrument and the independent variable in the Model with industry fixed effects.

In Table 6, Model 3 shows the second stage of the 2SLS regression with firm fixed effects, I find that the instrument is not correlated with *CPS*. In addition, in Table 7, Model 3 shows the second stage of the 2SLS regression with industry fixed effects, I find no correlation between the instrument and *CPS*. The results indicate that the causality of the *Proportion of Female Directors* on *CPS* is not robust when addressing the endogeneity concerns with this particular instrument.

In Addition, Table A4 (see Appendix A) shows the second stages of the 2SLS regressions with the interactions between the *Proportion of Female Directors* and the measurements for the openness to gender diversity on *CPS*. For all Models, the interaction variable coefficients are not statistically significant. The results indicate that the causality of the *Proportion of Female Directors* on *CPS* when the measurements for the openness to gender diversity are included are not robust when addressing the endogeneity concerns with this particular instrument.

Table 6

The results of the first-and second stage regressions of the effect of female directors on CEO power, with firm fixed effects

Variables	(1) CPS	(2) Proportion of Female Directors, *t - 1*	(3) CPS
Board Ties to Female Directors	0.0146	-0.0117	
	(0.0116)	(0.00886)	
Proportion of Female Directors, *t - 1*			-0.895
			(1.233)
CEO is Chair	0.00981**	0.00400	0.0156**
	(0.00411)	(0.00270)	(0.00696)
CEO Tenure	0.00111***	-4.77e-05	0.00113**
	(0.000421)	(0.000206)	(0.000494)
CEO Ownership	-0.0108	0.0160*	0.0171
	(0.0294)	(0.00953)	(0.0419)
Relative Equity Compensation	0.213***	-0.00843	0.196***
	(0.0138)	(0.00536)	(0.0188)
Board Size	-0.00530***	0.0307***	0.0237
	(0.00199)	(0.00136)	(0.0382)
Board Independence	0.0469	0.427***	0.467
	(0.0291)	(0.0209)	(0.527)
Compensation Committee Size	-0.000189	0.000816	-0.000250
	(0.00166)	(0.00112)	(0.00226)
Compensation Committee Independence	-0.0499*	-0.0391**	-0.0776
	(0.0287)	(0.0191)	(0.0598)
Firm Age	0.00212***	0.00407***	0.00556
	(0.000585)	(0.000457)	(0.00495)
Firm Size	-0.00483	-0.00379	-0.0122
	(0.00498)	(0.00456)	(0.00856)
Firm Growth	0.0197**	0.00401	0.0241**
	(0.00936)	(0.00526)	(0.0123)
Growth Opportunity	-0.0114*	-0.00553	-0.0174*
	(0.00614)	(0.00392)	(0.0103)
Firm Leverage	-0.00106	-0.000132	-0.000531
	(0.000817)	(0.000539)	(0.00101)
Industry Adjusted Tobin's Q	0.00421	-0.000422	0.00412
	(0.00276)	(0.00169)	(0.00353)
Industry Adjusted ROA	0.0526**	0.00344	0.0664**
	(0.0249)	(0.0134)	(0.0280)
External Board Seats by Directors	-0.000362	0.000771	0.000267
	(0.000780)	(0.000621)	(0.000825)
Male External Board Seats	0.00324	-0.0459***	-0.0404
	(0.00217)	(0.00161)	(0.0567)
Firm fixed effects	Yes	Yes	Yes
Industry fixed effects	No	No	No
Year dummies	Yes	Yes	Yes
Observations	8,600	7,498	7,498

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

Table 7

The results of the first-and second stage regressions of the effect of female directors on CEO power, with industry fixed effects

Variables	(1) CPS	(2) Proportion of Female Directors, *t - 1*	(3) CPS
Board Ties to Female Directors	0.0147	0.0145*	
	(0.0198)		
		(0.00831)	
Proportion of Female Directors, *t - 1*			3.524
			(2.245)
CEO is Chair	0.00765**	0.00137	0.00310
	(0.00356)	(0.00219)	(0.00912)
CEO Tenure	0.000490	-0.000542***	0.00245*
	(0.000359)	(0.000151)	(0.00138)
CEO Ownership	-0.0370*	0.0235**	-0.112*
	(0.0211)	(0.0103)	(0.0640)
Relative Equity Compensation	0.248***	-0.00513	0.254***
	(0.0154)	(0.00572)	(0.0274)
Board Size	-0.00309*	0.0557***	-0.199
	(0.00165)	(0.00121)	(0.124)
Board Independence	0.143***	0.761***	-2.524
	(0.0249)	(0.0160)	(1.715)
Compensation Committee Size	0.000942	-0.000638	0.00277
	(0.00155)	(0.000938)	(0.00376)
Compensation Committee Independence	-0.0451	-0.0425	0.126
	(0.0351)	(0.0286)	(0.157)
Firm Age	0.000162	0.000170**	-0.000462
	(0.000111)	(6.89e-05)	(0.000475)
Firm Size	0.000471	0.00138	-0.00474
	(0.00184)	(0.00105)	(0.00548)
Firm Growth	-0.000358	-0.00639	0.0293
	(0.00984)	(0.00564)	(0.0258)
Growth Opportunity	-0.0274***	-0.00161	-0.0233*
	(0.00593)	(0.00360)	(0.0139)
Firm Leverage	-0.000932	-0.000528	0.00116
	(0.000807)	(0.000518)	(0.00210)
Industry Adjusted Tobin's Q	-0.00741***	-0.00177	-0.000990
	(0.00268)	(0.00134)	(0.00642)
Industry Adjusted ROA	0.0671***	0.000813	0.0662
	(0.0247)	(0.0140)	(0.0543)
External Board Seats by Directors	-0.00166**	0.000346	-0.00318
	(0.000801)	(0.000503)	(0.00259)
Male External Board Seats	0.00127	-0.0807***	0.285
	(0.00192)	(0.00143)	(0.181)
Firm fixed effects	No	No	No
Industry fixed effects	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Observations	8,511	7,411	7,411

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

8. Comparison of Results with Other Studies

The results of my study on the effect of the proportion of female directors on CEO power differ from the results of the paper by Usman, Zhang, Farooq et al. (2018). They find a positive relationship between the proportion of female directors and CEO power, whereas I find no direct significant relationship. A possible explanation for this discrepancy may be the geographical differences in the sample data. More specifically, my study only includes US firms, while their paper only includes Chinese firms. A big difference in the US and the Chinese market is that in the Chinese market a relatively high percentage of the firms are state owned enterprises (SOE). In the sample of Usman, Zhang, Farooq et al. (2018) about 50% of the firms were SOE. After the introduction of the Chinese corporate law system in 1993, SOEs required board of directors, which not all SOEs previously had (Lei, 2019). Under this new law, the responsibilities of the management team, including the CEO, were not well defined, and the boards of directors were not given the task to monitor the CEOs. More specifically, most of the directors were part of the management team as well, thereby often voting in line with the CEO. Therefore, the positive relationship of female directors on CEO power by the paper of Usman, Zhang, Farooq et al. (2018) could be explained by the discrepancy of the manager – board relationship in China.

In addition, while my study covers about the same time period, 2007 to 2017 compared to 2005 to 2015, the paper of Usman, Zhang, Farooq et al. (2018) has around double the firm-year observations. More specifically, my final sample includes around 8,850 firm-year observations, while their paper includes 17,420 firm-year observations. It is important to bear this in mind while comparing the results.

Another important difference in the research methodology is the choice of the instrument variable to address endogeneity issues. I used the widely accepted instrument from Adams and Ferreira (2009), namely the connectedness of male directors to female directors on other boards, while Usman, Zhang, Farooq et al. (2018) just used the lagged proportion of female directors. Moreover, in my study, the results did not hold when addressing the endogeneity issues with my instrument, whereas in their study the results did hold when addressing these issues with their instrument. It is important to weigh these instrument variables and assess their soundness, since the results of Usman, Zhang, Farooq et al. (2018) may not hold when using the widely accepted instrument from Adams and Ferreira (2009).

As most decisions regarding executive compensations are not made at board level, but at compensation committee level instead, I also examined the effect of female directors on the compensation committee on CEO power (Kesner, 1988). I find a negative relationship between the proportion of female directors on the compensation committee and CEO power. This results are in line with the vast majority of studies in the literature that predict a monitoring effect of the presence of female directors on board decisions (Adams and Ferreira, 2009; Ahmed and Ali, 2017; García-Sánchez et al., 2017; Luo et al., 2017; Usman, Zhang, Farooq et al., 2018). As no prior studies have been done on this exact relationship, it is difficult to relate my results to other studies directly. However, Usman, Zhang, Wang et al. (2018) find a negative relationship between the proportion of female directors on the compensation committee and the CEO's total compensation. If the CEO's compensation decreases

more than the compensation of the other executives in the top 5 executive team, we would expect CPS to decrease. However, they did not examine the effect of female directors on the compensation committee on the compensation of other executives. Therefore, direct comparison with my results is difficult.

As a key contribution of this thesis, my thesis extends the research on the effect of the proportion of female directors on CEO power, by trying to determine the critical mass. From my search of literature, the predicted critical mass for female directors is three (Granovetter, 1978; You, 2019). Surprisingly, I find a critical mass of only one female director to exert influence on CEO power. More specifically, I find that firms with at least one female director in comparison to firms with no female directors, increase CEO power. This positive relationship I find, is more similar to the positive relationship found by Usman, Zhang, Farooq et al. (2018). However, comparing these results must be done with caution, since Usman, Zhang, Farooq et al. (2018) only examined the proportion of female directors on CEO power, and did not use dummy variables based on the number of female directors in their methodology.

Moreover, my thesis suggests that the openness to gender diversity in the upper echelons of a firm does not strengthen the effect of female directors on CEO power. As this paper is the first study on this topic, I am not able to compare my results with other papers. Future research seeking to use this methodology should attempt to define more refined measurements of a female friendly environment. It should seek to label environments of firms in a dichotomous manner either as female friendly, or female unfriendly, in order to improve the model.

9. Conclusions

In this section, I discuss *(1)* the principal findings, *(2)* discuss the mechanisms and implications of my results, (3) name weaknesses of this study, *(3)* compare my results with other studies, and (4) consider avenues for further research.

9.1. Principal Findings

The objective of this thesis is to determine the effect of female directors on CEO power, and whether this is impacted by the presence of a female friendly environment in the upper echelons of a firm. In order to measure the effects on CEO power, I use a popular proxy for CEO power, namely the CEO pay slice (CPS) from Bebchuk et al. (2011). By using this proxy, I find no direct relationship between the proportion of female directors on the board and CEO power. However, I do find that for my sample there is a critical mass of one female director on the board in order to exert positively significant influence on CEO power. Moreover, when examining the relationship between female directors and CEO power on board committee level, I find that the proportion of female directors on the compensation committee negatively affects CEO power. Noteworthy, I find a critical mass of two female directors on the compensation committee to influence CEO power. More, specifically I find that that having at least two women on the compensation committee negatively influences CEO power and having only one

woman on the committee does not influence CEO power. Lastly, a female friendly environment in the upper echelons of a firm does not effect the relationship between female directors and CEO power.

9.2. Meaning of the Study: Possible Mechanisms and Implications

The findings of my thesis do not support legislative quotas of women on boards, when assessing the effect of female directors on CEO power, due to the power imbalances between male and female directors. For my sample, I find no relationship between the proportion of female directors on the board and CEO power, and having at least one female director on the board has a positive effect on CEO power. The results suggest that female directors do not increase the monitoring of a board, and may even worsen it when assessing its effect on CEO power. However, an increase in the number of female directors on the compensation committee does increase the monitoring effect of the board, consequently resulting in less CEO power. At this moment the legislative quotas of women only apply to board level, and not to committee level. Based on my findings, it may be meaningful to rethink the design of legislative quotas of female directors. Additionally, based on my findings with regard to CEO power, it may be relevant to introduce quotas on committee level, in order to increase the effectiveness of legislative quotas of women on boards.

A notable result is the negative effect of having at least two female directors on the compensation committee on CEO power, which is in contrast with the positive effect of having at least one female director on the board on CEO power. This is a seemingly contradictory result. However, this negative effect may in part be explained by the fact that the compensation committee is a smaller group in itself. In my data sample, a compensation committee consists of four directors on average, whereas a board usually consists of ten directors. Seemingly, group size could be an influential factor in itself, which can be further explained by two phenomena. Firstly, the results may imply that the power imbalance between men and women becomes exaggerated in a larger group. Secondly, the concept of female rivalry could weaken a female alliance within a larger group.

The power imbalances may become exaggerated due to women being a relatively smaller part of the group when a board increases in size. For example, within the board, consisting of a group of 10 directors, two women are more of a minority, when compared to the compensation committee which consists on average of four directors. Within the smaller group of a compensation committee the presence of women can increase the monitoring effect, because they are a relatively large part of the group. In contrast, within the board, with ten directors, they are a smaller portion of the group, consequently, male directors could perceive them as "weaker". When the women on the board are seen as weaker, their opinions are less influential, consequently diminishing their monitoring effect. Summarizing all of the above, the power imbalances between men and women on the board, , could diminish the monitoring effect of female directors (Eagly and Carli, 2003; Usman, Zhang, Farooq et al., 2018).

Additionally, the concept of female rivalry in boards, could weaken the 'female alliance', because women might see other women as their competitors instead of allies (Ely, 1994). This effect could potentially be influenced by group size. The smaller the group of which the women are part of, the less likely they will see themselves as weaker minority, and will therefore be less likely to obstruct each other. Therefore, larger groups could decrease the monitoring effect of female directors on CEO power. Since several aspects of the effect of female directors on CEO power, and the moderating effect of group size remain unaddressed, future research is required.

Another noteworthy aspect is that due to mixed results, the implication of a female friendly environment in the upper echelons of firms on the effect between the relationship of female directors and CEO power is still unclear. Further study is needed to uncover the underlying mechanisms of this phenomenon.

9.3. Weaknesses of this Study

This work suffers from a number of limitations. First, an important caveat for interpreting my study is that I use CPS as proxy for CEO power. With this proxy CEO power is heavily dependent on the compensation a CEO receives, rather than on the actual power a CEO has on the decision-making processes of a firm. Moreover, the use of proxies in general allows for limited generalizations of effects. Consequently, it is difficult to assess the effects of female directors on CEO power.

Secondly, a drawback of this thesis is that CPS is the proxy that is used for CEO power. While CPS gives an indication of the relative power of a CEO, further studies should consider other proxies in order to validate the results found in this thesis.

Lastly, the causality of the results should be interpreted with caution, as the effect of female directors on CEO power is prone to endogeneity issues. In particular, the 2SLS regressions shows that the found effects do not hold, when trying to address these endogeneity concerns with my particular instrument. Consequently, no conclusion can be drawn whether female directors influence CEO power or that female directors choose certain boards to join due to the corporate culture, which may be associated with CEO power. It is one of the most important limitations of this study, and consequently, this question is very difficult to answer.

9.4. Unanswered Questions and Future Research

There are a number of ways in which the ideas presented in this thesis could be developed further, in this section I will list three ideas.

First, the causality of the effect of female directors on CEO power should be further reviewed. More specifically, future research should investigate whether CEO power is a factor that influences the decision-making process of women on whether or not to join a board.

Secondly, in future work, it may be useful to further identify measurements of a female friendly environment in the upper echelons of a firm. Additionally, it may be interesting to weigh these measurements, and classify firms either as open to gender diversity, or not open to gender diversity, instead of using separate measures. This classification allows for the comparison of the effect of female directors in firms with a female friendly environment versus firms with a less female friendly environment on CEO power.

Lastly, the influence of state-owned enterprises on the effect of female directors on CEO power should be further analyzed, as this could be a possible explanation for the discrepancy in the results of my study and the study of Usman, Zhang, Farooq et al. (2018).

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Appendix A: Tables

Table A1

Description of variables

Variables	Variable description
CPS	CEO Pay Slice. Proportion of total compensation of top five executives captured by the CEO
Proportion of Female Directors	Proportion of women on the board
Proportion of Female Directors on Compensation Committee	Proportion of women on the compensation committee
One Female Director	Dummy, equals 1 if there is exactly one woman on the board, 0 otherwise
Two Female Directors	Dummy, equals 1 if there are exactly two women on the board, 0 otherwise
One or More Female Directors	Dummy, equals 1 if there is at least one woman on the board, 0 otherwise
Two or More Female Directors	Dummy, equals 1 if there are at least two women on the board, 0 otherwise
Three or More Female Directors	Dummy, equals 1 if there are at least three women on the board, 0 otherwise
One Female Director on the Compensation Committee	Dummy, equals 1 if there is exactly one woman on the compensation committee, 0 otherwise
Two Female Directors on the Compensation Committee	Dummy, equals 1 if there are exactly two women on the compensation committee, 0 otherwise
One or More Female Directors on the Compensation Committee	Dummy, equals 1 if there is at least one woman on the compensation committee, 0 otherwise
Two or More Female Directors on the Compensation Committee	Dummy, equals 1 if there are at least two women on the compensation committee, 0 otherwise
Three or More Female Directors on the Compensation Committee	Dummy, equals 1 if there are at least three women on the compensation committee, 0 otherwise
Board Ties to Female CEOs	Proportion of male directors who have board ties to firms with female CEOs
Gender Gap in Executive Pay	Difference between the average pay of male executives and female executives, excluding the CEO
Proportion of Female Executives	Proportion of women of top five executives
CEO is Chair	Dummy, equals 1 if CEO is also chair on the board, 0 otherwise

(Continued)

Table A1 (Continued)

Variables	Variable description
CEO Tenure	The number of years the CEO has served as the company's CEO
CEO Ownership	Dummy, equals 1 if CEO holds at least 20% of outstanding shares, 0 otherwise
Relative Equity Compensation	Ratio of the fraction of the equity compensation of the CEO in comparison with other executives
Board Size	Number of directors on the board
Board Independence	Proportion of independent directors on the board
Compensation Committee Size	Number of directors on the compensation committee
Compensation Committee Independence	Proportion of independent directors on the compensation committee
Firm Age	Difference between the fiscal year and the moment when data was available on Compustat
Firm Size	Log of total assets
Firm Growth	Current year's assets minus previous year's assets, divided by the current year's assets
Growth Opportunity	Book-to-market ratio
Firm Leverage	Ratio of total debt to total assets
Industry Adjusted Tobin's Q	Total assets plus the market value of equity minus the book value of equity, all divided by total assets. Thereafter, it is industry adjusted at the four-digit SIC level.
Industry Adjusted ROA	Net income divided by total assets. Thereafter, it is industry adjusted at the four-digit SIC level.
Board Ties to Female Directors	The proportion of male directors who have board ties to boards on which there sits at least one female director
External Board Seats by Directors	Total number of external board seats by directors
Male External Board Seats	Total number of male external board seats

Table A2

The critical mass of female directors on CPS

Variables	(1) CPS	(2) CPS
One or More Female Directors, $t-1$	0.000349	
	(0.00518)	
One Female Director, $t-1$		0.000251
		(0.00519)
Two or More Female Directors, $t-1$		0.00124
		(0.00616)
CEO is Chair	0.0138***	0.0138***
	(0.00444)	(0.00444)
CEO Tenure	0.000924**	0.000925**
	(0.000409)	(0.000408)
CEO Ownership	-0.00344	-0.00353
	(0.0229)	(0.0228)
Relative Equity Compensation	0.206***	0.206***
	(0.0133)	(0.0133)
Board Size	-0.00365***	-0.00367***
	(0.00105)	(0.00105)
Board Independence	0.0725***	0.0723***
	(0.0226)	(0.0226)
Compensation Committee Size	-0.000838	-0.000848
	(0.00162)	(0.00162)
Compensation Committee Independence	-0.0346	-0.0346
	(0.0300)	(0.0300)
Firm Age	0.00195***	0.00192***
	(0.000606)	(0.000608)
Firm Size	-0.00629	-0.00629
	(0.00521)	(0.00520)
Firm Growth	0.0148	0.0148*
	(0.00901)	(0.00901)
Growth Opportunity	-0.0151**	-0.0150**
	(0.00630)	(0.00631)
Firm Leverage	-0.000886	-0.000885
	(0.000910)	(0.000910)
Industry Adjusted Tobin's Q	0.00498*	0.00497*
	(0.00276)	(0.00276)
Industry Adjusted ROA	0.0553**	0.0552**
	(0.0248)	(0.0248)
Firm fixed effects	Yes	Yes
Industry fixed effects	No	No
Year dummies	Yes	Yes
Observations	8,918	8,918
R-squared	0.113	0.113

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

Table A3

The critical mass of female directors on the compensation committee on CPS

Variables	(1) CPS	(2) CPS	(3) CPS
One or More Female Directors on Compensation Committee, *t - 1*	0.000820 (0.00311)		-0.00418 (0.00309)
One Female Director on Compensation Committee, *t - 1*		0.000975 (0.00317)	
Two or More Female Directors on Compensation Committee, *t - 1*		-0.00150 (0.00498)	
CEO is Chair	0.0138*** (0.00444)	0.0138*** (0.00443)	0.0115*** (0.00368)
CEO Tenure	0.000925** (0.000409)	0.000927** (0.000408)	0.000288 (0.000342)
CEO Ownership	-0.00343 (0.0229)	-0.00343 (0.0228)	-0.0707*** (0.0224)
Relative Equity Compensation	0.206*** (0.0133)	0.206*** (0.0133)	0.238*** (0.0148)
Board Size	-0.00364*** (0.00105)	-0.00366*** (0.00105)	-0.00305*** (0.000955)
Board Independence	0.0725*** (0.0225)	0.0723*** (0.0225)	0.165*** (0.0191)
Compensation Committee Size	-0.000860 (0.00162)	-0.000837 (0.00163)	0.00129 (0.00161)
Compensation Committee Independence	-0.0346 (0.0299)	-0.0347 (0.0299)	-0.0390 (0.0333)
Firm Age	0.00194*** (0.000602)	0.00197*** (0.000605)	0.000120 (0.000114)
Firm Size	-0.00630 (0.00521)	-0.00633 (0.00521)	0.00192 (0.00163)
Firm Growth	0.0148 (0.00901)	0.0147 (0.00901)	0.0116 (0.00932)
Growth Opportunity	-0.0150** (0.00629)	-0.0151** (0.00629)	-0.0274*** (0.00573)
Firm Leverage	-0.000885 (0.000910)	-0.000885 (0.000911)	-0.000618 (0.000863)
Industry Adjusted Tobin's Q	0.00497* (0.00276)	0.00496* (0.00275)	-0.00600** (0.00262)
Industry Adjusted ROA	0.0553** (0.0248)	0.0559** (0.0248)	0.0616** (0.0250)
Firm fixed effects	Yes	Yes	No
Industry fixed effects	No	No	Yes
Year dummies	Yes	Yes	Yes
Observations	8,918	8,913	8,809
R-squared	0.113	0.113	0.202

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

Table A4

The results of the second stage regressions of the interaction between the measurements for the openness to gender diversity and female directors on CEO power.

Variables	(1) CPS	(2) CPS	(3) CPS	(4) CPS
Proportion of Female Directors X Board Ties to Female CEOs, *t - 1*	-12.82	-131.7		
	(17.81)	(344.5)		
Proportion of Female Directors X Gender Gap in Executive Pay, *t - 1*			-8.77e-05	0.00236
			(0.000222)	(0.00443)
Proportion of Female Directors, *t - 1*	0.342	2.893	-0.0195	-0.705
	(0.498)	(7.441)	(0.0759)	(1.235)
Board Ties to Female CEOs	2.059	22.50		
	(3.005)	(58.94)		
Gender Gap in Executive Pay			5.73e-06	-0.000440
			(4.20e-05)	(0.000816)
CEO is Chair	0.0110*	-0.0342	-0.00841	0.00898
	(0.00654)	(0.113)	(0.0108)	(0.0240)
CEO Tenure	0.00150**	0.00517	0.00301***	0.000717
	(0.000689)	(0.0122)	(0.000937)	(0.00315)
CEO Ownership	0.00883	-0.0483	-0.00969	-0.0259
	(0.0317)	(0.0769)	(0.0339)	(0.0707)
Relative Equity Compensation	0.205***	0.275*	0.231***	0.307**
	(0.0176)	(0.160)	(0.0244)	(0.137)
Board Size	-0.00517	0.00157	-0.000968	-0.0323
	(0.00377)	(0.0254)	(0.00385)	(0.0645)
Board Independence	0.0832*	0.227	0.0377	-0.222
	(0.0491)	(0.358)	(0.0615)	(0.707)
Compensation Committee Size	-0.000735	0.00919	0.000540	0.00534
	(0.00253)	(0.0257)	(0.00349)	(0.0145)
Compensation Committee Independence	-0.0576	0.146	-0.0582	0.224
	(0.0434)	(0.488)	(0.0723)	(0.513)
Firm Age	0.00291**	0.000996	0.000412	0.000413
	(0.00137)	(0.00250)	(0.00157)	(0.000578)
Firm Size	-0.0183	-0.00571	0.000330	-0.000763
	(0.0144)	(0.0271)	(0.0105)	(0.00922)
Firm Growth	0.0339	0.121	0.0252	-0.0399
	(0.0230)	(0.327)	(0.0176)	(0.134)
Growth Opportunity	-0.00324	0.0343	-0.0434***	-0.0167
	(0.0155)	(0.163)	(0.0152)	(0.0371)
Firm Leverage	0.000901	-0.00369	-0.000617	0.00114
	(0.00223)	(0.0107)	(0.00132)	(0.00484)
Industry Adjusted Tobin's Q	0.00200	0.0111	0.000563	-0.00356
	(0.00528)	(0.0473)	(0.00529)	(0.0126)
Industry Adjusted ROA	0.0396	-0.228	0.101*	0.268
CEO is Chair	(0.0471)	(0.801)	(0.0529)	(0.342)
	0.00263	0.0135	-0.000708	0.00191
CEO Tenure	(0.00350)	(0.0334)	(0.00147)	(0.00386)
	1.63e-05	-0.0212	-0.000613	0.0448
	(0.00325)	(0.0664)	(0.00481)	(0.0919)

(Continued)

Table A4 (Continued)

Variables	(1) CPS	(2) CPS	(3) CPS	(4) CPS
Firm fixed effects	Yes	No	Yes	No
Industry fixed effects	No	Yes	No	Yes
Year dummies	Yes	Yes	Yes	Yes
Observations	7,498	7,411	2,410	2,364

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