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The Financial Impact of Gender Diversity on Corporate Boards

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Abstract

The purpose of this study is to investigate the relationship between gender diversity and firm financial performance, using a data set of 50 S&P 500 companies during 2015-2019. Gender diversity was measured through the percentage of women on the board and whether the board has a "critical mass" (of at least three women). In the results of the regression analyses, some significant relationships between variables were found. The regression between ROA and the percentage of women indicated a positive, significant relationship for ROA to the percentage of women. For the regression between ROA and the critical mass variable, no significant relationship was established. The results indicate that a critical mass may not be necessary for women to have a positive impact on a firm's ROA. After trimming the data for outliers, a positive relationship was found between ROE and the percentage of women on the board. Consistent with other research, a positive relationship was also found between ROE and the critical mass variable.

Table of Contents

1. Introduction

Over the recent years, women have made major strides in the corporate world. They have had increasing participation in the labor force and higher education and begun holding more corporate leadership positions at every level of an organization. An increasing number of companies are also making efforts to improve in terms of gender diversity. However, when considering one of the highest-ranking bodies of an organization, the board of directors, women remain in the minority in holding this role worldwide. The board of directors serves in an important position to guide the actions of a company, so as we see women make advances, this is an important area where their leadership is lacking,

A company's board of directors serves as a monitoring body over management with the aim of protecting shareholder interests. They hold responsibility over many strategic decisions for a company (Sarhan et al. 2019). The requirements related to the size of the board and composition are specific to each firm, with differences amongst firms and industries. There are some attributes that tend to be common criteria for the election of board members which include "independence, integrity, a good professional and financial status," with knowledge of the industry, products, and consumers of the company, and the ability to make difficult decisions (Chitimus 2014). While there is research to suggest that men and women exhibit behavioral differences in the workplace (Chen et al., 2016), there is no evidence to suggest that women would perform as inferior board members to men. Yet, there is still a great disparity in gender on boards across the world.

According to the Spencer Stuart Board Index (2019) which draws data from S&P 500 boards, women made up 26% of all directors in 2019. This number has increased incrementally every year for the past five years. In 2015, the percentage was just 20% (Spencer Stuart, 2015).

Women not only remain in the minority, but they also tend to experience being the only woman in many group settings. In 2019, 99% of boards had at least one woman director, but only around 90% have two or more (Spencer Stuart, 2019). The lack of gender diversity on boards has drawn international discussion and controversy. This has led some countries to make attempts towards the progression of more equal representation on boards. In some areas of the world, gender quotas have been enacted to increase the number of women on boards. For example, in 2002, a gender quota was legislated by the Norwegian government requiring women to make up at least 40% of boards of public limited-liability companies (Torchia et al. 2011). Other countries have followed suit including Spain, Iceland, and France. In a different approach, Germany has legislated voluntary participation which asks firms to "comply or explain" with recommendations for diversity on boards (Joecks et al. 2012). In 2018, the United States saw its first gender mandate for boards with the passage of California Senate Bill No. 826 (Greene et al. 2020).

Clearly, the composition of boards is shifting and will continue to. This raises the question of what impact women have as board members. There are many ways in which this can be measured, so the following paper aims to explore the financial effect of greater gender diversity. Much of the current literature on the topic focuses on countries that have taken a more progressive approach toward requiring gender diversity on boards. This study will look at the boards of large-cap firms in the United States using recent data to investigate the relationship between varying levels of gender diversity and firm financial performance.

2. Literature Review

Numerous studies have been conducted to study the impacts of gender diversity on board of directors. Adams and Ferreira (2009) find that gender diversity has significant effects on

board governance. Female directors tend to have fewer attendance problems and positively influence the attendance behavior of male directors as well. They also find that boards with greater gender diversity tend to have more board meetings. Their research suggests that female board members appear to be tougher monitors (Adams & Ferreira, 2009). Assuming that women serve as tougher monitors, Nguyen (2019) hypothesizes that board gender diversity may also be correlated with a lower cost of equity for firms. This research, using a sample of French firms, finds that the proportion of women directors is negatively correlated with cost of equity (Nguyen, 2019). This result is significant because it suggests that investors may have greater confidence in boards with women serving on them which would lower the firm's riskiness. This could also lead the firm to improved financial performance.

Consistent with the evidence that women serve as better monitors on boards, Chen et al. (2016) find that boards with a greater proportion of female directors are also less likely to have internal control weaknesses. Further, the presence of women reduces the occurrence of internal control issues even when they do not serve on the audit committee (Chen et al., 2016). These results suggest that the presence of women on boards leads to greater effectiveness considering the important role of effective internal controls. Research by Saona et al. (2019) provides further evidence to support the idea that women directors lead to more effective boards. This study finds through a sample of European firms that more gender diverse boards help mitigate earnings management practices (Saona et al., 2019). The role of the board of directors is important in monitoring management and preventing opportunistic behavior. This research demonstrates further the potential value women can provide for boards.

Another possible benefit gender diversity can provide to boards is reducing groupthink, "the failure of board members to consider alternatives to the dominant view when making

decisions" (Kamalnath, 2017). Kamalnath (2017) finds evidence which suggests that when female directors are independent and considered "outsiders," they can help serve as a remedy to groupthink. Female directors often tend to be independent, or not having a relationship with the company except as a director. This research suggests that boards would improve decision making abilities with the presence of female, independent directors. This also could have impacts on the firm's performance.

2.a Financial Performance

Considering the research mentioned, a business case can be made for the inclusion of women on boards. In particular, women on boards could contribute to improved financial performance for firms. This study aims to determine the relationship between the number of women on boards and the financial performance of firms. There are several studies that have looked at this relationship. However, the results are controversial. This may be due to a variety of reasons which will be discussed below.

2.a.1 Positive Relationships

There are several studies which find a positive relationship between financial performance and gender diversity on boards. Erhardt et al. (2003) find that board diversity, both ethnic and gender, is positively associated with financial performance. In this study financial performance is measured by return on asset (ROA) and investment (ROI). Firm data is collected from 1993 to 1998 and is for 117 large US companies. This research does not look exclusively at gender diversity, so when controlling for other forms of diversity, results could vary. Also, since the data used is over twenty years old, and board composition has shifted in terms of diversity, current research could also find different results.

In another study, Carter et al. (2010) analyze the relationship between gender diversity on the board and financial performance as measured by Tobin's Q. The sample used includes data from all Fortune 500 firms for the period 1998-2002. The results show that there is a positive relationship between board gender diversity and financial performance. In particular, the evidence shows that this is primarily through the audit function of the board. This study chooses a different measure for financial performance than Erhardt et al. (2003), but it still yields similar results. It also is slightly more recent, but still dated considering the changing demographics of many boards. Further research with more current data would allow for more insights into how this relationship may have shifted as the composition of boards has shifted.

2.a.2 Negative Relationships

In contrast, further research shows a negative correlation between board gender diversity and firm financial performance. In one study, Vemala et al. (2018) examine a sample of S&P 500 firms from 2000 to 2011. This research is more current and considers both Tobin's Q and accounting ratios including return on assets and equity (ROE). The results of the analysis find that there is a negative correlation between gender diversity and the firm's Tobin's Q ratio and ROA. However, there is a positive correlation when looking at ROE. This data is almost a decade old, but more recent than the studies mentioned previously. The more recent data could explain the varying results, and the longer time period used could also play a factor. Perhaps, the presence of female directors leads to short-term changes that do not last in the longer term. It also uses multiple measures of financial performance.

Another study conducted by Daunfeldt and Rudholm (2012) examines the same question but using companies listed in Sweden from 1997 to 2005. They find that more gender diverse boards tend to lead to lower returns on assets after two years (Daunfeldt & Rudholm, 2012). This

study uses a large data set of 20,487 companies of varying sizes rather than just large companies like much of the other research. Daunfeldt and Rudholm (2012) argue that large, successful firms may be more likely to choose women for their boards which could explain finding a positive relationship to financial performance. There also may be a stronger push from stakeholders of larger companies to have more diverse boards than for smaller ones. Rather than the presence of women on the boards leading to higher returns, the reverse of this may be true (Daunfeldt & Rudholm, 2012). Additionally, since this study uses Swedish data, variances could be due to cultural differences between the countries which could impact the acceptance of women on the boards and how likely they are able to influence change.

According to research done by Adams and Ferreira (2009), these authors also find a correlation between gender diversity and performance. They measure performance through Tobin's Q, ROA, and standard deviation of monthly stock returns for five years. The data used is from S&P 500, S&P MidCaps, and S&P SmallCap firms from the period of 1996 to 2003. Their results suggest that firms perform worse with greater gender diversity. Further, they find that in companies with strong rights for shareholders, greater gender diversity can be disadvantageous. However, in companies where more monitoring is needed, gender diversity can have positive effects (Adams & Ferreira, 2009). These results are consistent with the theory that woman directors are tougher monitors. Similar to the study by Daunfeldt and Rudholm (2012), Adams and Ferreira (2009) include firms of many different sizes in their sample. As discussed previously, this could explain why results are different from other studies which find a positive correlation because most of the other research focuses mainly on larger firms. This distinction is important because the function and purpose of a board for a smaller organization can vary greatly from that of a large publicly-traded corporation. The main difference is that smaller

companies likely have fewer shareholders, while large boards have many more shareholders that they are working to protect the interests of. In addition, the composition of these boards likely tends to differ to account for these differences.

2.a.3 Inconclusive Outcomes

Obviously, there is not a clear answer to understanding the relationship between board gender diversity and financial performance. To make matters more ambiguous, some studies have found no significant relationship between board of director's gender diversity and the financial performance of firms. Noland et al. (2016) use a global survey of data from 21,980 firms and 91 countries. This study finds that the presence of women in corporate leadership positions may influence firm performance. More specifically, female executive officers demonstrate an impact. However, there is not sufficient evidence that female board members impact firm performance. They suggest that having more women on boards may not directly improve performance of the firm, but it may lead to greater inclusion of women in other corporate leadership positions (Noland et al., 2016).

Another study conducted looks specifically at the gender quota enacted by Italy (Ferrari et al., 2016). By analyzing the changes from before and after the quota was in place, they find no significant impact on firms' performance as boards became more gender diverse. The data collected is from 2007 to 2014. The authors mention the conservative gender culture in Italy which is slightly different than other European countries. This could potentially explain the lack of change from the increased number of women on the boards. However, the study also finds that the market positively receives the shift of boards as there is a positive effect on stock returns at the date of board elections (Ferrari et al., 2016). Gender quotas introduce another layer for analysis that studies in the United States do not have to consider. Also, cultural differences

between Italy and the United States could also have additional effects. These reasons could explain the different results of this study from others previously mentioned.

2.b Need for Further Research

There is not a clear consensus about what the impact is of having female board members. Rhode and Packel (2014) analyze and provide a comprehensive overview of recent studies to evaluate the business case for gender diversity on corporate boards. They conclude that the relationship between gender diversity and corporate financial performance has not yet been "convincingly established" (Rhode & Packel, 2014).

The mixed results can also be explained further through the application of more theoretical perspectives. First, a few studies have addressed the limited number of women of boards and whether their presence is an example of tokenism. If on many boards, a single woman or the small number of women directors are viewed as a token, then this could inhibit the influence that they are able to have over the board. Joecks et al. (2012) conducted research to determine at which point a critical mass is established on boards. They find that three women (or about 30% of the board) may be the "magic number" for women on boards of German firms. After this point, firms tend to perform better (Joecks et al., 2012).

Similar evidence is found in Norwegian firms in a study by Torchia et al. (2011). In this research, when a board shifts from two to three female directors, this increases the level of firm innovation. This research suggests that, if in previous studies, few women were on the boards, the results may change as women begin to make up a greater proportion of the board and reach a critical mass. It has been established that board of directors are continuing to become more gender diverse every year to this point. This reality suggests that further research should be

conducted now that more boards may have a critical mass of at least three women serving on them.

Many questions remain unanswered through the analysis of the existing literature. Considering the contradictory nature of current research, lack of literature using recent data, and the shift in the composition of boards of directors over time, there is a strong indication that further research is necessary. This study aims to provide further clarity on this subject by using more current data (from the time period of 2015 to 2019) because of the trend towards greater gender diversity. It also considers two measures of gender diversity, both the percentage of women and introduces the critical mass variable, in order to determine if tokenism and critical mass theories can be applied to the results. Lastly, it will measure financial performance through return on assets and return on equity financial ratios to be able to compare the results to previous studies that have been conducted using the same metrics to see how these relationships may or may not have shifted over time due to the change in the demographic composition of boards.

3. Methodology

Based on the objectives previously laid out, a model was developed to test the hypotheses that increased gender diversity on boards improves firm financial performance measured by higher ROA and ROE ratios. In addition, it is hypothesized that the presence of a critical mass of at least three women on a board also improves ROA and ROE. The variables included in this model are described in the next section.

3.a Variables

For this study, the main independent variable is board gender diversity. Two measures of gender diversity were used. The first is the percentage of women on the board (the total number

of female directors on the board divided by the total number of board members). This has been widely used in previous studies as a way to measure gender diversity on boards. Data on board members' gender was manually collected from the board members' profiles based on the pronouns and titles used to describe them. If a board member was referred to as "he" or "his" or had the title of "Mr." they were counted as a male. Board members that were referred to as "she" or "her" or had the title of "Ms." or "Mrs." were counted as female.

The second measure used is whether the boards had at least three women board members ("a critical mass"). Boards with fewer than three women received a value of "0" while boards with at least three women received a value of "1." There is little existing research that considers critical mass theory when looking at gender diversity on boards; most of the existing literature focuses solely on the percentage of women on the board. This measure was included based on the limited research conducted applying critical mass theory to board of directors by Joecks et al. (2012), Erkut et al. (2008), and Torchia et al. (2011). The term critical mass is used to refer to "any context in which things change after a certain number of people get together or enter a setting" (Oliver 2014). It has been used in many settings when speaking about diversity – including gender, racial, and ethnic diversity. In the research by Joecks et al. (2012), Erkut et al (2008), and Torchia et al (2011), they all find that once a critical mass of three women has been reached on a board, this is when there starts to be significant differences. Joecks et al. finds this to be true with ROE in German firms, and Torchia et al. finds this relationship with firm innovation in Norway.

The research by Erkut et al. differs in that it uses qualitative data, but it provides evidence for the importance of a critical mass of women on boards. It states that "having three or more women on a board can create a critical mass where women are no longer seen as outsiders and

are able to influence content and process of board discussions more substantially" (Erkut et al. 2008). It helps create a dynamic that is more natural with less focus on gender. One woman that participated in the study described it as, "One woman is the invisibility phase; two women is the conspiracy phase; three women is mainstream" (Erkut et al. 2008). This study provides evidence that gender diversity not only influences the board but that it also matters the number of women that are present. Based on this research, the critical mass variable was included in order to provide a more in-depth look at the ways in which gender diversity can influence boards.

The primary dependent variable used is firm financial performance which is measured through two financial ratios. The ratios chosen are return on assets (ROA) and return on equity (ROE). The return on asset ratio is found by taking net income divided by total assets. Return on equity is calculated by taking net income over total equity. There are many ways to measure how a company is performing financially; these metrics were chosen because they are consistent with much of the prior research on this topic. They are also commonly used in other types of studies and in the business world as measures of financial performance. Return on assets is a measurement of how efficiently a company is using its assets to generate profit, while return on equity considers how well a company's investments from shareholders are being used to create more income. While some studies use Tobin's Q, ROA and ROE were used most often, so they were the best option for comparability to the already existing literature.

A number of other variables were included as control variables at the firm and board levels. The firm-level control used was firm size. This was computed by taking the log of a firm's total assets. All the firms in the sample tended to be fairly large due to their selection from the S&P 500 Index. This is because the S&P 500 is made up of the largest publicly-traded companies in the US. Despite this, there was still variability amongst the size of firms in the

sample, and thus, this variable was included. The range for firm size was from 9.46 to 12.39 with a mean of 10.45 and standard deviation of 0.56. The board-level controls used were board size (the total number of directors on the board) and the average age of directors (sum of the ages of all directors divided by the total number of directors). The mean board size was 10 members with the minimum being 4 and maximum of 18. The standard deviation for board size was 2.49. The average age variable ranged from 51.5 years to 71.67 years, with a mean of 64.82 and standard deviation of 3.73. Dummy variables for year are also included to control for trends over time that would impact revenues or costs for a firm.

These control variables were chosen because they were expected to have an impact on a company's ROA or ROE. They are also consistent with the literature on the subject. For each variable chosen, data was collected for each year across the time period of 2015 to 2019. This time period was chosen because it was the most recent complete data available at the time of the data collection process. Previous studies varied in the length of time that data was collected, so five years was chosen as a feasible choice when considering the manual nature of the data collection process. A complete list of variables is included in Table 1 below.

Table 1

Descriptions of Variables

Variable	***Symbol***	***Description***
Year 2016	Y_{16}	This is a dummy variable where if the data was for the year 2016, the variable would be "1," otherwise it would be "0"." This

		was included to control for trends relating to the time period that could impact the profitability of a firm.
Year 2017	Y_{17}	This is a dummy variable where if the data was for the year 2017, the variable would be "1," otherwise it would be "0"." This was included to control for trends relating to the time period that could impact the profitability of a firm.
Year 2018	Y_{18}	This is a dummy variable where if the data was for the year 2018, the variable would be "1," otherwise it would be "0"." This was included to control for trends relating to the time period that could impact the profitability of a firm.
Year 2019	Y_{19}	This is a dummy variable where if the data was for the year 2019, the variable would be "1," otherwise it would be "0"." This was included to control for trends relating to the time period that could impact the profitability of a firm.

Board size	*BS*	The total number of directors on the board or the sum of the total number of male and total number of female directors.
Percentage of women	*W*	The percentage of women on the board is calculated by taking the total number of female directors on the board divided by the total number of board members.
Critical Mass	*CM*	Boards with fewer than three women received a value of "0" while boards with at least three women received a value of "1."
Average age of board	*A*	The average age of the board was found by taking the sum of the ages of all directors divided by the total number of directors on the board.
Firm size	*S*	This was computed by taking the logarithm of a firm's total assets.
Return on Assets	*ROA*	Return on Assets is calculated by taking net income divided by total assets. ROA is a measurement of how efficiently a company is using its assets to generate profit.

Return on Equity	*ROE*	Return on equity is calculated by taking net income over total equity. ROE is a measurement of how efficiently a company is using its equity to generate profit.

3.b Data Collection and Sample

Data for this study was collected for a sample of fifty firms randomly selected from the S&P 500 stock market index. A full list of companies included in the sample is available in Appendix A. The S&P 500 Index is widely used to gauge large-cap US equities and contains companies listed on US stock exchanges only. Companies selected were listed on the index for each period from 2015 to 2019. Data on each firm was collected over this period from the Mergent Online database. Mergent Online provides information on publicly traded companies including financial ratios, annual reports, and executive profiles. The final sample contains 250 data points and includes firms across different industries in the United States.

Table 2

Summarized Sample Data

Variable	*Obs.*	*Mean*	*Std. Dev.*	*Min.*	*Max.*
Board Characteristics					
Number of directors	250	10	2.49	4	18
Number of male directors	250	7.64	1.98	3	14
Number of female directors	250	2.36	1.11	0	6
Percentage of women	250	23.26%	0.09	0%	45.45%
Critical Mass	250	0.39	0.49	0	1
Average age	250	64.82	3.73	51.5	71.67
Firm Characteristics					
ROA	250	6.48%	7.70	-36.06%	33.85%
ROE	250	19.89%	37.64	-101.12%	370.45%
Log(Firm size)	250	10.45	0.56	9.46	12.39

There are limitations of this sample that should also be addressed. The first being that only firms with large market capitalizations were included. This is an area where future research on this subject could be expanded. Data from smaller firms is not as readily available though, so conducting research on smaller firms would be challenging. Secondly, there are potentially other variables that could be used as control variables. Some studies used board independence, CEO duality, multiple directorships, or tenure of board members as control variables. Data for these variables was difficult to collect, as much of it is not required to be disclosed by companies, so for the scope of this study, these variables were not included. There are also other characteristics

of board members, boards, and firms that are difficult to quantify that could impact financial performance. These include things such as corporate culture or the characteristics of specific individuals. In addition, a few studies also controlled for reverse causality, that is, considering that women may choose directorships at high-performing firms, or high-performing firms will choose more women as directors than those that are not. The following table includes data to describe the sample that was selected.

Since one of the main independent variables is whether or not a critical mass is present on the board, data comparing boards with and without a critical mass is shown in Table 3. For boards without a critical mass, the boards tended to be smaller. Also, these boards tended to have older directors on average. The average ROA for boards without a critical mass was 6.35 while it was slightly higher for boards with a critical mass at 6.68. Likewise for ROE, boards without a critical mass had an average that was slightly lower at 19.84 whereas the average for boards with a critical mass was 19.98. Based on these differences, it can be reasonably expected that the critical mass variable will have an impact on how firms perform financially. Also, boards with and without a critical mass seem to have somewhat different characteristics which may also play a role in these differences.

Table 3

Comparison of Firm Data With and Without a Critical Mass

Variable	***No Critical Mass***	***Critical Mass***
Average Total Number of Directors	9.07236842	11.43878
Average Age	65.2093525	64.23368
Average ROA	6.34960526	6.67551
Average ROE	19.8424941	19.97558

3.c Analysis of Data

Before the data was analyzed, it was prepared by checking for missing data points. A few firms were found to have missing data for the financial ratios. For these data points, the ratios were manually calculated using the financial data available within the Mergent Online database. The data were then examined through regression analysis in Microsoft Excel and SPSS. This study uses four models of regression.

Two of the models use the percentage of gender diversity variable with each measure of financial performance (ROA and ROE).

$$Model\ I\text{: } Return\ on\ Assets\ (ROA) = BS + W + A + S + Y_{16} + Y_{17} + Y_{18} + Y_{19}$$

$$Model\ II\text{: } Return\ on\ Equity\ (ROE) = BS + W + A + S + Y_{16} + Y_{17} + Y_{18} + Y_{19}$$

The other two use the critical mass variable with each measure of financial performance (ROA and ROE).

$$Model\ III: Return\ on\ Assets\ (ROA) = BS + CM + A + S + Y_{16} + Y_{17} + Y_{18} + Y_{19}$$

$$Model\ IV: Return\ on\ Equity\ (ROE) = BS + CM + A + S + Y_{16} + Y_{17} + Y_{18} + Y_{19}$$

Lastly, the regressions were checked for multicollinearity. The results of the regression analysis and collinearity diagnostics are discussed in the next section.

4. Results

Through the regression analyses, some significant relationships between variables were found. Using model I, the regression indicated that there was a positive, significant relationship between the percentage of women and ROA. This result is consistent with the hypothesis formed during the creation of the model. Additionally, average age and firm size were negatively correlated with ROA. These results were statistically significant at the 5% confidence level, except for average age which was at the 10% confidence level. The full results are included in Table 4 below. For the regression model II, which uses ROE as the dependent variable, there was a negative relationship between the average age and firm size and ROE. The results were statistically significant at the 5% confidence level. However, a statistically significant relationship between the percentage of women and ROE was not established. This is contradictory to the hypothesis that was established previously and was a surprising result to find. The results of this regression model are again included in Table 4.

Table 4

Results from Models I and II (whether boards with greater percentages of women are more likely to have higher ROA and ROE).

P-values that are statistically significant are noted with a *

Variable	Predicted sign	Model 1a		Model 2a	
		Coefficient	P-value	Coefficient	P-value
Board size	+	0.1073	0.6244	0.2127	0.8461
Percentage of women	+	11.6217	0.0444*	-9.2144	0.7491
Average age	-	-0.2543	0.0577*	-1.7797	0.0082*
Firm size	+	-4.0966	0.0000*	-11.3943	0.0165*
Year-16	+	0.4283	0.7731	3.8420	0.6052
Year-17	+	1.1138	0.4628	7.0367	0.3540
Year-18	+	0.7707	0.6226	4.7779	0.5421
Year-19	+	1.0886	0.5102	8.2058	0.3214

Using Models III and IV, some relationships were found to be statistically significant once again; however, critical mass was not significant with either ROA or ROE. The variables that were found to have a negative relationship with ROA are average age and firm size. With ROE, age and firm size also had a negative relationship. These results were again surprising, as it was hypothesized that the critical mass variable would have a positive relationship with both ratios. The regression results for Models III and IV are included in Table 5.

Finally, the results of the collinearity diagnostics found there to be no issues of multicollinearity with each of the models used. Based on these results, the p-values in the Tables 4 and 5 can be considered reliable.

Table 5

Results from Models I and II (whether boards with a critical mass are more likely to have higher ROA and ROE).

P-values that are statistically significant are noted with a *					
Variable	Predicted sign	Model 3a		Model 4a	
		Coefficient	P-value	Coefficient	P-value
Board size	+	0.0006	0.9978	0.1254	0.9135
Critical Mass	+	1.2355	0.2737	1.6452	0.7692
Average age	-	-0.2917	0.0284*	-1.7192	0.0095*
Firm size	+	-3.7577	0.0001*	-12.1661	0.0091*
Year-16	+	0.5954	0.6897	3.5777	0.6295
Year-17	+	1.3383	0.3787	6.6606	0.3784
Year-18	+	1.0070	0.5212	4.2802	0.5835
Year-19	+	1.4788	0.3694	7.4272	0.3648

After considering the full sample without removing any data points, the data was truncated to exclude the 2% largest and 2% smallest values for both ROA and ROE. The 2% trimmed means are presented in Table 6. Before trimming, the standard deviation for return on equity was 37.64% with a range from -101.12% to 370.45%. This spread is very large and may include firms not necessarily operating under normal conditions. In addition, when looking at the firms excluded, all five from the lowest 2% happen to be firms from the utility industry. This

may indicate an underlying industry-wide issue rather than performance issues of individual boards. If this is the case, this would not be indicative of normal conditions, and it would be important to consider the data without these outliers that lower the mean ROE for the sample. On the other hand, ROA had a mean of 6.48% before truncation and a range from -36.06% to 33.85%. The standard deviation was 7.70. This sample seemed less likely to have outliers which were extreme in nature and considered abnormal; however, the same method for trimming was also used for ROA and considered for consistency. After truncation, this excluded ten boards from the data, so there were 240 data points contained in each sample. The four models of regression were run again with the new set of data.

Table 6

2% Trimmed Means of ROA and ROE

Variable	***2% Trimmed Mean***
ROA	6.5575
ROE	20.7762

The additional regression results varied somewhat from the original results. Under model I, a positive relationship was still found between the percentage of women on the board and ROA. The p-value was more significant than the one found previously. These results meet the expectations formed in the hypothesis. In addition, firm size was found to have a negative relationship with ROA at the 1% confidence level. For the regression including ROE (Model II), the coefficient for the percentage of women changed from negative to positive, and the p-value became significant at a 1% confidence level. These results are more aligned with the results that

were hypothesized and indicate that there is a relationship between ROE and board gender diversity. In addition, there was a negative relationship between firm size and ROE. The results for these regression models are shown in Table 7.

Table 7

Results from Models I and II (whether boards with greater percentages of women are more likely to have higher ROA and ROE) using truncated data which excludes the smallest 2% and largest 2% of ROA and ROE.

P-values that are statistically significant are noted with a *					
Variable	Predicted sign	Model 1b		Model 2b	
		Coefficient	P-value	Coefficient	P-value
Board size	+	-0.1998	0.2562	-0.4416	0.4348
Percentage of women	+	10.8213	0.0175*	38.6238	0.0095*
Average age	-	-0.1551	0.1420	0.0600	0.8638
Firm size	+	-2.8704	0.0002*	-6.4117	0.0079*
Year-16	+	0.8063	0.4980	4.5530	0.2341
Year-17	+	1.2312	0.3023	0.7224	0.8511
Year-18	+	-0.0659	0.9574	1.4220	0.7197
Year-19	+	0.4118	0.7523	2.6563	0.5235

The regressions that include the critical mass variable also yield varying results from what was found before trimming for outliers. As mentioned previously, there was no significant

relationship established between the critical mass variable and either ROA or ROE. When model 3 was applied using the trimmed data, the same result was found. No association could be drawn between ROA and critical mass. Again, this was not the result that was hypothesized for this model. There were two significant variables in this model, though. Average age and firm size had a negative relationship with ROA. Model IV, on the other hand, found a positive and significant relationship between ROE and critical mass at the 1% confidence level. This result aligns with the hypothesis that was formed in the methodology section and indicate that a critical mass does matter on boards. The results for Models III and IV are shown in Table 8.

Table 8

Results from Models I and II (whether boards with critical masses are more likely to have higher ROA and ROE) using truncated data which excludes the smallest 2% and largest 2% of ROA and ROE.

P-values that are statistically significant are noted with a *					
Variable	Predicted sign	Model 3b		Model 4b	
		Coefficient	P-value	Coefficient	P-value
Board size	+	-0.2886	0.1239	-1.0613	0.0748*
Critical mass	+	0.9676	0.2824	8.0673	0.0049*
Average age	-	-0.1924	0.0678*	-0.0237	0.9447
Firm size	+	-2.5154	0.0008*	-6.0554	0.0103*
Year-16	+	1.0031	0.4025	4.9893	0.1901
Year-17	+	1.4638	0.2229	1.2633	0.7408

Year-18	+	0.1797	0.1448	1.8268	0.6422
Year-19	+	0.8265	0.6347	3.2452	0.4299

5. Evaluation of Results – Implications and Areas for Further Research

This section of the thesis will evaluate the results that were explained above. It will also discuss the implications of these results and provide direction for future research on this subject.

The results from model I confirm the previous research which finds a positive relationship between return on assets and board gender diversity such as the study by Erhardt et al. (2003). Considering the data for the Erhardt et al. (2003) study was from 1993 to 1998, these new results indicate that as boards have become more diverse, this positive relationship continues to hold true. Similarly, Carter et al. (2010) also found a positive relationship between financial performance and board gender diversity, but they measure financial performance in terms of Tobin's Q. Still, this builds an even stronger case for the inclusion of women on boards and their impact on financial performance if the impact on financial performance can be measured via varying metrics.

In contrast, the results laid out in this paper find a relationship that opposes prior research from Vemala et al. (2018). Similar to this research, their sample consists of firms from the S&P 500; however, the primary difference is that their sample is from 2000 to 2011. This suggests that as boards become more gender diverse this relationship will become increasingly established. Other research from Daunfeldt and Rudholm (2012) also found a negative relationship with ROA and the percentage of women on a board. This research is different in that it uses Swedish firms and includes firms of all sizes, rather than just large companies. Similarly,

Adams and Ferreira (2009) also use a sample which includes firms from the S&P 500, S&P MidCaps, and S&P Small Cap firms. As mentioned previously, the sample used for this research was limited to firms from the S&P 500 which only includes large, publicly-traded companies. Based on the contrasting results found, more current research including smaller and mid-sized firms should be conducted to understand whether a shift has occurred in the relationship between ROA and the performance of firms of differing sizes.

When considering model III, there has been no previous research which considers the relationship between ROA and critical mass. However, these results indicate that a critical mass may not be necessary for female board members to influence a firm's ROA. This means that just one or two female board members impacted firms' ROAs, rather than needing a critical mass of three women present on the board.

Considering the models that include ROE, the results from model II confirm the research by Vemala et al. (2018) which also finds a positive relationship between ROE and board gender diversity. Much of the other literature does not address the impact of the percentage of women on ROE. Though there was limited research which considers critical mass theory, the study by Joecks et al. (2012) was the primary basis for adding the critical mass variable to this research. The results found from Model IV find the same results that Joecks et al. (2012) do. Considering the lack of research that accounts for critical mass, this is a significant finding. The results from both of these models combined with earlier research make a strong case for the importance of female board members in impacting ROE, especially for the inclusion of a greater proportion of women on boards.

Overall, these results should encourage the election of more female board members, as it would be a smart business decision to help improve important financial ratios for the company.

While the results suggests that just one or two women can impact a company's ROA, there is no compelling reason not to have more women than that on the board. A negative relationship was not found between ROA and critical mass, meaning it would not hurt companies to have three or more women serving on their board. In addition, having at least three women on the board could also help improve companies' ROEs. While this research is promising in building a business case for the inclusion of women on boards, there are limitations to the applications of the current literature.

As mentioned previously, one important area for further research would include smaller and mid-sized firms. One of the challenges of completing this type of research is that data for these firms is not as widely available; however, this is an area where the current literature is lacking. Another gap in the existing literature is the consideration of the intersection of different identities when discussing diversity. The sole focus of much of the current research is on gender diversity or racial diversity. These two types of diversity intersect to shape the experiences of board members. Although some of the current literature in this area considers both of these types of diversity, they often do not consider how these variables impact one another. Further, there is no research which considers other pieces of identity such as sexual orientation and ability status. As boards shift to become more gender diverse, they are likely becoming more diverse in other ways as well, and the role that this plays in firm performance would be interesting to consider.

Once again, this sort of research would be difficult to perform at this time due to the lack of available data. This may change in the near future, however. The Nasdaq stock exchange has proposed a standardized disclosure framework that would require all companies listed on this exchange to follow certain disclosure rules ("Nasdaq," 2020). It would also require boards to have at least two diverse directors, "including one who self-identifies as female and one who

self-identifies as either an underrepresented minority or LGBTQ+" or explain why they do not ("Nasdaq," 2020). This is similar to the German "comply or explain" policy that was referenced earlier. In the research by Joecks et al. (2012), the researchers find that as these policies have been put into place, and boards are consisting more frequently of critical masses of women, ROE has improved for German firms. Based on the similar findings in this research which also indicates a positive relationship between ROE and critical mass, but within firms in the United States, the policy suggested by the Nasdaq may be effective in achieving greater diversity whilst positively impacting firms. This type of reform could also be adopted by the New York Stock Exchange to promote diversity efforts more broadly in the United States.

The US Securities and Exchange Commission (SEC) still has to approve the proposal, however. The passage of this plan would be a significant step in increasing transparency relating to the demographics of board members in the United States. This would not only allow for improved and more in-depth research on this subject, but it would also improve the information available to consumers and shareholders. This is significant in that it would allow shareholders to make more informed decisions when electing board members, and consumers would have the opportunity to demonstrate their preferences for companies that choose to embrace diversity at the board level through their buying behaviors. In a time when diversity and inclusion efforts have become of increased concern for companies in the United States, this research further promotes the importance of these efforts.

It also makes a distinction between simply having diverse boards and working towards the inclusion of diverse board members as demonstrated by the confirmation of the critical mass variable's relationship with ROE. This application of critical mass theory promotes the idea that firms must go beyond performative actions for diversity and inclusion. They must work to treat

their diverse employees as more than tokens and create settings that are more equitable and inclusive, where women and those in other generally underrepresented groups will no longer face the phenomenon of being the only person in the room like them. Finally, more diverse corporate boards have the potential to create more equitable opportunities at every level of firms and better alignment with the various stakeholders of firms including customers and employees. As boards of directors become more diverse, there is potential to spark changes that are much broader reaching than the improvement of an individual firm's financial performance.

Appendix A: Companies Included in Sample

Companies Included in Sample		
Company Name	***Exchange:Ticker***	***Industry***
3M Company	NYSE:MMM	Industrial Conglomerates
Adobe Inc.	NasdaqGS:ADBE	Application Software
Agilent Technologies, Inc.	NYSE:A	Life Sciences Tools and Services
Akamai Technologies, Inc.	NasdaqGS:AKAM	Internet Services and Infrastructure
Alexion Pharmaceuticals, Inc.	NasdaqGS:ALXN	Biotechnology
American Electric Power Company, Inc.	NasdaqGS:AEP	Electric Utilities
AmerisourceBergen Corporation	NYSE:ABC	Health Care Distributors
Aon Plc	NYSE:AON	Insurance Brokers
Apple Inc.	NasdaqGS:AAPL	Technology Hardware, Storage and Peripherals
Applied Materials, Inc.	NasdaqGS:AMAT	Semiconductor Equipment
AvalonBay Communities, Inc.	NYSE:AVB	Residential REITs
Bank of America Corporation	NYSE:BAC	Diversified Banks
BlackRock, Inc.	NYSE:BLK	Asset Management and Custody Banks
Boston Properties, Inc.	NYSE:BXP	Office REITs
Brown-Forman Corporation	NYSE:BF.B	Distillers and Vintners
CarMax, Inc.	NYSE:KMX	Automotive Retail

Carnival Corporation & Plc	NYSE:CCL	Hotels, Resorts and Cruise Lines
CenterPoint Energy, Inc.	NYSE:CNP	Multi-Utilities
Chevron Corporation	NYSE:CVX	Integrated Oil and Gas
Costco Wholesale Corporation	NasdaqGS:COST	Hypermarkets and Super Centers
CVS Health Corporation	NYSE:CVS	Health Care Services
Delta Air Lines, Inc.	NYSE:DAL	Airlines
Devon Energy Corporation	NYSE:DVN	Oil and Gas Exploration and Production
Expedia Group, Inc.	NasdaqGS:EXPE	Internet and Direct Marketing Retail
FirstEnergy Corp.	NYSE:FE	Electric Utilities
FMC Corporation	NYSE:FMC	Fertilizers and Agricultural Chemicals
Ford Motor Company	NYSE:F	Automobile Manufacturers
General Electric Company	NYSE:GE	Industrial Conglomerates
Hess Corporation	NYSE:HES	Oil and Gas Exploration and Production
HP Inc.	NYSE:HPQ	Technology Hardware, Storage and Peripherals
Humana Inc.	NYSE:HUM	Managed Health Care
Intuit Inc.	NasdaqGS:INTU	Application Software
Jacobs Engineering Group Inc.	NYSE:J	Construction and Engineering
Kimberly-Clark Corporation	NYSE:KMB	Household Products

L3Harris Technologies, Inc.	NYSE:LHX	Aerospace and Defense
Lumen Technologies, Inc.	NYSE:LUMN	Alternative Carriers
McDonald's Corporation	NYSE:MCD	Restaurants
Mohawk Industries, Inc.	NYSE:MHK	Home Furnishings
Molson Coors Beverage Company	NYSE:TAP	Brewers
News Corporation	NasdaqGS:NWSA	Publishing
NIKE, Inc.	NYSE:NKE	Footwear
NVIDIA Corporation	NasdaqGS:NVDA	Semiconductors
O'Reilly Automotive, Inc.	NasdaqGS:ORLY	Automotive Retail
Sealed Air Corporation	NYSE:SEE	Paper Packaging
The Kroger Co.	NYSE:KR	Food Retail
The TJX Companies, Inc.	NYSE:TJX	Apparel Retail
Tyson Foods, Inc.	NYSE:TSN	Packaged Foods and Meats
Under Armour, Inc.	NYSE:UAA	Apparel, Accessories and Luxury Goods
Walmart Inc.	NYSE:WMT	Hypermarkets and Super Centers
Whirlpool Corporation	NYSE:WHR	Household Appliances

Appendix B: Results of Truncation at 5%

This appendix is included to show the results of trimming the data to exclude the largest 5% and smallest 5% for ROA and ROE. This removes 24 boards from each sample, leaving a sample of 226 data points versus 250 in the full sample and 240 in the previously truncated sample. This makes the sample significantly smaller. Utilizing this set of data, the results from Model I shifted. The relationship between the percentage of women and ROA was no longer significant, although it remained positive. The results for ROE remained somewhat similar when compared to the other set of trimmed data. Again, a positive relationship was established between both the percentage of women and critical mass variables. These results were significant at a 5% confidence level. As mentioned previously, a stronger case can be made to trim the data in the sample used for ROE than with ROA. This could explain the differences in the results from the ones established previously. The results for Models I and II using this set of data is included in Table B1, and the results from the regressions using Models III and IV are included in Table B2.

Table B1

Results from Models I and II (whether boards with greater percentages of women are more likely to have higher ROA and ROE) using truncated data which excludes the smallest 5% and largest 5% of ROA and ROE.

P-values that are statistically significant are noted with a *					
Variable	Predicted sign	Model 1c		Model 2c	
		Coefficient	P-value	Coefficient	P-value
Board size	+	-0.2507	0.1060	-0.5082	0.2887
Percentage of women	+	1.8915	0.6509	28.1896	0.0297*
Average age	-	-0.1497	0.1092	0.0364	0.9028
Firm size	+	-2.0027	0.0036*	-3.1594	0.1252
Year-16	+	0.6538	0.5364	0.7594	0.8142
Year-17	+	1.6944	0.1148	1.1973	0.7118
Year-18	+	1.0522	0.3377	0.9783	0.7702
Year-19	+	1.1931	0.3035	3.5734	0.3095

Table B2

Results from Models III and IV (whether boards with critical masses are more likely to have higher ROA and ROE) using truncated data which excludes the smallest 5% and largest 5% of ROA and ROE.

P-values that are statistically significant are noted with a *					
Variable	Predicted sign	Model 3c		Model 4c	
		Coefficient	P-value	Coefficient	P-value
Board size	+	-0.2361	0.1454	-0.9749	0.0532*
Critical Mass	+	-0.3321	0.6795	5.7517	0.0182*
Average age	-	-0.1621	0.0776*	-0.0168	0.9543
Firm size	+	-1.8151	0.0067*	-2.8533	0.1551
Year-16	+	0.7090	0.5014	1.2160	0.7048
Year-17	+	1.7894	0.0943*	1.6109	0.6163
Year-18	+	1.1680	0.2848	1.3572	0.6831
Year-19	+	1.3553	0.2373	4.0743	0.2405

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