

The Glass Ceiling Obstacle and Company's Performance: Panel Study Analysis

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Abstract

This paper examines the impact of women's presence in top management positions (CEOs, CFOs, and Board of Director Members) on a company's financial performance. Though women remain highly underrepresented in senior management positions due to the Glass Ceiling obstacle, few psychological and behavioral studies examining male's and female's leadership styles, heterogeneous gender-diverse groups, and top managers' impact on middle management class create a reasonable background to think that women senior managers may improve company's performance. We test this hypothesis by doing a panel regression analysis on the US top 716 firms during the 2006-2018 period. The study finds that scientific evidence of women board members positively impacting on the company's performance exists. However, for CEO and CFO positions, gender is found to have a non-significant impact on a company's performance.

Keywords: *Panel Study, Glass Ceiling Obstacle, Top Management*

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1. Introduction

The issue of female presence in top management positions is a very vivid topic nowadays. Even though gender equality in terms of legal rights and responsibilities is not even questioned in many countries of the world, the statistics show that women are highly underrepresented when it comes to top-level positions such as boardroom and executive level. This barrier of career advancement for women is known in the literature as a Glass Ceiling obstacle. Figure 1 shows the percent of women in top management positions in the US top 1500 during the 2006-2018 period. As we can see from the graph female CEO's share varied between 2% to 6% during the recent 10 years. Female's presence in CFO position was also low, with the highest value of 10% in 2015. The share of women in the boardroom has a positive trend as women gradually improve their positions in boardroom, however, still their share on average is less than one-quarter level (Wharton School, 2019).

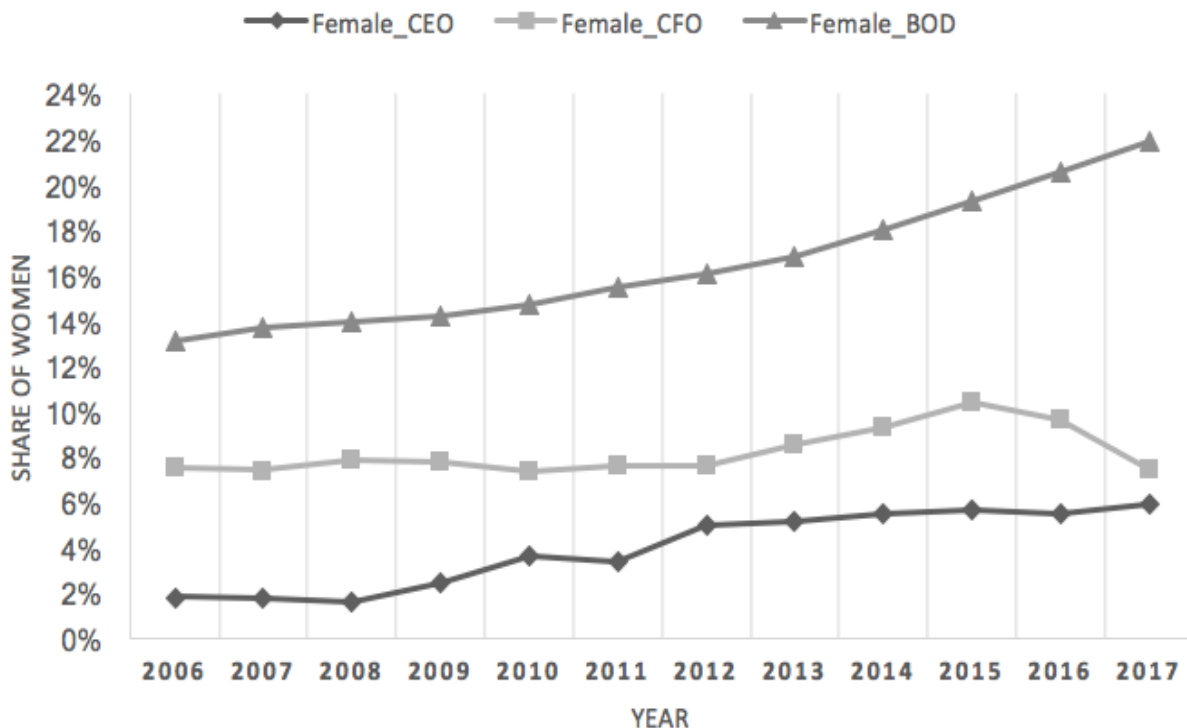


Figure 1: Share of Women in Top US 1500 Firms

The low female participation rate may have very different reasons in behind, yet this paper studies whether scientific evidence of women positively affecting the performance of business exists. A positive relationship would be an important signal for many companies to change their recruitment policies and thus make their performance more efficient by the right usage of female human capital. In response to the underrepresentation of women in senior-level positions, some countries already use quotas designed to increase women's representation in leadership positions by establishing law requirements. Those include Norway, Iceland, Finland, Switzerland, Italy, etc., where according to studies average percentage of women on boards almost doubled after enforcement of the regulation (Catalyst, Women on Corporate Boards, 2018).

There are reasonable backgrounds to think that the increase in the share of women in a top management position can improve a company's performance. Studies have shown that females perform in less-hierarchical and more collaborative managerial style, which improves the information flow within the company and encourages participative decision making (Helgesen, 1995). Additionally, female CEOs are found to have better crisis management skills, perform in a less-risky manner and produce more stable performance (Liswood, 2015) and (Faccio, Marchica, & Mur, 2016). Females presence in the boardroom creates diversity in the management team which may improve the quality of decisions due to an increased availability of alternative options and diverse ways of thinking (Wiersema & Bantel, 1992). Finally, the presence of females in corporate governance team is believed to have a significant positive impact on the performance of middle-management class thanks to transactional leadership characteristics and role model effect (Eagly & Carli, An evaluation of the evidence, 2003) and (Burke & McKeen, 1996).

Empirical studies in the existing literature trying to find a positive relationship between female's share in top management position and company's performance give

ambiguous results (Smith, Smith, & Verner, 2006; Strom & Bohren, 2005; Campbell & Minguez-Vera, 2008). Referring to the studies based on the US data, Shrader failed to find any significant positive effects for the percentage of women in top management and financial performance using the data reported by 200 US firms with the largest market value (Shrader, Blackburn, & Iles, 1997). A more recent study, close to this paper was done by Dezsó and Ross, observing top US 1500 firms' performance during the 1992-2006 period, where they found that female representation in top management improves but only if its strategy is focused on innovation (Dezsó & Ross, 2012).

This paper uses an updated panel data representing the period of 2006-2018 from the ExecuComp database, which reports information on female participation rates in top management positions of US top 1500 firms and their financial performance (Wharton School, 2019). The data includes post-crisis period, which is an important advantage as it enables to highlight the differences among firms' financial outcomes as a result of top management performance and make the results of possible correlation more significant. The other advantage is that as seen from the graph the number of women top managers is gradually increasing. Thus, the updated database is much valuable for capturing the effect of female representation in top management. In our analysis, we measure firms' performance by ROA as the main assessment of company performance. Control factors include firm size (number of employees), management size and sector that affect firm performance indicator of our model.

The results showed that females representation in the boardroom has significant and positive impact on a company's performance. According to estimates, if the number of women in average-sized boardroom increases by 1 the company's ROA is predicted to increase by 0.4%. The analysis also showed that when company with 0-20% female board moves to higher levels till 60%, its ROA increases gradually. In contrast, if considering the

impact of female CEOs and CFOs, the results showed that on an individual level, gender does not make a significant difference on a company's profitability.

Paper has few limitations due to data constraints, which are suggested to be improved in the further researches.

2. Literature Review

Female participation in top management and its possible positive impact on a company's performance has been in the center of interest for many researchers coming from different countries of the world. There are many theoretical reasons behind this hypothesis, the majority of which are based on a broad literature in social psychology, organizational behavior and women's studies. In this section, we will concentrate on a few theoretical explanations of how female presence in top management can affect a company's performance, and discuss empirical studies done by researchers on this topic.

2.1 Different Managerial Style

The various behavioral differences between men and women result in significant variations among their management styles that can affect a company's performance. One of such key important differences is related to risk response behavior. Experimental evidence shows that females are more risk-averse and have a higher sensitivity to risk than their male colleagues (C.Eckel & J.Grossman, 2008). This implies that female top managers are likely to adopt safer strategies and avoid implementing high-risk projects. Companies run by female CEOs are found to have lower leverage, less volatile earnings and low corporate risk-taking than otherwise similar firms run by male CEOs (Faccio, Marchica, & Mur, 2016). Though risk-averse behavior does not necessarily lead to positive results, we can conclude that companies with female CEOs expect to have more stable performance.

According to many studies, women tend to perform in a more collaborative and less hierarchical managerial style in comparison with men. Meta-analytic investigation suggests that females working in top management positions are willing to share their power and are open to discussions (Eagly & Johnson, *Gender and Leadership Style: A Meta-Analysis*, 1990). After studying famous female business leaders, Helgesen describes a nice model showing gender-based differences in management behavior. According to his studies, in contrast to a traditional hierarchical pyramid typical to male management style, female managers build an interrelated matrix around strategic purpose and concentrate power at the center, drawing others close to it (Helgesen, 1995). This improves the information flow within a company and encourages participative decision making. These characteristics shape the unique female managerial style, which as we can conclude slightly differs from the case of the opposite gender and can largely change a company's management strategy and therefore the quality of its performance.

2.2 Diversity in the Boardroom

Based on 2018 results, women hold nearly one-quarter of senior level management roles across the world, thus top management teams are largely comprised of males, which means that increase in the proportion of women will bring diversity to the management team (Catalyst, *Women in Leadership*, 2018). Several studies exist evaluating the advantages and disadvantages of heterogeneous governance groups. Papers in favor of management diversity state that diverse group makes decisions based on more alternative options and therefore is more likely to find effective solutions to existing problems (Wiersema & Bantel, 1992). The presence of female employees in the boardroom opens a room of new way of thinking, stimulate looking at questions from different perspectives leading to high-quality decisions. Moreover, as women are believed to be good at seeing big picture issues, having a female member in a team helps to identify some problems, which would have been challenging for

the teams comprised only by males (Rosener, 1995). An article published in Harvard Business review identifies few consequences of gender-based heterogeneity for boardroom work which include enhanced dialogues, better decision making, risk mitigation, and crisis management, positive changes to boardroom environment and culture, and even improvement in the behavior of men (Liswood, 2015).

The advantage of a heterogeneous board is a way more significant for the companies that are related to female consumers or trade more with female partners (Daily, Certo, & Dalton, 1999). Women may have a better understanding of certain marketplaces and industries in comparison with men, therefore including females in a decision-making team can improve the quality of firm performance (Vinnicombe & Singh, 2003). In 2017, McKinsey published an article where leaders of famous companies describe their efforts at engaging more females on board and share their personal view on gender diverse teams. For example, CEO and Chairman of Kering, F.H Pinault, mentions that around 64 percent of their board members are women (despite the minimum required level of 40 percent according to the law in France), and 75-80 percent of their customers are women as well (McKinsey, Straight Talk, 2017).

In contrast to several advantages of having a diverse board of directors, few studies found some drawbacks of it that can eventually have a negative impact on a company's performance. Though a heterogeneous group is likely to make higher quality decisions thanks to the diversity existing in the group, a theoretical study showed that the process may be quite a time consuming (Hambrick & Finkelstein, 1996). The diversity in the boardroom can become a reason for conflicts and disagreements due to various differences among males and females such as a way of thinking, risk response behavior etc. So, we can conclude that there is a trade-off between having heterogeneous and homogeneous teams in terms of quality and time. For companies operating in an industry requiring fast decision making, it is beneficial to

have less management diversity in order to avoid extra time consumption and be able to react fast to market changes. Thus, the exact direction of the impact of gender diversity in a boardroom on a company's performance is not clear on a theoretical level.

2.3 Effect on Middle Management

Females presence on top management position does not only change the nature of a company's corporate governance but also is expected to have a significant impact on middle management class. According to a report published by McKinsey, female leaders use five types of leadership behaviors more often than males do: people development, reward system, role-model, inspiration, and participative decision making (McKinsey, Women Matter, 2017). As transactional leaders, females show a caring approach towards their employees, make them feel a crucial part of the team and reward for good performance (Eagly & Carli, An evaluation of the evidence, 2003). This is expected to increase the motivation of lower-class managers and improve their productivity, thus effecting positively on a company's performance. Especially for women, having a female top manager can serve as an aspiration based on the role model effect (Burke & McKeen, 1996). This is an important factor for low-class female managers as they get closer to the possible success of overcoming the "glass ceiling" obstacle and getting a future promotion.

2.4 Earlier findings

A few empirical studies can be found in the existing literature examining the direct impact of female's participation in top management on a company's performance. Majority of works are done for European and American firms, however, the results are controversial. Empirical analysis performed on Norwegian non-financial firms in 2005 showed a negative relationship between women participation in top management and company performance measured in Tobin's Q (Strom & Bohren, 2005). Smiths and Verner examined the

performance of 2500 largest Danish firms observed during the 1993-2001 period and found that the proportion of women in top executive positions and board of director tends to have a significantly positive impact on firm performance (Smith, Smith, & Verner, 2006). The topic is also investigated in Spain, as a country having historically minimal female participation, and showed a positive correlation (Campbell & Minguez-Vera, 2008).

The empirical studies that were done on US data also show diverse results. Using data reported by 200 US firms with the largest market value, Shrader failed to find any significant positive effects for the percentage of women in top management and financial performance relationships-they were either very small or negative. (Shrader, Blackburn, & Iles, 1997). A quite large study was done by Dezsó and Ross, observing top 1500 firms performance during the 1992-2006 period, where they found that female representation in top management improves but only if its strategy is focused on innovation (Dezsó & Ross, 2012). A study done analyzing Fortune 500 firms' performance found that companies with the highest representation of women on top management teams experienced better financial performance than companies with the lowest women's representation. More precisely, the differences in measures for return on equity (ROE) and Total Return to Shareholders (TRS) were 35% and 34% respectively (Catalyst, Women in Leadership, 2004).

As we can conclude both theoretical and empirical literature gave ambiguous results about the effect of females' participation in top management on the company's performance. The reasons behind those variations may be different estimation methods, not a proper observation of control factors, non-reliable databases, etc., which are tried to be minimized in this paper.

3. Data

In this section, we will explain the methods applied to reveal the relationship between female's proportion in top management of a company and its financial performance. This will include the presentation of the choice of variables, the source and description of database.

3.1 Variables

To evaluate the financial performance of the company the following main dependent variable is used in the analysis:

- ROA – Return on Asset (%), indicating the profitability of a company as relative to total assets measured as net income over total assets. The variable gives information on how efficiently a company's management is at using its assets to generate earnings.

In order to measure the proportion of women in a top management position of a company, three explanatory variables are included in the model:

- F_BOD – shows the percentage of female members in the board of directors of a certain company in a particular year.
 - Group1 – is a dummy variable that takes value 1 if F_BOD belongs to the interval [0;20) and 0 if not.
 - Group2 is a dummy variable that takes value 1 if F_BOD belongs to the interval [20;40) and 0 if not.
 - Group3 is a dummy variable that takes value 1 if F_BOD belongs to the interval [40;60) and 0 if not.
 - Group4 is a dummy variable that takes value 1 if F_BOD belongs to the interval [60;100] and 0 if not.
- F_CEO – a dummy variable that gets value 1 in case the chief executive officer of a company in a particular year is female and 0 if male.

- F_CFO – a dummy variable that gets value 1 in case the chief financing officer of a company in a particular year is female and 0 if male.

To control for other factors, other explanatory variables are included in the model, however, they are limited due to data constraints:

- EMPL - variable is an indicator of the size of a company and is measured based on the number of employees working in the certain company in a given year.
- B_SIZE- measures the size of the boardroom of a given company in provided year, and is included in the model as a controlling factor for management size.
- SECROA (%) – is presented as a control variable showing the average ROA (in a given year) of a sector to which a certain company belongs to.
- CEO_AGE – shows the age of the CEO of a given company in a given year
- CFO_AGE – shows the age of the CFO of a given company in a given year

3.2 Data Collection

The paper uses secondary data for statistical analysis. The source of data collection is the Execucomp database, which provides diverse information on top US 1500 firms. Three main file sources were used to collect the final dataset for the analysis: data on financial performance, executive board and board of directors for the 2006-2018 period. Due to data constraints for a given time period some companies are removed and final dataset is an unbalanced panel data which contains information about 716 US firms.

The data about financial performance measurement of ROA is obtained from the database. Additionally, information about the gender of CEO and CFO was taken for a dummy variable F_CEO and F_CFO. Data source also contains information about the names of the board of directors' members. However, as information on the gender of board of director members is not available in the database, additionally Genderize API function is used in Excel to derive the gender of BOD members from their first names. Afterwards F_BOD is

calculated, representing the proportion of women in the boardroom for a company in a given year. The total number of boardroom participants is taken as B_SIZE describing the size of a management. The total number of employees of a company is also taken from the database as EMPL variable.

The dataset provides information about the relevant industries that companies belong to. In our dataset, the firms represent 143 industries which we grouped in 16 sectors including Finance and Insurance, Utilities, Consumer Discretionary, Consumer Staples, Energy, Health Care, Industrials, Technology, Retail, Materials, Real Estate, Transportation, Printing and Media, Conglomerates, Service and other (Appendix 1). For each sector and year, we calculate SECROA by taking the average value of the performance factor ROA in a chosen year for all the companies that belong to relevant sector.

All the obtained information was merged in the final dataset based on two criteria: company and year. Thus, the final analysis is based on panel data covering the period of 2006-2018. In contrast to other similar papers, the updated data for this paper contains the post-crisis period that highlights the differences among firms' financial outcomes as a result of top management performance and makes the results of possible correlation more significant.

3.3 Descriptive Statistics

Table 1 shows the mean statistics, standard deviation, minimum and maximum values, and number of observations for our explanatory variables. We can notice that due to some missing values in the dataset, the number of observations differ from variable to variable. The descriptive statistics are based on the observation of US 716 companies from 16 sectors analyzed during 2006-2018 period.

From the Table 1, we can see that the average representation of women in boardroom is 16% which shows the underrepresentation of women in top management positions. Among

the 6931 observations in 20% of cases companies do not have a single female member in the boardroom, however data also includes some companies that are fully managed by females. The mean management size of the companies is 9. The size of the companies measured based on the number of employees they have also largely varies, but as we can see from the average value the dataset mainly includes quite large companies. ROA as a performance factor of a company has a mean value of 3.64% and the results are similar if adjusting the performance factor for different sectors.

Table 2 observes the development in the proportion of women among CEOs, CFOs and board of directors over time for all the companies included in this research. From the statistics, we can infer that there is an increasing trend for women representation in all the three management positions. However, there is still a clear dominance by men. During the 2006-2017 period, the proportion of female CEOs has been increased by 4% reaching to 6% peak in 2017. For CFO positions women comprised around 9% during the recent few years. The results are relatively high if looking at the percentage of females in boardroom each year. The proportion has been largely increased over time and passed the one-fifth line in 2017 which indicates that women gradually overcome the so-called “glass ceiling” obstacle and improve their positions.

Table 3 shows the percent of observations into each 4 groups that are separated based on company’s female friendliness level measured as percentage of women’s share in the boardroom. We can notice that in the majority of companies, females comprise 0-20% of boardroom, around 35% of cases we have 20-40% level of female top managers, 4% of companies have 40%-60% females in boardroom, and in very rare cases women comprise more than 60% of boardroom. This statistic again signals about female underrepresentation in senior management positions.

Variable	Description	Mean	Std. Dev	Min	Max	Observations	
F_BOD	Female (%) in BOD	16.35	12.03	0	100	N= 6896	n=713
B_SIZE	Boardroom Size	9.07	2.61	1	26.00	N=6896	n=713
EMPL	Number of Employees	31619.60	64200.94	5	760000	N=6841	n=711
ROA	Return on Asset (%)	3.64	11.8	-310.2	357.6	N=6882	n=713
SECROA	Sector Average ROA (%)	3.63	3.5	-90.76	42.55	N=6926	n=715
CEO_AGE	Age of CEO	57	6.71	31	96	N=6852	n=715
CFO_AGE	Age of CFO	52	6.35	32	84	N=6477	n=714

Year	Female CEOs (F_CEO)	Female CFOs (F_CFO)	Female's share in BOD (F_BOD)
2006	1.80%	7.54%	13.09%
2007	1.77%	7.39%	13.68%
2008	1.57%	7.86%	13.95%
2009	2.42%	7.75%	14.19%
2010	3.58%	7.33%	14.67%
2011	3.36%	7.56%	15.43%
2012	4.98%	7.56%	16.03%
2013	5.16%	8.54%	16.87%
2014	5.46%	9.29%	17.98%
2015	5.65%	10.36%	19.25%
2016	5.49%	9.61%	20.51%
2017	5.92%	7.40%	21.95%

Groups ranked by females' share in the boardroom	Share in total observations
Group1: [0%;20%)	60.7%
Group2: [20%;40%)	35.2%
Group3: [40%;60%)	3.7%
Group4: [60%; 100%]	0.4%

4. Methodology

The paper uses quantitative analysis to support or reject hypothesis. Panel data regression analysis on dataset covering the period of 2006-2018 is applied to analyze the effect of women on a company's performance. The two dimensions of panel regression are company and time.

For our studies panel data regression is preferred over cross-sectional or time-series analysis due to several advantages it provides. Panel regression uses more information, usually contains higher degrees of freedom, more sample variability and thus gives more accurate inference of model parameters. Comparing the performance of the firms both with each other, and observing the performance over time allows us to control for missing and unobserved variables that can be correlated with included explanatory variables and cause the problem of heterogeneity.

Based on the available data and following the methodology used in Smiths' paper of panel study for Danish firms we construct our models (Smith, Smith, & Verner, 2006):

Model 1:

$$Perf_{it} = \beta_0 + \beta_1 F_BOD_{it} + \beta_2 F_CEO_{it} + \beta_3 F_CFO_{it} + \beta_4 EMPL_{it} + \beta_5 B_SIZE_{it} + \beta_6 X_{it} + u_{it}$$

where i stands for the company and t stands for the year. $Perf$ is the performance measurement variable (ROA), X stands for a control variable for sector (SECROA), and u is an error component. β_1 , β_2 and β_3 are parameters of primary interest.

Model 2:

In the second model, we add the dummy variables Female CEO, Female CFO in interaction terms with ages (F_CEO*CEO_AGE, F_CFO*CFO_AGE), following the intuition that CEOs with higher ages are likely to have more experience and maybe the

impact on financial performance of the company will differ based on the age level of executives.

Model 3:

In the third model, instead of F_BOD, 4 dummy variables are entered (one taken as the base group) representing five different levels for female's share in boardroom to catch the hypothesized impact relative to company's level of female friendliness:

$$Perf_{it} = \beta_0 + \beta_1 Group2_{it} + \beta_2 Group3_{it} + \beta_3 Group4_{it} + \beta_4 F_CEO_{it} + \beta_5 F_CFO_{it} + \beta_6 EMPL_{it} + \beta_7 B_SIZE_{it} + \beta_8 X_{it} + u_{it}$$

where Group1 [0%;20%) is taken as a base group.

In order to choose which one of the three most common panel data models to use for our models (Pooled OLS, Fixed effect/Random Effect) two tests are used: Breusch-Pagan Lagrange multiplier test and Hausman test. The results of the first test showed that Pooled OLS is not an appropriate model. Further, we applied Hausman test to distinguish between the fixed effects and random effects. Based on the results the null hypothesis is failed to be rejected, implying that the variation across individual units is assumed to be random and uncorrelated with the predictor or independent variables included in the model, thus the random effect model is preferred (Appendix 2). Additionally, heteroscedasticity robust regression is applied for the analysis.

To ensure that our explanatory variables included in the model do not have multicollinearity problem we constructed correlation matrix and calculated variance inflation factors. Though most of the correlations are very small, and VIF values are largely less than cutoff value 10 indicating no collinearity issues, it is interesting to notice the positive correlation between size of the company (EMPL) and proportion of women in boardroom (F_BOD) equal to 0.24 (Appendix 3). Thus, this means that the larger firms have higher proportion of women in the boardroom.

5. Results

Table 4 shows how different explanatory variables of Model 1 impact company's performance measured as ROA. The results are reported based on panel regression random effect analysis. In this study, we are specifically interested in examining female top manager's impact on company's profitability, thus the coefficients for F_BOD (female's share in BOD), F_CEO (female CEO) and F_CFO (female CFO) are in the center of attention.

Table 4: Regression Results of Model 1, 2		
Dependent Variable: ROA	Model 1	Model 2
Variable	Coefficients	Coefficients
Female (%) in BOD	0.04***	0.04***
	(0.01)	(0.01)
Female CFO	-0.26	-4.11
	(0.61)	(4.34)
Female CEO	-0.37	9.9
	(0.87)	(8.7)
Sector Average ROA (%)	0.98***	0.99***
	(0.15)	(0.16)
Number of Employees	0.007**	0.007**
	(0.003)	(0.004)
Size of Boardroom	-0.04	0.01
	(0.12)	(0.12)
Age of CEO		0.03
		(0.02)
Age of CFO		0.02
		(0.03)
Age of CEO*Female CEO		-0.2
		(0.16)
Age of CFO*Female CFO		-0.07
		(0.08)
Number of observations	6802	6366
Number of groups	708	687
***p≤0.01 **p≤0.05 *p≤0.10		
Standard errors are reported under each coefficient		

According to the results, female's presence in the boardroom has positive and highly significant impact on company's performance. The coefficient for females' share in BOD is equal to 0.04. This means that if the company's board is comprised of only males, replacing them by females is predicted to increase the ROA of a company by 4 %. Taking into account that average boardroom size in our data is 9, the coefficient will also indicate that if the number of women in the boardroom increases by 1, the company's ROA is expected to increase by 0.4%.

The coefficients for Female CEO and Female CFO dummy variables are insignificant for 0 to 10 percent significance level, thus we will conclude that the gender of CEO and CFO does not have significant impact on the company's profitability.

Within the control factors, the most significant variable is Sector Average ROA, and also the one with the highest coefficient, which implies that company's ROA greatly depends on the sector it belongs to and the variations due to gender change play proportionately small role.

The results of regression analysis for Model 2 are very much the same, indicating that even if controlled for age, the impact of female CEO and female CFO remains insignificant, whereas we get the same positive significant result for females' share in the boardroom.

Table 5 provides the regression results of Model 3. The base group for this analysis is Group1, which takes value 1 if females in a company's boardroom comprise 0-20% and 0 if not. From the results table, we can see that Group2 and Group3 have significant positive coefficients. This means that if a female unfriendly company (having 0-20% females in its top management) increases the share of females to one level higher (20-40%) its ROA is expected to increase by 1.17%. Additional level increase brings extra 0.1% ROA.

The result for Group4 is not significant which can be explained by the fact that in our data majority of companies have less than 60% of females in boardroom (as shown in

descriptive statistics) thus for those types of firms the significant effect on company's performance is difficult to catch with this dataset. Similar to the previous 2 models, the impact of female CEOs and CFOs remains insignificant.

Table 5: Regression Results of Model 3	
Dependent Variable ROA	Model 3
Variable	Coefficients
Group2: 20≤Female's share in BOD (%)<40	1.17** (0.47)
Group3: 40≤ Female's share in BOD (%)<60	1.27* (0.66)
Group4: 60≤ Female's share in BOD (%)≤100	2.83 (2.57)
Sector Average ROA	0.98*** (0.15)
Number of Employees	0.007* (0.004)
Female CEO	-0.32 (0.7)
Female CFO	-0.26 (0.8)
Boardroom Size	-0.007 (0.12)
Base Group1: 0≤Female's share in BOD (%)<20	
Number of observations =6802	
Number of groups =708	
***p≤0.01 **p≤0.05 *p≤0.10	
Standard errors are reported under each coefficient	

6. Discussion and Conclusion

Despite the several efforts made in different countries to sustain gender equality in various areas, women are still underrepresented when it comes to hierarchical positions in a company such as CEOs, CFOs and board of director members. The data of US 1500 firms shows that though women's proportion has been gradually increasing during the recent ten years those positions are still largely male dominated. This barrier of advancement in a

profession for women is called a glass ceiling obstacle. The main purpose of this study is to understand how the presence of women in top management influences on company's performance and thus evaluate the impact of glass ceiling issue.

The paper presents few theoretical reasons behind this topic which are concentrated on three main areas: differences in management style of women and men, gender diversity in the boardroom and top management's effect on middle management class. According to several existing theories the direction of impact of female's representation on company's performance is predicted to be positive, however, there are also opposite views. The available empirical findings also do not give precise results, which was yet another motivation to implement this research.

In this study, we used a sample of US top 716 firms over 2006-2018 period to empirically analyze how the proportion of females in top management positions influence on company's financial performance measured as ROA. For the analysis panel regression is preferred to use more diverse data and control for time-constant unobserved heterogeneity which may bias the results from cross-sectional analysis. Based on Hausman test, random effect is chosen and thus the results are reported accordingly.

According to panel regression analysis, we found that female's proportion in the boardroom has significant and positive impact on company's profitability. More precisely, findings showed that if adjusting for the average boardroom size of the sample, *ceteris paribus*, one more female in the board of directors will bring an extra 0.4 % of ROA to company. When dividing companies into 4 range groups based on their female friendliness measured as the proportion of females in top management, we again find positive results. According to our analysis if a firm moves from 0-20% female-shared boardroom to 20-40% and 40-60%, its ROA is expected to increase by 1.17% and 1.27% respectively. In contrast,

the effect of female CEOs and CFOs is estimated to have a non-significant impact on a company's performance.

The positive empirical impact of female's representation in boardroom on company's financial performance can be explained by various theoretical studies presented in this paper. Women's unique managerial style which includes participative decision making and more collaborative approach to decision making processes can be the reasons of the positive relationship. However, it is important to note that those behaviors have significant contribution when are demonstrated in a team and not on the individual level. Another part of the increase in the financial performance of the firm can be due to the fact that companies having higher proportion of women in corporate board are likely to be more female friendly. Thus, females working in middle or low management positions find it realistic to overcome the glass ceiling obstacle, which increases the motivation among them and enhances organizational commitment.

Taking into account that the average proportion of women in the boardroom for our sample is 16%, and the results of the third model, we can interpret the positive outcome also following the theory on gender diversity. As the share of women in boardroom is greatly less in comparison with males, an increase in the number of female directors creates a heterogeneous board. According to the analyzed theory, a heterogeneous board is likely to make high-quality decisions due to the availability of diverse opinions. Thus, this also gives a logical interpretation for the positive results we received from the panel regression analysis.

Based on the outcomes of this study, we conclude that proportion of women in top management positions such as board of directors positively impacts on company's financial performance. Therefore, companies should implement relevant steps to overcome the glass ceiling obstacle and engage more female members into the boardroom, as this is predicted to improve their financial performance. With this vision, some European countries already

established a law on minimum female presence rates in top management positions of the company, where afterwards the representation of women increased drastically. The results of this paper encourage this type of policies, suggests companies to change their recruitment policies and make their performance more efficient by the right usage of female human capital.

7. Limitations and Further Research

Though the paper has several advantages, it contains also few limitations which are suggested to be improved in further research. The study is based on US top companies which can be considered as one of the drawbacks of this paper as the results can differ for different countries. Additionally, as concluded from the descriptive statistics, our data mainly includes quite large firms (measured based on the number of employees) thus the results may change if analyzing the performance of relatively small companies. Due to data constraints, our model does not include many of the control factors (such as age of a company), which can be controlled in further studies with the enrichment of database.

Additionally, as the main aim of this paper is to analyze the impact of women's presence in top management positions on company's performance, controlling for additional variables related to top managers (such as education level, experience etc.) will be quite valuable. Though based on our analysis female's presence in the boardroom is positively associated with company's performance, this may be due to the fact that as a reason of glass ceiling obstacle, women who reach to top management positions have higher qualifications than their male colleagues, and gender is not the only differentiated factor between them. Finally, the issue of reverse causality at this point is not checked for this paper, however, based on the results of close studies on this topic we assume no reverse impact for our analysis as well (Smith, Smith, & Verner, 2006) and (Dezső & Ross, 2012).

Taking into account the increasing trend of women's presence in top management positions, a research on updated database will have a considerable contributing advantage. Thus, the further research with improvements of above mentioned drawbacks is highly suggested.

I agree for my work to be posted on library database for an open access to AUA community.

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Appendix

Appendix 1: Sectors and Respective Industries

1. Conglomerates	9. Materials
Industrial Conglomerates	Specialty Chemicals
2. Consumer Discretionary	Fertilizers & Agricultural Chemicals
Leisure Products	Gold
Paper Packaging	Diversified Chemicals
Household Appliances	Paper Products
Apparel Retail	Diversified Metals & Mining
Casinos & Gaming	Commodity Chemicals
Apparel, Accessories & Luxury Goods	Steel
Footwear	Silver
Movies & Entertainment	Construction Materials
3. Consumer Staples	10. Not Assigned
Personal Products	Not Assigned
Distillers & Vintners	11. Real Estate
Housewares & Specialties	Residential REITs - Discontinued Effective
Brewers	Office REITs
Agricultural Products	Industrial REITs
Packaged Foods & Meats	Retail REITs
Household Products	Health Care REITs
Soft Drinks	Specialized REITs
Tobacco	Specialized REITs - Discontinued Effective
4. Energy	Diversified Real Estate Activities - Discontinued
Industrial Gases	Hotel & Resort REITs
Marine	12. Retail
Oil & Gas Exploration & Production	Home furnishing Retail
Oil & Gas Drilling	Computer & Electronics Retail
Oil & Gas Refining & Marketing	Specialty Stores
Independent Power Producers & Energy Traders	Food Retail
Integrated Oil & Gas	Internet & Direct Marketing Retail
Coal & Consumable Fuels	General Merchandise Stores
5. Finance and Insurance	Department Stores
Reinsurance	Home Improvement Retail
Life & Health Insurance	Drug Retail
Consumer Finance	Retail REITs - Discontinued Effective
Multi-line Insurance	Automotive Retail
Regional Banks	13. Service
Asset Management & Custody Banks	Office Services & Supplies
Multi-Sector Holdings	Environmental & Facilities Services

Property & Casualty Insurance	IT Consulting & Other Services
Diversified Banks	Diversified Commercial & Professional Services
Insurance Brokers	Oil & Gas Equipment & Services
Thrifts & Mortgage Finance	Life Sciences Tools & Services
Research & Consulting Services	Specialized Consumer Services
Investment Banking & Brokerage	Human Resource & Employment Services
Financial Exchanges & Data	Electronic Manufacturing Services
6. Health Care	Restaurants
Pharmaceuticals	Diversified Support Services
Health Care Equipment	Education Services
Health Care Distributors	Hotels, Resorts & Cruise Lines
Managed Health Care	14. Technology
Biotechnology	Electronic Components
Health Care Supplies	Home Entertainment Software
Health Care Services	Semiconductors
Health Care Facilities	Electrical Components & Equipment
Health Care Technology	Technology Hardware, Storage & Peripherals
7. Industrials	Application Software
Aerospace & Defense	Data Processing & Outsourced Services
Building Products	Broadcasting
Semiconductor Equipment	Alternative Carriers
Industrial Machinery	Cable & Satellite
Heavy Electrical Equipment	Systems Software
Electronic Equipment & Instruments	Computer Storage & Peripherals - Discontinued
Metal & Glass Containers	15. Telecom and Media
Tires & Rubber	Communications Equipment
Home Furnishings	Wireless Telecommunication Services
Trading Companies & Distributors	Integrated Telecommunication Services
Construction & Engineering	Commercial Printing
Construction Machinery & Heavy Trucks	Publishing
Homebuilding	Advertising
Auto Parts & Equipment	16. Transportation
Agricultural & Farm Machinery	Airlines
Automobile Manufacturers	Food Distributors
Leisure Facilities	Trucking
Forest Products	Technology Distributors
8. Utilities	Railroads
Electric Utilities	Oil & Gas Storage & Transportation
Gas Utilities	Air Freight & Logistics
Multi-Utilities	Distributors
Water Utilities	

Appendix 2: Breusch and Pagan Lagrangian multiplier and Hausman tests

Breusch and Pagan Lagrangian multiplier test for random effects

$$\text{roa}[\text{company},t] = Xb + u[\text{company}] + e[\text{company},t]$$

Estimated results:

	Var	sd = sqrt(Var)
roa	139.8036	11.82386
e	103.8704	10.19168
u	34.87031	5.905109

Test: $\text{Var}(u) = 0$

chibar2(01) = 772.46
Prob > chibar2 = 0.0000

— Coefficients —

	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
secroa	.9832317	.9864023	-.0031706	.0116486
f_bod	.0160662	.0428432	-.026777	.0123029
b_size	-.1356936	-.0211699	-.1145237	.0587454
f_ceo	-.2223692	-.3704308	.1480616	.4813177
f_cfo	.0393454	-.2657449	.3050904	.3916829
empl	-6.22e-06	7.20e-06	-.0000134	.0000102

b = consistent under H_0 and H_a ; obtained from xtreg
 B = inconsistent under H_a , efficient under H_0 ; obtained from xtreg

Test: H_0 : difference in coefficients not systematic

$\chi^2(5) = (b-B)'[(V_b-V_B)^{-1}](b-B)$
 = **8.33**
 Prob> χ^2 = **0.1388**

Breusch and Pagan Lagrangian multiplier test for random effects

$$\text{roa}[\text{company},t] = Xb + u[\text{company}] + e[\text{company},t]$$

Estimated results:

	Var	sd = sqrt(Var)
roa	139.8036	11.82386
e	103.8167	10.18905
u	35.06673	5.921717

Test: $\text{Var}(u) = 0$

chibar2(01) = 766.84
Prob > chibar2 = 0.0000

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fixed	(B) random		
secroa	.9818157	.9857602	-.0039445	.0116346
group2	.9467858	1.169165	-.2223787	.189539
group3	.9686612	1.271362	-.3027006	.4639282
group4	.5384277	2.831167	-2.29274	1.085622
b_size	-.126667	-.0060213	-.1206457	.0589338
empl	-6.99e-06	7.06e-06	-.0000141	.0000102
f_ceo	-.2109193	-.3265331	.1156138	.4802834
f_cfo	.0264398	-.2608209	.2872607	.3910679

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 10.64
Prob>chi2 = 0.1550

Appendix 3: Correlation matrix and VIF

	f_bod	f_ceo	f_cfo	empl	ceo_age	cfo_age	b_size	secroa
f_bod	1.0000							
f_ceo	0.0763	1.0000						
f_cfo	0.1248	-0.0031	1.0000					
empl	0.2391	0.0458	0.0452	1.0000				
ceo_age	-0.0438	-0.0367	0.0094	0.0505	1.0000			
cfo_age	0.0182	0.0279	-0.0716	0.0560	0.1444	1.0000		
b_size	0.1968	0.0389	-0.0122	0.2876	-0.0049	0.0403	1.0000	
secroa	0.0336	0.0305	-0.0048	0.0574	-0.0022	0.0428	0.0041	1.0000

	secroa	group2	group3	group4	b_size	empl	f_ceo	f_cfo
secroa	1.0000							
group2	0.0221	1.0000						
group3	0.0233	-0.1455	1.0000					
group4	-0.0059	-0.0448	-0.0120	1.0000				
b_size	-0.0124	0.1506	-0.0549	-0.0601	1.0000			
empl	0.0525	0.1584	0.1007	0.0228	0.2872	1.0000		
f_ceo	0.0242	0.0327	0.0333	0.0259	0.0366	0.0414	1.0000	
f_cfo	-0.0022	0.0492	0.1016	0.0448	-0.0104	0.0487	-0.0022	1.0000

Variable	VIF	1/VIF
empl	1.14	0.874402
b_size	1.11	0.897448
f_bod	1.11	0.904228
cfo_age	1.03	0.967405
ceo_age	1.03	0.971863
f_cfo	1.02	0.975978
f_ceo	1.01	0.990187
secroa	1.01	0.993414
Mean VIF	1.06	