

# Factors that Explain Undergraduate Business Students' Performance in Their Chosen

## Field. Does Gender Matter?

Leiv Opstad  
Norwegian University of Science and Technology  
Trondheim  
Torbjørn Årethun  
Western Norway University of Applied Sciences  
Sogndal

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## Abstract

The purpose of this study is to find out how undergraduate students perform in selected courses at a business school. Management and communication oriented courses require different skills to those of core business courses. There are many studies on students' success in economics, accounting, and finance, but not in management and marketing. The data in this study are from a business school in Norway. Undergraduate business students can choose different pathways in their third year. We compare students' performance in different selected majors. The methods chosen were the independent samples test and a linear regression model. It appears that the most notable indicator of success in the chosen major is performance in the introductory course within the same field. Mathematics is another important element, while grade point average (GPA) scores have a minor impact. There is obviously some gender effect. The males perform well in quantitative subjects, while women outperform men in marketing.

**Keywords:** business students; gender difference; success in business courses; quantitative analysis; linear regression model; ordinary least squares (OLS)

## **Factors that Explain Undergraduate Business Students' Performance in their Chosen Field.**

### **Does Gender Matter?**

The admission criteria at NTNU (Norwegian University of Science and Technology) Business School depends on grade point average (GPA) scores. Those admitted are a heterogenous group. There is a wide spread of mathematical skills, and this has an impact on their attitude towards mathematics (Opstad, 2019; Opstad & Årethun, 2019). This is an important consideration in the choice of study fields in the third year of the bachelor's programme (Opstad & Årethun, 2020). Students with good mathematical skills prefer to specialise in quantitative courses, for instance in financial subjects. Those who fear mathematics and perform poorly in it tend to choose non-quantitative courses. Performance in the compulsory business mathematics course largely determines the selection of study field in the third year. There is a strong significant negative correlation between those who choose non-quantitative courses (for example organisational theory or marketing) and their business mathematics results. It is the opposite case in quantitative courses. There is a strong positive link between performance in business mathematics and choice of financial sciences.

The purpose of this article is to focus on factors that might explain the results in the students' chosen field in their third year. We compare outcomes in the various preferred topics and see if there are any differences in terms of gender. We know there is a gender gap in choice of business course majors (Siegfried, 2016), but are there also gender differences in outcomes?

### **Literature Review**

Students' selection of courses can depend on their mathematical skills. Pritchard et al. (2004) found that students with strong quantitative skills prefer to major in accounting or finance, while those with weaker quantitative skills tend to major in marketing and management. Since marketing and particularly management courses do not use mathematical tools in their presentation of theory, these fields are more attractive for students who have low quantitative abilities and dislike mathematics and feel anxious about it. Benligiray and Onay (2017) reported that performance in mathematics is a predictor of scores in finance courses, but not in financial accounting and cost accounting. Uyar and Güngörmüş (2011), however, suggested a positive correlation between performance in mathematics and outcome in financial accounting.

Marketing is one of the most popular majors amongst business students (Aggarwal et al., 2007). Management oriented courses require high verbal and organisational, and to a lesser extent mathematical, skills. Empirical studies showed that undergraduate marketing students perform less well than business students in quantitative subjects (Bhowmick et al., 2017; Nilsson & Carlsson, 2018). Since many find quantitative methods unpleasant and boring (Tarasi et al., 2019), the result will be a lack of motivation and interest in quantitative courses. Therefore, one might expect that those students are better in written and verbal communication. According to Hugstad (1997), this is not the case. They do not outperform those who choose to specialise in finance. However, as Agarwal et al. (2007) pointed out, marketing students obviously have other skills that employers find attractive. They may score poorly on traditional measurements of academic performance compared with other business students, but they likely acquire skills during their studies that enable them to obtain decent jobs. It is unclear if they choose this field because of career possibilities, because they consider marketing and other non-quantitative subjects to be an easier way to achieve a degree or some other reason.

There are not many studies on performance in management or organisational courses. McMillan-Capehart and Adeyemi-Bello (2008) found that grades in prerequisite management courses are positively correlated with outcomes in graduate organisational behaviour courses.

Students who prefer to major in finance or accounting perform better in quantitative courses than those majoring in management and marketing (Yousef, 2013). They are successful in both quantitative and non-quantitative courses. This suggests that students with quantitative abilities tend to choose finance courses (Agarwal et al., 2007). Other studies (Hahn & Leslie, 2017; Fairchild & Hahn, 2019) confirm this. Students who have selected accounting and finance majors outperform all the other majors in the business field.

Several studies have analysed the link between grades obtained in different introductory courses and subsequent performance in the same field. Findings revealed a strong positive correlation. Performance in finance depends on the outcome in prerequisite courses (Grover et al., 2009; Denny, 2014). Maksy (2012) found a positive relationship between intermediate and upper level accounting courses. There is a link between success in the core course and the chosen business major (Cobb-Wahlgren et al., 2017). Pappu (2004) pointed out that students' performance in introductory courses in marketing has a significant effect on later study in the same subject. Good grades in introductory courses motivate and stimulate students to learn more about the field. Sabot and Wakeman-Linn (1991) showed that grade levels in introductory courses were a far greater indicator of later choices than overall rankings within the class.

Grade point average scores matter. Trine & Schellenger (1999) and Blaylock & Lacewell (2008) indicated that GPAs, mathematical knowledge, and grades in introductory courses in accounting were significant predictors of performance in finance courses. Zwick and Sklar (2005) and Maks and Rodriguez (2018) found a significant association between a

student's GPA score and grades obtained in accounting and finances courses. Ketchman et al. (2018) reported a positive link between GPA scores and performance in business courses.

Pritchard et al. (2004) pointed out that accounting and finance majors have similar skills, and these were different to those of students in marketing and management. Mo and Waples (2011) found also that students majoring in accounting and finance have similar characteristics, except for their gender. Accounting attracts more females than finance. One reason might be that male students tend to be better at mathematics than female students (Hyde et al., 2008). The females tend to select more qualitative fields such as marketing and management (Emerson et al., 2018).

The literature presents a mixed picture with regard to the gender gap in performance on business courses. Daymont and Blau (2008) concluded that females performed at least as well as males in management courses. Friday et al. (2006) stated that the females achieved higher scores than the males in this discipline, whereas McMillan-Capehart and Adeyemi-Bello (2008) discovered the opposite. Borde (1998) did not find any significant gender difference in grades obtained in marketing courses. However, Naqvi and Naqvi (2017) reported higher performance scores amongst males than females in marketing. However, in Cheung and Kan's (2002) study the females had more success than the males. Many studies have revealed no or minor gender gaps in achievement in accounting courses. Gammie et al. (2003) showed that females outperformed their male counterparts in the first year accounting course, but there was no gender gap in the final year. Uyar & Güngörmüş (2011) could not establish any gender difference in accounting courses. Terry et al. (2015) examined the performance of undergraduate business students in business law, economics, finance, and management courses; there were no significant gender differences. Other studies have suggested there might be a gender gap in favour of males in quantitative courses (Naqvi & Naqvi, 2017; Raehsler et al., 2012).

## Data, Methodology, and Results

The results are reported after presentation of the data, which were gathered from business students enrolled in the NTNU Business School, Norway from 2013 to 2016. Unlike many other studies, this paper applied data collected from the school's database, and not self-reports of students' characteristics and performance. The students on the bachelor's programme have identical course portfolios for the two first years, but they can choose different fields or majors in the third year. We selected four advanced subjects (finance, accounting, marketing, and management) from the courses available. The average number of students who complete the bachelor's degree is around 200 per year; approximately 40–45% of these are females. Marketing is quite a popular field (see Table 1). However, there is a big overlap between students selecting the compulsory major courses in management and marketing (around 40%). Students on these two programmes have obviously similar interests and preferences. The combination of marketing and finance or management and finance is rather rare (about 10%). In addition, students who choose to specialise in accounting combine this to a very small degree with other subjects. Table 1 shows some notable gender differences. Females preferred to take management courses, while finance subjects were significantly less popular among women.

The GPA scores from high school did not vary with the chosen pathway, but there were substantial differences in the mean performance in the introductory course in business mathematics. Those undergraduate students who specialised in finance subjects achieved better grades than those graduating from the marketing or management fields.

### Table 1

*Summary Statistics of Students on Four Different Courses in their 3<sup>rd</sup> Year at the NTNU Business School 2013–2016*

Advanced course	GPA	Performance maths <sup>1)</sup>	Gender	N
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			(% age of males)	
Finance	52.17	3.60	56	279
Accounting	51.67	3.23	38	155
Marketing	51.74	2.18	38	442
Management	51.71	1.90	29	306

Table 2 presents the outcomes from introductory courses and from the chosen third year courses broken down by gender. There was a significant gender difference in the introductory courses. Females outperformed males in marketing, while males obtained higher grades in the quantitative courses and in accounting. The gender gap tended to decrease in the selected third year courses compared with the compulsory, introductory courses – except in the case of the marketing major, where the difference widened in favour of women.

**Table 2**

*Independent Sample T-test of Mean (Assume Equal Variance)*

Compulsory introductory course	All <sup>1)</sup>	Performance		Difference	Significance level
		Male	Female		
Business maths	2.76 (1.65)	2.84	2.69	0.15 (0.093)	*
Management	2.94 (1.23)	2.90	2.96	-0.06 (0.061)	
Marketing	2.78 (1.08)	2.71	2.83	0.12 (0.053)	**
Accounting	3.13 (1.61)	3.29	3.00	0.29 (0.093)	***
Macroeconomics	3.09 (1.23)	3.28	2.94	0.34 (0.117)	***
Chosen course 3 <sup>rd</sup> year					
Management	3.15 (1.24)	3.08	3.17	-0.09 (0.164)	
Marketing	3.06 (1.15)	2.79	3.24	-0.45 (0.117)	***
Accounting	3.28 (1.54)	3.35	3.23	0.13 (0.28)	
Finance	3.48 (1.20)	3.57	3.37	0.15 (0.90)	

1) 0:F, 1:E, 2:D, C:3, 4:B, 5:A

Note. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% level, respectively.

Pairwise comparison does not take into account the influence of other factors. By using a linear regression model it is possible to find out simultaneously how other factors affect the performance in a chosen course. Was there a gender effect? Based on previous literature on this subject, we present the following model:

$$Y_i = a_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

( $a_0$  is a constant,  $\beta$  are the regression coefficients, and  $\varepsilon$  is stochastic error)

Where the dependent variable is:

$Y_i$ : performance in the selected advanced course  $i$  ( $i$  = finance, accounting, marketing, and management)

The independent variables are:

$X_1$ : Gender (0: Female, 1: Male)

$X_2$ : Performance in compulsory business mathematics (0: F, 1: E, 2: D, 3: C, 4: B, 5: A)

$X_3$ : GPA score from high school

$X_4$ : Performance in the compulsory introductory course within the same field

(0: F, 1: E, 2: D, 3: C, 4: B, 5: A)

The selected finance course was finance and the currency market. The chosen corresponding prerequisite course was compulsory macroeconomics. Table 3 presents the results. There was a significant positive link between the introductory course related to the chosen course. Students with success in the preliminary course obtained significantly better marks in the corresponding advanced course than students with poorer outcomes in the basic course. Performance in business mathematics had a strong positive effect on students' grades in advanced quantitative courses such as finance and accounting, as well as in the qualitative based advanced course in marketing. Grades achieved in business mathematics and in the advanced management course were, however, uncorrelated.



There was a significant negative correlation between gender (more females) and scores in the chosen marketing course. A higher proportion of female students tended to increase their performance in the advanced management course. The GPA had a minor influence on the performance in the advanced courses; we could not identify any significant correlation. Since the variance inflation factor (VIF) was below 1.5, there was only a minor correlation amongst the independent variables.

**Table 3**

*Results From Regression Model*

Independent Variables	Dependent variable: Performance marketing course		Dependent variable: Performance management course		Dependent variable: Performance finance course		Dependent variable: Performance accounting course	
	Coefficient	Significance level	Coefficient	Significance level	Coefficient	Significance level	Coefficient	Significance level
Constant	1.259 (1.041)	0.228	1.021 (1.378)	0.460	0.090 (1.122)	0.936	2.372 (2.719)	0.289
Gender	-0.389 (0.135)	0.004 (***)	-0.055 (0.196)	0.328	0.206 (0.159)	0.197	-0.147 (0.043)	0.617
GPA	0.010 (0.021)	0.638	0.027 (0.028)	0.328	0.004 (0.022)	0.932	-0.30 (0.043)	0.484
Performance Business maths	0.120 (0.043)	0.006 (***)	0.062 (0.058)	0.288	0.167 (0.059)	0.005 (***)	0.179 (0.104)	0.089 (*)
Performance introductory course marketing	0.409 (0.076)	0.000 (***)						
Performance introductory course management			0.231 (0.069)	0.001 (***)				
Performance introductory quantitative course (macro-economics)					0.670 (0.087)	0.000 (***)		
Performance introductory course accounting							0.599 (0.126)	0.000 (***)
	Adj. $R^2$ = 0.210 $N$ = 246		Adj. $R^2$ = 0.085 $N$ = 165		Adj. $R^2$ = 0.40 $N$ = 146		Adj. $R^2$ = 0.29 $N$ = 77	

Note. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% level, respectively.

## Discussion

The results of this study are similar to some of the conclusions in prior publications. There was a close relationship between the prerequisite course and the related selected course. Bernardi and Bean (2002) found that the outcomes in introductory accounting courses accounted for around 50% of the variation in performance in Accounting II. This result might have been caused by positive self-selection, that is, the students chose the subject in which they were proficient. They might have had suitable abilities and skills, and this motivated them to study the topic more thoroughly. In addition, by completing the introductory course, the students acquired subject-specific knowledge of concepts and methods that provided them with a head-start in the corresponding advanced course compared with other students. Therefore, it is not surprising there was a close correlation between the students' success in the introductory course and in the chosen course in the same field. In other words, the outcome in the introductory course was a good predictor of achievement in the subsequent similar voluntary course.

According to Benigary & Onay (2017), the students' scores in finance courses were not significantly correlated to performance in non-quantitative courses such as management and marketing, since non-quantitative courses require other kinds of abilities and skills. This might, to some degree, explain the differences amongst the chosen fields.

Several studies found a disproportionately low number of female students in economics and quantitative courses (Dynan & Rouse, 1997; Rask & Bailey, 2002), and the women had a relatively significant lower performance (Johnson et al., 2014). Our study confirmed this tendency. There might be multiple reasons why females were less likely to choose quantitative courses. These results can be related to the fact that women tend to choose less advanced mathematics at high school (Opstad, 2018) and that they have poorer attitudes towards mathematics (Opstad & Årethun, 2019b). The influence of sociocultural factors

(Johnson et al., 2014) or student-specific characteristics (Opstad & Fallan, 2010; Johnson et al., 2014) could both play an important part.

In the present study, there was a significant difference in outcomes in favour of males in compulsory quantitative courses. However, the gap became insignificant when the analysis was limited to the third year. Then, the percentage of females who chose finance decreased when compared with the compulsory course, but their performance relative better to the males. The literature has shown mixed results when it comes to non-quantitative courses. In this research, the females obtained slightly higher scores in management than males, but the difference was again not significant. For marketing, however, the gender gap in favour of women increased from the introductory course to the advanced course. The percentage of females participating in the marketing course not only increased (Table 1), but the women achieved substantially better outcome than the men (Table 3). It appears that more competent females were attracted to marketing than males. Cheung and Kan (2002) suggested that females had higher scores in marketing and communication courses because they put greater effort into their studies, or alternatively, the women generally performed better in some academic subjects (languages and human and social sciences) and men had more success in others (mathematics and natural science). For this reason it made sense that female students obtained higher grades than peer males in psychology (Launius, 1997). It may also help to explain the different gender composition of the selected courses. Another explanation might be that women are more risk averse than men (Covington, 1998); they therefore tend to apply for advanced courses with lower requirement barriers and less competitive class environments (e.g, marketing) than quantitative, male dominated courses (e.g., finance). Highly skilled female students then increase the probability of achieving high marks.

Performance in mathematics had a significant positive impact on outcomes in the chosen finance course, and there was no significant link between performance in mathematics

and in the selected management course. Since finance subjects require mathematical skills, the results in this study make sense. The level and the impact of mathematics on performance in accounting was less significant. This is consistent with other studies. Mathematical skills help students in logical reasoning. Hence, mathematics scores were not a suitable proxy for skills in the management course compared with finance. Marketing does not require particular quantitative skills. Therefore, it might be surprising that this study found a positive significant link between performance in mathematics and performance in the chosen marketing course (third year). Students who dislike mathematics and who choose to specialise in marketing do so because they want to avoid using mathematics. They focus on verbal presentation and communication skills. Even so, some authors (Bhowmick et al., 2017; Ganesh et al., 2010) have emphasised the importance of mathematical abilities in achieving success in marketing. Mann and Enderson (2017) claimed that mathematical talents help to improve critical and analytically thinking and it helps solving problems in other fields. Even though the average student's knowledge of mathematics is rather poor amongst those who choose marketing, those with better skills in the subject are rewarded with higher degrees. This can explain why there is a positive link between performance in mathematics and success in marketing courses.

### **Limitations and Further Studies**

The value of the R square was rather low. Obviously, variables other than those included in the regression model had an impact on students' choices. The dataset was collected from just one business school in Norway with high entry qualifications, and so we do not know how representative the results are. Despite these limitations, this study makes an important contribution to the literature on gender and performance in business courses. A number of options are available for further research. Factors that might explain gender differences in performance among chosen courses could be investigated in greater depth. It

would also be interesting to identify other variables that might explain outcomes in different fields.

### **Conclusion**

It was not surprising to discover that performance in introductory courses was a key factor for success in the chosen field. However, it was observed that GPA scores seemed to have only a small effect. This study confirms that a different set of skills are required between quantitative and non-quantitative subjects. Many studies have analysed gender differences in economics and core business courses, but rather few in management and marketing. The study is a contribution to research into the gender gap in these fields, where females seemed to perform well. The role of mathematics varied according to the selected major. The study shows that there were significant differences in the effect of the independent variables on performance in chosen third year courses. This information is important in designing study programmes.

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