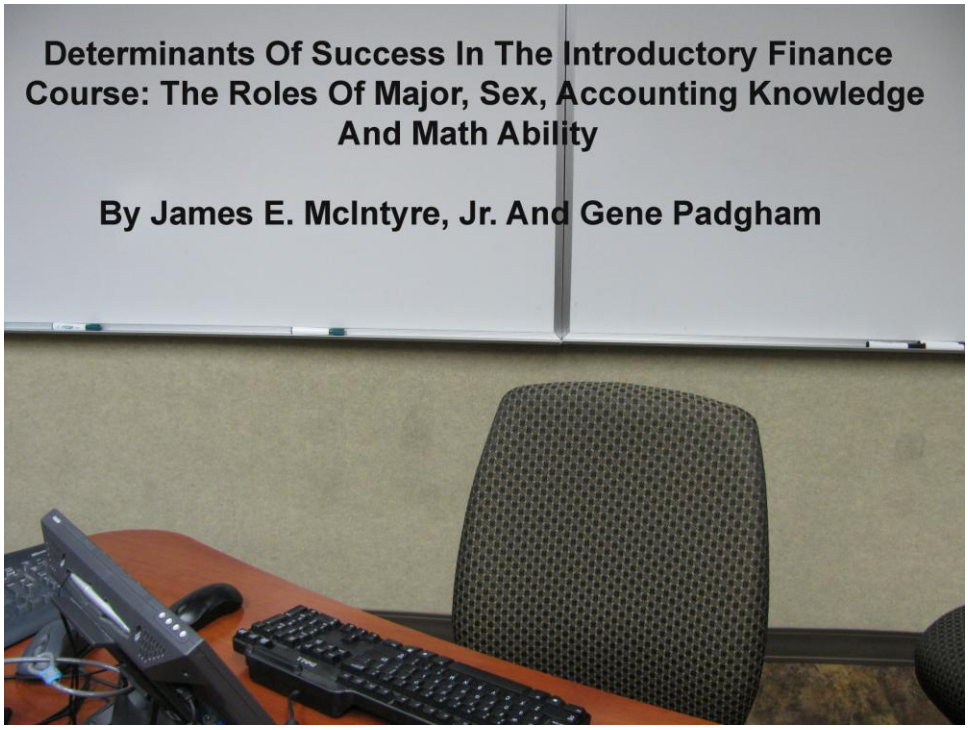

Peer Reviewed

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The authors wish to acknowledge insightful comments provided by two anonymous referees.

Abstract

This study investigates the significance of variables associated with student grades in the introductory finance course. The key results are: 1) an accounting or finance major correlated with higher course grades than a management or marketing major; 2) the ability to pass an accounting retention test on the first attempt was associated with higher grades in the course, but a student's accounting GPA was not; 3) math ability was related to higher course grades; 4) students self-selected majors based on math ability; 5) higher transfer hours were linked to lower course grades; 6) a student's sex was not a significant predictor of grade in introductory finance.

Introduction

This study examines the relation between key student attributes and performance in the introductory finance course. We examine the roles of major, math ability, accounting competence, transfer hours and sex on course grade.

We begin by examining the link between students' majors and the grade achieved in introductory finance. Very little research has been conducted to assess the link between major and success in introductory finance. Sen, Joyce, Farrell, and Toutant (1997) compared the performance of business and non-business majors in finance classes but did not distinguish between accounting, finance, management and marketing majors.

We next examine the link between math ability and course grade. Most institutions have math prerequisites (e.g., algebra, statistics and/or calculus) for their introductory finance course. Several studies (Ely and Hittle (1990), Sen, Joyce, Farrell and Toutant (1997), Alcock, Cockroft and Finn (2008), and Marcal and Roberts (2001)) have examined the role of math or statistics grades as indicators of success. Most studies find these variables to be highly significant. We replicate these studies using students' grades in algebra and their statistics GPA as proxies for math ability. Significant coefficients for these variables would confirm the need for completing math prerequisites prior to taking the introductory finance course and reiterate the desirability of remediating students deficient in math.

Students may self-select majors based, in part, on self-perceived competencies. We term this the self-selection hypothesis. If true, a math-intensive major like accounting or finance would more likely be chosen by students having high levels of competence in math with the reverse being true for students choosing "soft" majors like management or marketing. If management and marketing majors are actually less proficient in math, they should underperform in math-dependent classes like introductory finance relative to accounting and finance majors.

We test the self-selection hypothesis by performing tests of mean differences to compare algebra and statistics grades across majors and by regressing students' finance grades against dummy variables representing their majors. The self-selection hypothesis can be accepted if finance and accounting majors have algebra and statistics grades that are significantly higher than those of management and marketing majors and if an accounting or finance major is associated with higher grades in finance. Acceptance of the self-selection hypothesis would also suggest either the need to remediate management and marketing majors before proceeding with the finance course or suggest the need

to track management and marketing majors into separate sections of finance than those offered to accounting and finance majors.

One of the common prerequisites for the introductory finance course is one or more financial accounting classes. The assumption behind this prerequisite is that accounting competence is needed to succeed in the finance class. If retention of material taught in accounting courses is necessary for success in finance, then there should be a positive relationship between measures of accounting knowledge and finance grades. A related question is whether accounting grades accurately reflect student accounting retention contemporaneously with enrollment in the finance course. If accounting grades are poor measures of student retention, this may indicate: 1) the need to remediate students in accounting at the beginning of the finance class and 2) the advisability of using alternative measures of accounting knowledge in models designed to predict success in the introductory finance course.

While some research has examined the relationship between accounting grades and finance grades (e.g., Didia and Hasnat (1998)), it is by no means certain that accounting grade point average (GPA) is the best measure of accounting retention. Grover, Heck and Heck (2007) pretested introductory finance students in math, accounting retention, and economics and then used the results as predictors of success in the class. These authors found significant and positive coefficients on the math and accounting retention variables and a positive but insignificant coefficient on the economics retention variable. However, whether accounting GPAs or accounting retention tests are equally powerful predictors of finance grades is still unknown. To assist in resolving this issue, we administered a test of students' accounting retention contemporaneous with their enrollment in the introductory finance class and determined whether this test and accounting GPA are equally effective in predicting students' grades.

Data, Variables, and Statistical Tests

At the direction of the dean of our business school, we administered an accounting proficiency exam to all undergraduate business majors enrolled in introductory finance [1]. This closed-book, pass-fail exam was adminstered each semester for four years. It required students to place a corporation's account balances onto the appropriate financial statements. Shown below is an example of the test we used.

Sample Exam

Spring 2009 _____Pass _____Fail

This exam is being given to evaluate your proficiency at recognizing basic financial information and where it is identified in the financial statements.

Provide the following Information:

Your Name (Please Print) _____

Your Student Number _____

Your Major _____

Where did you take your first accounting course?

_____

What year did you take this course?____

What was your grade in this course? ____

Financial Statement Proficiency Exam

Medex Inc. had the following balances in their accounts for the year ended December 31, 2008:

CASH	**$4,200**	**WAGES EXPENSE**	**$8,800**
ACCOUNTS RECEIVALBLE	**6,700**	**UTILITIES EXPENSE**	**3,210**
ACCOUNTS PAYABLE	**7,240**	**WAGES PAYABLE**	**2,100**
SALES REVENUE	**76,700**	**LAND**	**39,200**
BUILDING	**44,000**	**COMMON STOCK**	**9,000**
SUPPLIES	**6,230**	**ADDITIONAL PAID IN CAPITAL**	**47,760**
INTEREST EXPENSE	**2,460**	**SHORT-TERM NOTES PAYABLE**	**6,700**
COST OF GOODS SOLD	**35,790**	**DEPRECIATION EXPENSE**	**6,870**
BONDS PAYABLE	**26,500**	**EQUIPMENT**	**25,350**
SUPPLIES EXPENSE	**980**	**INVENTORY**	**8,970**

The Equipment and Building accounts are both **net** of the related accumulated depreciation. The income tax rate for the year is 40%. The Retained Earnings balance was $26,496 on January 1, 2008 and the company paid $2,300 in common dividends during the year 2008.

1. Based on the information provided, prepare the income statement for Medex Inc. for the year ended December 31, 2008. **Provide labels for all entries on these financial statements.**

2. Based on the information provided, prepare the Retained Earnings statement for Medex Inc. for year ended December 31, 2008.

3. Based on the information provided, prepare the Balance Sheet for Medex Inc. as of December 31, 2008.

A passing grade was awarded if the accounts were placed on the appropriate statement and if the balance sheet balanced. The exam was administered twice during the class, with the first administration occuring about two weeks after the start of class and the second shortly after the midpoint of the semester. Students were informed that to receive a grade in the class they had to pass the accounting proficiency exam. Otherwise they would receive an incomplete until such time as they passed the test. Students passing the course, but not passing the accounting test on the second attempt, were free to retake the exam as often as needed after the course ended in order to resolve the incomplete grade. Using the results of this test, we constructed a variable called "accounting test" that was coded 1 if the student passed the test on the first attempt and coded 0 otherwise. The rationale behind this procedure is the belief that students passing the test on the first attempt show better accounting retention than students who do not.

Other data for the study were obtained from student transcripts. These included student majors and their grades in algebra, accounting and statistics, the number of hours transferred from other institutions, and the total number of hours attempted [2]. To represent a student's major, we constructed 0-1 dummy variables for accounting, finance, and marketing by entering a 1 if the student majored in the subject and 0 otherwise. The management major was used as the reference case. The transcript grades for algebra, accounting, and statististics were transformed to numeric values in the following manner:

A = 4
B = 3
C = 2
D = 1
F = 0

Grade point averages for the accounting and statistics courses were computed as simple averages.

Because previous research [see Borde, Byrd and Modani (1998)] suggests transfer status may be a factor affecting introductory finance grades, we included the number of hours transferred from other institutions as a variable in our data

set. The vast majority of transfers at our university are from junior colleges. It may be that students choose to begin their college careers at a junior college if they perceive they are not academically prepared to enter a four-year institution and/or if they believe courses offered at junior colleges are less rigorous than those offered at universities. If this is true, the number of hours a student transfers may be a negative indicator of ability to succeed in higher education and, therefore, of success in the finance class. However, if junior colleges provide a rigorous education, then the level of transfer hours may be a positive indicator of success in the class. Since experience in college may also be related to the finance grade, we include a variable measuring the total number of hours a student has attempted. However, total hours could be a negative indicator if less talented students consume more hours before becoming eligible to take the finance class.

Since the sex of a student could be a factor affecting success in the finance course, we included a dummy coded 1 for female and 0 for male as the reference case. The relationship between sex and grades in finance remains unresolved. Henebry and Diamond (1998) found no significant difference in grades attributable to student sex, but Borde, Byrd and Modani (1998) found a dummy variable coded 1 for male and 0 for female predicted higher grades for men than for women when included in an OLS regression even though they found no significant difference in the overall GPA earned by men and women. In accounting, Mutchler, Turner and Williams (1987) and Tyson (1989) found females earned significantly higher grades than men. However, Lipe (2003) found sex unrelated to accounting grades.

Summary Statistics

Table I below provides some key statistics derived from our data set. A number of these results merit discussion. The first outcome that stands out in Table I is the dominance of accounting and finance majors over management and marketing majors in finance, algebra, and statistics. Both finance and accounting majors had about a B average in these courses while management and marketing majors had a C to C+ average. This would seem to lend credence to our *a priori* notion that students self-select accounting or finance majors based, in part, on perceived ability in math.

Table I
Key Variable Means
(Standard Deviations in Parenthesis)

	#Students	% Passing Accounting Test First Time	Finance Course Grade	Algebra Grade	Accounting GPA	Statistics GPA	Transfer Hours
Total	**230**	**34%**	**75.5 (12.4)**	**2.86 (.99)**	**2.67 (.86)**	**2.84 (.90)**	**34.08 (33.92)**
Finance Majors	**33**	**36%**	**79.67 (10.60)**	**2.94 (1.09)**	**2.64 (.84)**	**3.08 (.74)**	**23.27 (30.22)**
Accounting Majors	**41**	**56%**	**80.92 (12.11)**	**3.12 (.93)**	**3.01 (.87)**	**3.27 (.68)**	**46.12 (39.41)**
Management Majors	**101**	**27%**	**72.73 (12.97)**	**2.84 (.98)**	**2.68 (.88)**	**2.77 (.99)**	**36.35 (34.23)**
Marketing Majors	**55**	**31%**	**73.89 (10.87)**	**2.67 (.96)**	**2.40 (.74)**	**2.54 (.82)**	**27.42 (27.98)**
Male	**97**	**29%**	**74.19 (12.07)**	**2.59 (1.04)**	**2.55 (.82)**	**2.61 (.92)**	**33.19 (32.52)**
Female	**133**	**38%**	**76.39 (12.65)**	**3.06 (.89)**	**2.75 (.88)**	**3.01 (.85)**	**34.74 (35.02)**

Finance Course Grade = percentage grade in introductory finance.
Algebra Grade = the grade (using a 4-point scale) earned in college algebra.
Accounting GPA = the average grade earned in the two-course accounting prerequisite.
Statistics GPA = the average grade earned in the two-course statistics prerequisite.

The second notable outcome is that algebra and statistics grades were higher for females than for males (about a B average for females and a C+ average for males). This result challenges the notion that men are innately superior to women in math [e.g., see Larry Summers' comments cited in Bombardieri (2005)].

Finally, accounting majors tended to transfer more hours from other institutions than other majors. The reasons for this are unclear, but may be, in part, due to the availability of sophomore-level accounting courses at junior colleges. We will have more to say on this topic in the conclusion.

Table II
Test of Mean Differences
T-Statistics (Significance)

Mean Differences Tested	Finance Course Grade	Algebra Grade	Statistics GPA	Accounting GPA
Accounting-Management	3.58 (.0005)	1.64 (.104)	3.46 (.0007)	2.07 (.041)
Finance-Management	3.08 (.003)	.48 (.631)	1.90 (.059)	.24 (.810)
Accounting-Marketing	2.94 (.004)	2.31 (.023)	4.71 (.00000)	3.68 (.0000)
Finance-Marketing	2.45 (.016)	1.16 (.0250)	3.12 (.002)	1.38 (.172)
Female-Male	1.34 (.182)	3.67 (.0003)	3.35 (.0009)	1.76 (.08)

Finance Course Grade = percentage grade in introductory finance.
Algebra Grade = the grade (using a 4-point scale) earned in college algebra.
Accounting GPA = the average grade earned in the two-course accounting prerequisite.
Statistics GPA = the average grade earned in the two-course statistics prerequisite.

Tests of Mean Differences

Since casual observation of Table I suggests significantly different math abilities for accounting and finance majors compared to management and marketing majors and also for men compared to women, we performed formal tests of mean differences to determine whether these groups earned significantly different grades in math-intensive subjects. Table II above presents the results of these tests.

Table II confirms the suspicions raised by Table I. Accounting majors significantly outperformed management majors in finance and statistics and accounting. They also surpassed marketing majors in finance, algebra, statistics, and accounting. Finance majors only outperformed management majors in finance (significant at the .3 percent level) and statistics (significant at the 6 percent level), but they significantly outperformed marketing majors in finance, algebra, and statistics.

Another test determined whether grades differed according to sex. We found females significantly outperform males in algebra and statistics. Females also tended to have significantly (8 percent level) higher accounting GPAs than men. However, we found no significant difference in finance grades between men and women.

OLS Regression Results

Tables III-A and III-B below show the results of two ordinary least squares regressions designed to determine whether major, accounting test, transfer hours, total hours, math ability, accounting GPA, and sex were related to grades achieved in introductory finance. OLS is appropriate for this study since we use the numeric course grade (grade = 0 - 100) as the dependent variable, rather than an ordinal letter-grade-based measure.

We computed two OLS regressions because we uses two sets of indicator variables. The first regression (Table III-A) used indicator variables (0-1 dummies) for accounting, finance, and marketing coded 1 if the student was in the major and 0 otherwise. The reference class in this regression was the management major which occurs when all three majors are coded as 0. The second regression (Table III-B) used indicator variables for sex coding 1 if the student was female and 0 if male [4]. Both tables report variance inflation factors (VIF) for the independent variables. Based on the VIF numbers, we conclude multicollinearity did not bias the regressions.

Table III-A shows that the grades in introductory finance for finance majors exceeded those of management majors by 4.6 points (significant at the 4 percent level) and that the grades of accounting majors were 3.7 points (significant at the 8 percent level) higher than those of management majors. There was no significant difference in finance grades between management and marketing majors. The accounting test variable indicates that students passing the accounting test on the first attempt earned course grades that were seven points higher than those that did not (significant at the .01 percent level). This result confirms that students having high concurrent retention of accounting performed significantly better in finance. Higher levels of transfer hours were related to lower course grades in finance (significant at the 5 percent level) [5]. This result is consistent with Borde, Byrd and Modani (1998). According to the regression, each hour transferred led to a .05 reduction in the finance course grade.

Algebra grade (significant at the 9 percent level) and statistics GPA (significant at the .1 percent level) were positively related to a higher grade in finance. This result confirms the self-selection hypothesis: the notion that students with competence in math self-select majors such as accounting and finance rather than management or marketing.

Table III-A
Effect of Major on Course Grade

Dependent variable = Finance Course Grade
Reference Class = Management Major

	Coefficient	T-Statistic (Significance)	VIF
Constant	51.70	11.36 (.000)	
Finance Major	4.59	2.08 (.039)	1.20
Accounting Major	3.66	1.74 (.084)	1.30
Marketing Major	1.06	.57 (.568)	1.26
Accounting Test	7.00	4.48 (.000)	1.11
Transfer Hours	-.05	-2.19 (.030)	1.31
Total Hours	.05	1.64 (.102)	1.27
Algebra Grade	1.44	1.70 (.091)	1.40
Accounting GPA	.86	.79 (.430)	1.75
Statistics GPA	3.61	3.23 (.001)	2.01
R^2 (Adjusted R^2)	28.6% (25.7%)		
F Statistic	9.8		

Accounting GPA = the average grade earned in the two-course accounting prerequisite
Accounting Major = a dummy variable which equals 1 if student is an accounting major and 0 otherwise.
Accounting Test = a dummy variable which equals 1 if student passed the test on the first attempt and 0 otherwise.
Algebra Grade = the grade earned in college algebra.
Finance Major = a dummy a variable which equals 1 if student is a finance major and 0 otherwise.
Male = a dummy variable which equals 1 if student is a male and 0 if a female.
Management Major = a dummy variable which equals 1 if student is a management major and 0 otherwise.
Marketing Major = a dummy variable which equals 1 if student is a marketing major and 0 otherwise.
Statistics GPA = the average grade earned in the two-course statistics prerequisite.
Total Hours = the number of hours of college credit student completed.
Transfer Hours = the number of hours transferred from another institution.
VIF= Variance Inflation Factor.

Table III-B
Effect of Sex on Course Grade

Reference Class = Male
(Dependent Variable = Finance Course Grade)

	Coefficient	T-Statistic (Significance)	VIF
Constant	51.79	11.50 (.000)	
Female	-.71	-.47 (.637)	1.09
Accounting Test	7.57	4.90 (.000)	1.061
Transfer Hours	-.06	-2.34 (.02)	1.25
Total Hours	.05	1.79 (.074)	1.20
Algebra Grade	1.53	1.77 (.078)	1.42
Accounting GPA	.68	.63 (.532)	1.725
Statistics GPA	4.19	3.76 (.000)	1.96
R^2 (Adjusted R^2)	26.7% (24.4%)		
F Statistic	11.5		

Accounting GPA = the average grade earned in the two-course accounting prerequisite.
Accounting Major = a dummy variable which equals 1 if student is an accounting major and 0 otherwise.
Accounting Test = a dummy variable which equals 1 if student passed the test on the first attempt and 0 otherwise.
Algebra Grade = the grade earned in college algebra.
Finance Major = a dummy a variable which equals 1 if student is a finance major and 0 otherwise.
Male = a dummy variable which equals 1 if student is a male and 0 if a female.
Management Major = a dummy variable which equals 1 if student is a management major and 0 otherwise.
Marketing Major = a dummy variable which equals 1 if student is a marketing major and 0 otherwise.
Statistics GPA = the average grade earned in the two-course statistics prerequisite.
Total Hours = the number of hours of college credit student completed.
Transfer Hours = the number of hours transferred from another institution.
VIF= Variance Inflation Factor

The coefficients on total hours and accounting GPA were not significant. The lack of significance on the accounting GPA variable is surprising, but it may be due to the large number of accounting courses tranferred from other institutions (overwhelingly junior colleges) where the courses may not contain the rigor needed to succeed in finance.

Table III-B above shows that a student's sex had no significant bearing on course grade. This result is consistent with those found in Table II (Test of Mean Differences), but it is nonetheless surprising given the significantly higher

outcomes in math shown for females in Table II. The coefficients on the remaining variables in Table III-B are consistent with those in Table III-A.

Conclusions and Suggestions For Future Research

The purpose of this study is to explore whether student major, math ability, transfer hours, accounting retention, accounting GPA or a students sex are associated with grades achieved in introductory finance. We performed tests to determine whether the algebra, statistics, accounting, and finance grades of accounting and finance majors were significantly different from those of management and marketing majors. We performed a separate test to determine whether there were significant differences in these grades for male and female students. OLS regressions were run to determine whether major, accounting knowledge, transfer hours, measures of math ability, and sex were linked to the finance course grade. We found that: 1) an accounting or finance major correlated with higher course grades than a management or marketing major; 2) the ability to pass an accounting retention test on the first attempt was associated with higher grades in finance, but accounting GPA was not; 3) math ability was related to higher course grades; 4) evidence that students self-selected majors based on perceived math ability; 5) higher transfer hours were linked to lower course grades; 6) a student's sex was not a significant predictor of course grade.

Finally, we found a contradiction: the number of transfer hours was negatively correlated with the finance course grade, but accounting majors, who had the highest level of transfer hours, (twice as many as finance majors, 27 percent more than management majors, and 68 percent more than marketing majors) did very well in the finance course. One reason for the higher number of transfer credits by accounting majors may be that they were simply capable of taking and passing more courses while enrolled in junior college than the management, marketing, and finance majors. It may also be due to the ability of accounting students to take courses in their major while in junior college, an opportunity usually not available to students majoring in management, marketing, and finance. However, the reasons for this contradiction will require more research.

Suggestions for future research include resolving the acounting-major/transfer hour contradiction and comparing the grades of management, marketing, accounting, and finance majors at other institutions to determine whether the results are consistent with those found in this study. Also, it is not clear precisely why men underperform women in math. An understanding of the reason for this could be used to instruct or remediate men in preparation for finance and other math-related disciplines.

Footnotes

[1] Students in the class were primarily juniors who had completed prerequisites in accounting (two courses), algebra, and statistics (two courses). The first accounting course was devoted to accounting entries associated with various financial transactions and to the construction of financial statements. The second accounting course is devoted to interpretation of the financial statements and to elementary cost accounting.

[2] At our institution, intermediate algebra is a prerequisite for the first accounting course and pre-calculus algebra is a prerequisite for the first statistics course. Two accounting and statistics courses are prerequisites for the introductory finance course.

[3] Our data set did include a small number of hours transferred from 4-year institutions.

[4] The reason all the indicator variables were not included in one regression is that the implicit reference class would then be a male management major (coded as all zeros for major and 0 for sex) which is not a reference class we wished to investigate. However, we did perform a regressions including all the variables and found no significant difference in results.

[5] We also ran a regression using both transfer hours and transfer hours squared to determine the presence of any curvilinear effects. The coefficient on transfer hours squared was not significant.

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