Where Are All the Female Finance Majors? An Examination of Gender and Performance in Undergraduate Corporate Finance

Ronia Hawash
Butler University

Sheryl-Ann K. Stephen
Butler University

Using a sample of 592 business students over the period 2009 to 2018, we investigate why there are so few undergraduate female students choosing finance as a major. We find that females, on average, scored higher in their first college math course by almost 2% than males, but there is no significant difference in the grades between female and male students in corporate finance. However, our results show that the odds of a female choosing a finance major is 0.4, which means that male students are 2.5 times more likely to choose finance as their major. Also, a 10% increase in the student's grade in his/her math class increases the student's grade in corporate finance by 6%. This underscores the theory that better performance in quantitative courses leads to better performance in finance.

Keywords: Finance Education, Finance Major, Gender

INTRODUCTION

It is well known that there is a gender imbalance in undergraduate finance in business schools throughout the United States and in fact, across the world. The preponderance of young men choosing to take courses, and major in finance, has become a puzzle to faculty who wonder why most of the young women stay away from finance courses, and indeed the finance major. This is a very important issue that must be addressed for many reasons.

The Global Gender Gap Report (2017) put out by the World Economic Forum states that the engagement of women in the public life and formal economy has a positive effect on inequality. Furthermore, the report notes that the underutilization of female talent has a negative impact on business resources and overall economic growth. Gender diversity, on the other hand, drives innovation and improves business performance. In Women Matter 2013, a report published by McKinsey & Company, a global management consulting firm, the authors pointed out the following: 1. In the United States, the increase in productivity as a result of women entering the workforce is about 25% of GDP; 2. Companies experience an increase of 47% in average return on equity when they employ female executives; and 3. Companies experience a 55% increase in average earnings before taxes when there are female executives in top management positions. Therefore, it is against this backdrop that business schools' faculty must examine this gender imbalance issue in order to implement solutions and increase the number of female

finance graduates. A more in depth understanding of the determinants that impact students' performance in the introductory corporate finance course could drive better overall performance, and lead to more female students choosing finance as their major.

It has been documented that introductory corporate finance is one of the more challenging core courses in any business school program. Terry (2002) points out that the main reasons for the substandard performance in introductory corporate finance are the quantitative nature of the course as well as the fact that finance is integrative in nature. This means that students need to have a good grasp of mathematics, accounting, and economics in order to do well in the course, and many students seem to forget the concepts learned in previous classes. Moreover, research has shown that students' performance in introductory classes is generally a good predictor of their choice of major (Borde, et al, 1998).

This study investigates why there are so few undergraduate females choosing finance as a major. Is it that males perform better than females in the introductory corporate finance class? Or, is it that males come into the course better prepared than females in quantitative areas such as math? Using a sample of 592 students, we examine factors such as gender, major, grade in the introductory finance course, math, Fall versus Spring semesters, and GPA. Specifically, we investigate gender differences in quantitative aptitude and overall performance that could help predict continuation to the finance major.

The objective is to examine whether there is gender bias in the choice of finance as a major in higher education. Are females less likely to choose finance as a major? If the bias exists, the paper also examines whether students' math skills or their grade in the introductory finance course impact their choice of finance as a major. This study is warranted, as there are a very limited number of published research studies that examine the dearth of females choosing finance as their undergraduate major.

RELATED LITERATURE

Many published empirical studies have looked at the factors that impact students' performance in economics and accounting. In addition, these studies investigate some of the same factors that we have looked at in this study on finance such as GPA, and quantitative requirements such as Math. Other studies have examined the issue of gender imbalance in various majors, such as economics, with some studies looking at the gender makeup of the faculty to investigate whether there is a role model effect driving females' choice of major. Even though the focus of our study is on finance, we include relevant prior literature pertaining to finance as well as economics and accounting, as similar issues have been experienced in these fields.

Does Gender Matter?
A number of studies have looked at whether gender is a significant variable in explaining the performance of students in corporate finance and economics. Results have been mixed. While some studies show that gender is insignificant, other studies show a significant relationship. Specifically, Borde (2017) found that on average, male students performed better in intermediate corporate finance than female students. Likewise, Terry (2002), Borde et al. (1998) found that, on average, male students outperformed female students in the introductory finance course even though the female students (on average) had a higher high school GPA. Dynan and Rouse (1997) and Williams et al. (1992) also found that male students performed better than female students in economics. Rask and Tiefenthaler (2008) examined the role of grade sensitivity in explaining the gender imbalance in the economics major. The authors found that female students are more sensitive to the grade they receive in introductory courses than male students. Therefore, male students who don't perform well in economics are more likely to choose the economics major. However, female students who don't perform well tend to choose a different major.

Interestingly, Tyson (1989) found that female students outperformed male students in both introductory and advanced accounting courses. On the other hand, Lipe (1989) found no difference in the performance of male and female students in the managerial accounting course. Likewise, Chizmar (2000), MacDowell et al. (1977) found no gender differences in the performance in economics courses.

Quantitative Skills

The performance in previous quantitative courses, such as mathematics and statistics, has been shown to be a strong predictor of performance in the introductory finance course, as well as other finance, economics, and accounting courses. Terry (2002) in examining the determinants of introductory corporate finance found that quantitative skills are an important factor in predicting students' performance in introductory finance. Specifically, the author found that the business statistics variable (as a proxy for general analytical skills) is significant in predicting finance performance. Eli and Hittle (1990) also found that previous mathematical coursework was significant in predicting performance in managerial economics, but not significant for performance in the fundamentals of finance course. Borde et al. (1998) found that there was a positive relationship between the performance in the required accounting classes and the performance in the introductory finance course. Dynan and Rouse (1997) found that, on average, female students have weaker math skills than male students; however, the authors found that math skills do not seem to impact students' decisions to take the introductory economic courses in their first year, or their choice of economics as a major later on.

Role Model Effect

The gender composition of business faculty has been a key area of concern when trying to explain the low numbers of female students who choose finance as their primary major. There is a theory that the dearth of female faculty in finance contributes to the decrease in the numbers of female finance majors. In fact, The Association to Advance Collegiate Schools of Business International (AACSB) Staff Compensation and Demographic Survey (2017-2018) reports that out of all full-time faculty at AACSB institutions, only 35% are female. Furthermore, only 33% of all full-time business faculty holding doctoral degrees are female. Specifically, at the rank of Professor, the report states that only 22% of all full-time business faculty are female; at the rank of Associate Professor, only 33.5% are female; and at the rank of Assistant Professor, 38.3% are female.[1] Admittedly, these figures are quite low and even though they refer to all full-time business faculty, could possibly motivate the role model effect.

Canes and Rosen (1995) investigated gender composition of the students in an academic department and the faculty gender composition when students were choosing their major at three different academic institutions. The authors found no relationship between faculty gender composition and the students' choice of major. Emerson et al. (2018), Smith and Zenker (2014) examined whether female faculty role models had a positive effect on female students' choice of economics as a major. Their results showed no support for the female faculty role model effect. Ricks (2007) found a positive and significant relationship between the number of female economics faculty and the number of female economics majors by analyzing 195 academic institutions. Using detailed data from student records, transcript records, and faculty records from Colgate University classes of 1988–2000, Rask and Bailey (2002) found role-model effects for women, minorities, and men. Specifically, the authors found that there is a direct effect between the number of classes taken with a faculty member "like-you" and students' choice of major. Lipe (1989) examined the impact of student and faculty gender on performance in a managerial accounting course. Interestingly, the author found that student and faculty gender on their own had no impact on performance, but there was significance via an interaction of the two variables. Specifically, male students outperformed female students when the instructor was male, and female students outperformed male students when the instructor was female.

Available Majors

Today's students have many options when it comes to choosing a major. Therefore, the breadth of majors may impact students' choice of major. Siegfried and Wilkinson (1982) investigated the number of economics majors using data from 546 economics departments. The authors found that the availability of closely competing business majors decreased the number of economics Bachelor's degrees awarded by a substantial amount. Likewise, Willis and Pieper (1996) looked at the connection between the number of business and economics majors across a cross-section of institutions. The authors also found an inverse relationship between whether a business degree was available at the institution and the number of

economics majors. We surmise that the sheer number of majors available at today's institutions may impact any observed gender differences in students' choice of major.

DATA AND METHODOLOGY

Our primary data were drawn from a sample of students in the School of Business at a private university in the USA, which is accredited by the AACSB. The student population is mainly Caucasian with very few ethnic and international students. The School of Business requires that students take the introductory corporate finance class as a mandatory course before graduation. Given that the class is mandatory, we avoid self-selection bias issues. The course is taught in both Fall and Spring semesters and students taking it are primarily of junior standing, although there are usually a few second semester sophomore students registered. Following Filbeck and Smith (1996), and to be consistent, students in the sample have taken the class with the same finance professor. Additionally, the curriculum as well as the level of difficulty is the same across all students taking the class from Fall 2009 to Spring 2018. We also obtained data from the institution's registrar. The dataset comprised information such as students' GPA, grades in the first college-level math course taken, gender, and primary major. The use of the registrar's dataset mitigated reporting error in our study. The descriptive statistics and correlations between variables included in the analysis are shown in Tables 1 and 2.

After dropping transfer students who did not have all the required information (such as math scores), our final sample size is 592 students in which 60% are males and 40% are females (Table 1). 20% of our sample has chosen Finance as a major. The average grade in the corporate finance class is 82% and in math is 85%. The average GPA across the sample is 3.2. The main dependent variable is whether the business student chooses finance as a major or not. The independent variable of interest is gender in an attempt to examine whether females are more or less likely to choose finance as a major. Other independent variables include students' GPA, their grade in their first math course in college, their grade in corporate finance, and the class size. We also control for the semester they have taken the class and the year by including dummy explanatory variables representing the class/section in which the student was enrolled. Then, we attempt to investigate the mechanism by which gender impacts the choice of major by examining whether their math, and/or academic aptitude may have impacted their decision. Table 2 shows that there is a correlation (significant at the 1% level) between gender and choice of finance as a major.

Our first hypothesis tests whether "females are less likely to choose finance as a major in comparison to males". The main outcome variable, Major_Finance, is a dichotomous variable reflecting whether the student chooses the finance major or not (1=yes, 0=no), and the explanatory variables include the binary variable gender (1=Female, 0=Male); percentage grade in the class Corporate Finance ranging from 39% to 100%; percentage grade in their first math class ranging between 61% and 97%; and the year in which the student started their college education (2007-2016).

The second hypothesis tests whether there is any significant difference between males and females in the grades they attain in corporate finance as a mandatory class to be taken before graduation. An OLS regression is conducted in which the dependent variable is the grade in corporate finance and the explanatory variables include gender, grade in their first math class taken at the college level, class size, dummies controlling for the year the student took the class, and a binary variable indicating the semester the student took the class (Fall/Spring).

TABLE 1
DESCRIPTIVE STATISTICS

Variable	Obs	Mean	Std.Dev.	Min	Max
Choice of Finance Major	592	.203	.402	0	1
Corporate Finance Grade %	592	81.588	10.268	38.59	100
Gender (Male=0; Female=1)	592	.399	.49	0	1
Class Size	592	31.851	3.626	12	36
Grade in Math % (MA125/MA106/MA1	592	85.034	9.47	61.5	97
GPA	592	3.231	.457	1.85	4

TABLE 2
PAIRWISE CORRELATIONS AMONG VARIABLES

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) Choice of Finance as a Major.	1.000					
(2) Corporate Finance Grade (%)	0.109* 0.008	1.000				
(3) Gender (Male=0; Female=1)	-0.153* 0.000	0.067 0.103	1.000			
(4) Class Size	0.090* 0.028	0.061 0.137	-0.101* 0.014	1.000		
(5) Math Grade (%)	0.055 0.183	0.543* 0.000	0.098* 0.017	0.089* 0.030	1.000	
(6) GPA	-0.114* 0.006	0.174* 0.000	0.051 0.215	-0.082* 0.047	0.187* 0.000	1.000

* shows significance at the 0.05 level

RESULTS

We begin the study by comparing mean values for the variables used in the analysis between females and males to test whether there is a significant difference between the two sub-groups. Table 3 shows the difference in mean values between males and females in our sample. 25% of males in the sample chose finance as a major whereas almost 13% of females in the sample chose finance as a major. The difference between the means is significant at the 1% level. It also appears that there is a slight difference in the

grades of corporate finance favoring females by 1.5 percent yet the difference is only significant at the 10% level. Moreover, contrary to the theory that claims female students have weaker math capabilities in comparison to male students, our results show that females, on average, scored higher in their first math course by almost 2%, which is significant at the 5% level. On the other hand, there does not seem to be any significant difference in terms of the GPA between male and female students.

TABLE 3
DIFFERENCE IN MEAN VALUES BETWEEN MALES AND FEMALES

	Males	Females	t-stat (H1: Means are not equal) (p-value)
Choice of Finance as a major	0.253	0.127	3.763*** (0.0002)
Corporate Finance Grade	81.029	82.455	-1.653* (0.0989)
GPA	3.212	3.259	-1.239 (0.2155)
Corporate Finance Grade Relative to GPA	0.932	0.942	-0.977 (0.329)
Math Grade	84.279	86.174	-2.394** (0.017)
Number of Students	356	236	592

Our first hypothesis tests whether there is a relationship between the gender of the student and the choice of finance as a major. Since the dependent variable is binary, a logistic model was fitted to the data. The result showed the following:

Predicted logit of (MAJOR_FINANCE) = -3.329 - 0.910(FEMALE) + 0.037(CORP_FIN_GRADE) + 0.002(MATH_GRADE) – 0.827(GPA)

According to the results shown in Table 4, the log of the odds of choosing finance as a major is negatively related to being a female, positively related to the student's grade in the corporate finance class, and negatively related to their GPA. In fact, the odds of a female choosing a finance major is 0.4 meaning that males are 2.5 times more likely to choose finance as a major after controlling for their grades in corporate finance, math and their GPAs. Results also show a significant positive association between the students' grade in corporate finance and their choice of finance as a major. Figure 1 confirms this relationship showing the differences between males and females predicted probability of choosing finance as a major across various corporate finance scores. From Figure 1, we surmise that for a given score in corporate finance, the probability of a male student choosing finance as a major is higher than that of a female student.

TABLE 4
LOGISTIC REGRESSION ANALYSIS OF CHOICE OF FINANCE AS A MAJOR

Predictor	β	SE(β)	Wald's χ^2	df	P	e^{β} (Odds Ratio)	95% confidence Interval for Odds Ratio	
							Lower	Upper
Constant	-3.329***	(1.243)						
Gender (1=Female, 0=Male)	-0.910***	(0.240)	14.44	1	0.0001	0.402***	0.252	0.6435
Corporate Finance Grade (%)	0.038***	(0.014)	7.73	1	0.0054	1.039***	1.011	1.067
Math Grade (%)	0.002	(0.015)	0.03	1	0.8692	1.002	0.974	1.032
Grade Point Average (GPA)	-0.827***	(0.241)	11.75	1	0.0006	0.437***	0.272	0.702

Test			χ^2	df	p			
Overall Model Evaluation								
Likelihood Ratio Test			46.65	2	0.0000			
Wald Test			31.56	2	0.0000			

Dummies for the year of college entry are included in the regression equation.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

FIGURE 1
PREDICTED PROBABILITY OF CHOOSING FINANCE AS A MAJOR VERSUS GRADES IN CORPORATE FINANCE BY GENDER
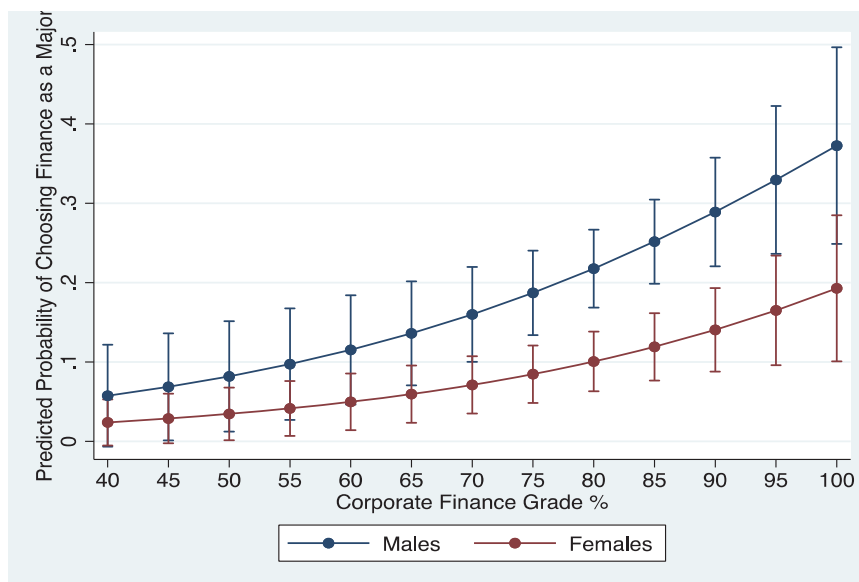
We test the second hypothesis of whether female students perform differently from male students in the corporate finance class and whether their math aptitude impacts female students' performance. We control for the class size, students' GPA, and include dummies to control for the class/section in which students were enrolled. Table 5 shows that there is no significant difference in grades between female and male students in corporate finance. Conversely, there is a strong positive association between students' analytical capabilities and their performance in the corporate finance class. Results show that a 10% increase in the student's grade in his/her math class increases the student's grade in corporate finance by 6%. This is significant at the 1% level. The relationship remained strong even after controlling for students' GPA, class size, and students' class/section including class/section fixed effects.

This result provoked our interest in finding out whether lower female mathematical aptitude may be the discouraging factor behind the lower female interest in choosing finance as a major. However, the results in Table 6 show that the math grades of the females in our sample are indeed 2% higher than the math grades of the male students. This suggests that the lower incentive of female students to choose finance as a major is not due to female students' lower mathematical or analytical aptitude.

TABLE 5
GENDER AND CORPORATE FINANCE GRADES

	(1) Corporate Finance Grade	(2) Corporate Finance Grade	(3) Corporate Finance Grade	(4) Corporate Finance Grade	(5) Corporate Finance Grade	(6) Corporate Finance Grade
Gender (Male=0; Female=1)	1.405* (0.850)	0.292 (0.716)	0.240 (0.716)	0.290 (0.714)	0.021 (0.703)	0.132 (6.280)
Grade in Math (%)		0.587*** (0.036)	0.572*** (0.037)	0.570*** (0.038)	0.571*** (0.038)	0.572*** (0.049)
GPA			1.688* (0.952)	1.737* (0.948)	1.613* (0.908)	1.614* (0.911)
Class Size				0.063 (0.114)	0.257 (0.215)	0.257 (0.215)
Gender*Math Grade						-0.001 (0.072)
Class/Section Fixed Effects	No	No	No	No	Yes	Yes
N	592	592	592	592	592	592

Panels (5)-(8) control for class/section fixed effects
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

TABLE 6
GENDER AND MATH GRADES

	(1) Math Grade	(2) Math Grade
Gender (Male=0; Female=1)	1.896** (0.787)	1.732** (0.771)
GPA		3.695*** (0.843)
N	592	592

* p < 0.10, ** p < 0.05, *** p < 0.01

CONCLUSION

This study employs an in-depth dataset of 592 students over 10 years to investigate whether there is gender bias in the choice of finance as a major in higher education. Are female students less likely to choose finance as a major? If the bias exists, the study also examines whether students' math skills or their grade in the introductory finance course impact their choice of finance as a major. We find evidence that females, on average, scored higher in their first college math course by almost 2% than males, but there is no significant difference in the grades between female and male students in corporate finance. Interestingly, we find that a 10% increase in the student's grade in his/her math class increases the student's grade in corporate finance by 6%. However, our results show that the odds of a female choosing a finance major is 0.4, which means that male students are 2.5 times more likely to choose finance as their major. Moreover, we find that for a given score in corporate finance, the probability of a male student choosing finance as a major is higher than that of a female student.

We believe that there are several implications for business schools, including faculty and students, as a result of this study. First, the theory that male students perform better in math and therefore do better in finance does not seem to hold true. The literature provides mixed evidence of this and therefore, further research may be required. Second, there must be some other qualitative factors influencing female students' choice of major since our results show that for the same grade in corporate finance, more male students choose finance as their major. Also, female students in our sample performed better in their math class than our male students but were still less likely to choose finance as their major. As a result, we surmise that the quantitative requirements are not strong predictors of whether female students choose finance as a major. Therefore, an investigation into the qualitative factors that influence female students' decisions as it pertains to selecting an undergraduate major is warranted. We believe that a survey targeting upper level undergraduate business students would help us more deeply understand the reasons behind their choice of major.

ENDNOTE

1. https://www.aacsb.edu/-/media/aacsb/publications/data-trends-booklet/2019.ashx?la=en&hash=84E51D3E6928ECADF6E8D51D41E64C0D58ED48B8

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