THE INTERACTION EFFECTS OF STUDENT NATIONALITY, GMAT SCORES, AND UNDERGRADUATE GPA IN EXPLAINING PERFORMANCE IN A GRADUATE ACCOUNTING PROGRAM

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ABSTRACT

Although much research exists explaining student performance in graduate business programs, few studies address performance in graduate accounting programs. This study tests the interaction effects of student nationality, GMAT scores, and undergraduate GPA in explaining performance in a graduate accounting program.

Results from this study indicate that GMAT scores and undergraduate GPA both explain student performance in the graduate accounting program, but not equally for domestic and international students. GMAT is more important in explaining student performance for international students, while undergraduate GPA is more important in explaining performance for domestic students. Contrasts show that the differences for GMAT mostly occur at low levels of GMAT, while differences for undergraduate GPA primarily occurs at high levels of undergraduate GPA. Thus, our results suggest that Graduate Program Directors and schools should consider using differing approaches or criteria for domestic and international students when evaluating acceptance to their graduate accounting programs.

Keywords: accounting education; performance in graduate accounting program; interactive effects

INTRODUCTION AND LITERATURE REVIEW

From 2011-2015, the number of international applications to United States (US) graduate business schools increased 13 percent (Redden 2015). Given the high demand by international students for admission into US graduate business programs, it is important for those programs to be able to assess the potential for student success if selected for admission. Two of the more common measures used by graduate business programs for admission consideration are the Graduate Management Admission Test (GMAT) score and undergraduate grade point average (GPA). Schools often take a composite score from using a student's GMAT and undergraduate GPA to determine whether the student meets the minimum standard for admission to their graduate business program. However, GPAs are not necessarily comparable across countries, which can make it challenging to assess a student's potential for successful completion of the graduate program (Grace and Black 2011). Additionally, universities often use services to

evaluate courses taken by students with undergraduate degrees from non-US colleges and universities to determine transfer credit and equivalent GPA averages for admission decisions.

The purpose of this paper is to test the impact of student nationality, GMAT scores, and undergraduate GPA in explaining performance in a graduate accounting program. This study extends prior studies twofold. First, we look at the interactive effects between GMAT scores, undergraduate GPA, and student nationality in explaining performance in a graduate accounting program. Second, this study looks at both the performance of students that graduate from the graduate program, but also at performance in the class all students take early in the program, Graduate Accounting Theory, to better validate the results and generalizability of this study.

Relevant Literature

Most of the early research on predicting graduate student success in business programs focused on Master in Business Administration (MBA) degree programs (Stolzenberg and Relles 1991; Hancock 1999; Adams and Hancock 2000; Krausz et al. 1999; Krausz et al. 2000; Koys 2005). With few exceptions, accounting graduate programs were not distinguished from other business disciplines (Krausz et al. 2000; Krausz et al. 2005; Owens and Talento-Miller 2006; Grace and Black 2011; Buckless and Krawczyk 2016). However, many public and private colleges and universities offer various forms of separate Masters in Accounting (MA) programs, often having separate admission and accreditation requirements. Given that students must have 150 credit hours to obtain the Certified Public Accountant (CPA) license in most states, many students are opting to complete those hours by enrolling in a graduate accounting program. As a result, while there has been increased interest in MA programs, there has been a dearth of research on student performance and success measures for those programs. As such, there is a need for research to determine what measures MA programs should use when reviewing applicants for program admission.

Past graduate program research has consistently shown that there is a positive association in explaining student success in graduate programs and the use of such standardized tests as GRE and GMAT scores and undergraduate GPAs. Kuncel et al. (2001) conducted a meta-analysis showing that GRE scores and undergraduate GPAs are significant indicators of graduate performance across multiple disciplines. Kuncel et al. (2007) followed up the earlier meta-analysis, with results based on more than 64,000 students. The meta-analysis found that the GMAT is a better performance indicator than undergraduate GPA in graduate business programs, but that a combination of the two yield a high level of validity for predicting student performance. Oh, et al. (2008) looked at the work done by Kuncel et al. (2007) and found that, upon reanalysis, GMAT was actually understated in their meta-analysis by seven percent. This finding effectively strengthened the importance of the GMAT as an evaluation tool for graduate admissions and suggested that faculty and administrators should use the most accurate measurement tools available for assessing graduate candidates. Similarly, Sireci and Talento-Miller (2006) found that GMAT scores accounted for about 16 percent of the variance in graduate GPA, rising to approximately 25 percent when combined with undergraduate GPA. They found no additional significant variations when adding race/ethnicity and gender, suggesting a lack of bias based on those factors.

Other studies found similar results when looking at GMAT and GPA as performance indicators in MBA programs (Yang and Lu 2001; Braunstein 2002; Talento-Miller and Rudner 2005; Fish and Wilson 2007; Eddey and Baumann 2009). Collectively, the studies found that

GMAT scores and undergraduate GPA were significant in explaining performance in MBA programs, strengthening the research supporting GMAT and GPA scores as valid measures for admissions consideration.

With GPA a common measure for both admission to graduate programs and evaluating the success of students within and/or upon completion of the program, related research looked at whether a student's major in an undergraduate degree program contributed to graduate performance (Ward et al. 1993; Gist et al. 1996; Koh and Koh 1999; Eddey and Baumann 2009). Most studies found that students with strong performance in quantitative areas (calculus, math ACT scores, etc.) did better in accounting classes, indicating a strong, positive association between math scores and performance in accounting principles classes (Ward et al. 1993; Gist et al. 1996; Koh and Koh 1999). However, Eddey and Baumann (2009) did find that either there was no indication that Australian graduate students in a Master of Commerce or Master of International Business with an undergraduate degree in a business field outperformed student with non-business undergraduate majors.

Several other studies also looked at the impact of GMAT scores as predictors for domestic students versus international students. Koys (2005) and Talento-Miller (2006) found that GMAT scores are stronger predictors for international students when studying in MBA programs in their home country than for domestic students studying in the United States. Research (Talento-Miller and Rudner 2005) also found that the quantitative component of the GMAT is a better measure of performance in MBA programs in the US than for those programs outside the US.

Language effects, especially English fluency, have also been looked at in regards to performance in undergraduate and graduate programs. Early research on undergraduate accounting majors found no significant language effects on students enrolled in principles and managerial accounting courses (Ward et al. 1993; Jackling and Anderson 1998). However, several studies of graduate students found that language was positively correlated with student performance. Specifically, Yang and Lu (2001) and Fish and Wilson (2007) found that GMAT verbal scores affected performance in MBA programs, while Stolzenberg and Relles (1991) found that both language skills and country of origin affected academic performance. Eddey and Baumann (2009) also found that stronger English skills contributed to improved student performance in an Australian business program.

Research targeting student performance in graduate accounting programs has been more limited than research looking at undergraduate or MBA programs. Owens and Talento-Miller (2006) found that GMAT scores and GPA were significant for students who *plan* to study accounting. However, there was no follow up with the subjects to determine whether the students actually majored in accounting in graduate school. Krausz et al. (2000, 2005) found that GMAT scores correlated positively with performance in the *first* graduate accounting class only. However, the studies did not look at student performance over the course of the full program.

Krausz et al. (2005) broadened their initial study to look at performance indicators for international students, finding that GMAT scores were more important than TOEFL scores in an MBA program. The authors suggest that these findings may be more important for accounting classes that are quantitative in nature than for classes that have major required writing components.

Hammond et al. (2015) looked at the components that make up GMAT scores to determine their ability to predict success in an MBA program. They found that the GMAT verbal and writing scores significantly correlated with student performance. However, GMAT

quantitative scores failed to significantly correlate with any of the success variables used in their study

Grace and Black (2011) and Buckless and Krawczyk (2016) were two studies that looked at performance indicators in a graduate accounting program. Grace and Black (2011) confirmed findings of earlier MBA studies that GMAT and undergraduate grade point averages were significant in explaining performance in graduate business programs. However, the graduate program they investigated was designed specifically for students with no prior accounting experience, with less than six percent of subjects having an undergraduate degree in business. Thus, the validity, and generalizability of their sample, is somewhat limited.

Buckless and Krawczyk (2016) tested whether student engagement (SE) information (soft skills) predicted academic success in a Masters of Accounting program using students from a large southern US university. The emphasis of the study was not on GMAT scores, undergraduate GPA, and nationality of the students, but the authors did control for GMAT and undergraduate GPA. As expected, they found that student SE engagement significantly predicted success in the program. Also, both GMAT and undergraduate GPA were significant in the prediction models.

Our study extends the Grace and Black (2011) study by: (1) using a more traditional MA program where most of the students (over 90 percent) have undergraduate degrees in accounting; (2) comparing the results for the program versus the first accounting course to see if results differ (as indicated in the Krausz et al. (2000, 2005) studies). We also look at a broader international student population and investigate interaction effects between nationality of students, undergraduate GPA, and GMAT scores.

HYPOTHESES DEVELOPMENT

Prior studies suggest that undergraduate GPA and GMAT scores are important in explaining performance in graduate business programs, although GMAT is the weaker measure. However, the validity of these studies is limited for a couple of reasons. First, the vast majority of these studies only look at the performance of students that graduate from a graduate program. Because of the shortness of the programs, and the transcendent nature of students moving in and out of the programs, with many only taking a class or two while working, it is almost impossible to obtain graduate GPA averages for students dropping out of the program. Thus, previous research is not capturing the performance of students that drop out of the program.

We attempt to improve the validity of our study by selecting two samples of MA students. Our first sample contains all students that graduated from the MA program at the authors' university during a five-year period, which is similar to samples used in prior studies. The second sample includes all students taking the first required class, Accounting Theory, in the program during a four-year period. We used a four-year period for the class sample because during this period the same professor taught the class using the same materials, testing format, and grading policy.

Prior studies primarily only looked at the main effects on performance in a graduate program for two very important variables, undergraduate GPA and GMAT scores. Although we also test the importance of these two variables in student performance in both the graduate program and the Accounting Theory class, we extend prior research by looking at the interactions between these two variables and the nationality of the students based on their undergraduate degrees. Graduate programs have to use services to determine the US equivalent

grades and type of credits to give for international students. The validity of the GPA equivalent measure for international students as a measure of prior knowledge is questionable. In addition, since the GMAT is a standardized test or measure of prior knowledge, the GMAT may be a more important variable in explaining success for international students than for domestic students.

The authors developed the following alternative hypotheses in this study.

H1: Undergraduate GPA is significant in explaining performance in the MA program.
H2: Undergraduate GPA is significant in explaining performance in the Graduate Accounting Theory class.
H3: GMAT Score is significant in explaining performance in the MA program.
H4: GMAT Score is significant in explaining performance in the Graduate Accounting Theory class.
H5: An interaction exists between Undergraduate GPA and international status of students.
H5a: Undergraduate GPA is more significant in explaining performance in the MA program for domestic students than for international students.
H5b: Undergraduate GPA is more significant in explaining performance in the Graduate Accounting Theory class for domestic students than for international students,
H6: An interaction exists between GMAT Scores and international status of students.
H6a: GMAT Score is more significant in explaining performance in the MA program for international students than for domestic students.
H6b: GMAT Score is more significant in explaining performance in the Graduate Accounting Theory class for international students than for domestic students.

The first four hypotheses look at the main effects of undergraduate GPA and GMAT in explaining student performance, for both students graduating from the MA program, and for students taking the Graduate Accounting Theory class. The other hypotheses look at the interaction effects between the main two variables and the international status of the student.

SAMPLES AND RESEARCH METHODOLOGY

Selection of Samples

In order to improve the validity of this study, and to extend prior research, the authors collected two samples of students to create the statistical models. The first sample contains all students that graduated from the authors' university MA program during a five-year period from fall of 2007 to summer of 2012. This sample is consistent with prior research looking at student graduates' performance in graduate business programs.

Our second sample contains students enrolled in one of the author's Graduate Accounting Theory classes from fall of 2007 to spring of 2011. Students normally take this class the first semester of their graduate program, although they can take it another semester with the approval of the Graduate Director. The same professor taught this class during the period of the sample. In addition, the same material, testing, and projects were used during this sample period.

Our decision to use two samples should increase the external validity of our study's results. Using one sample of students graduating from a graduate program has somewhat limited validity because not all students starting a graduate program complete the program. To some degree, although this type of sample is easier to obtain, it is somewhat biased because all students graduating a program are, to a degree, successful. However, using a sample of students

taking an early graduate class also has validity limitations since results can be course specific. Comparing the results from both types of samples should improve the external validity, especially if results for the two sample agree. We are not aware of any studies that attempted to obtain both types of samples in one study.

Table 1 contains a breakdown of the number of student observations each semester by gender used in this study. The breakdown shows similar stratification numbers by gender. The MA program sample contains 140 observations, with 47.1 percent being female and 52.9 percent being male. The Graduate Accounting Theory class sample contains 149 observations, with 46.3 percent female and 53.7 percent male.

Table 1
Two Samples of Study

Sample 1: Students Completing MA Program	Female	Male	Totals
Students completing program from fall, 2007 through summer, 2012	66 47.1%	74 52.9%	140 100%
Sample 2: Students Taking Required Graduate Theory Class			
Students taking Graduate Theory from fall, 2007 through spring, 2011	69 46.3%	80 53.7%	149 100%

Development of Models and Tests

The authors created two 2 X 2 with Co-Variates (ANCOVA) models, and relevant interactions, to test the relationship between the variables of interest and student performance. The following model tested the overall performance of students in the MA program:

$$GRADGPA = GENDER + STUDENT + GMAT + UNDERGPA + UNDERGPA*STUDENT + GMAT*STUDENT.$$

The second model tested the performance of students in the Graduate Accounting Theory class:

$$THEORYGRADE = GENDER + STUDENT + GMAT + UNDERGPA_t + UNDERGPA*STUDENT + GMAT*STUDENT.$$

GRADGPA and THEORYGRADE are the response or dependent variables in this study. GRADGPA is the cumulative GPA of each student upon graduation from the MA program. THEORYGRADE is the percentage grade that each student made in the graduate theory class.

The independent variables are:

GENDER = dichotomous variable coded 0 if the student was male, and 1 if the student was female;

STUDENT	=	dichotomous variable coded 0 for a domestic student (undergraduate degree from a US college or university), and 1 for an international student (undergraduate degree from a Non-US college or university);
GMAT	=	the student's score on the Graduate Management Admission Council test;
UNDERGPA	=	the student's undergraduate grade point average upon entering the school's MA program;
UNDERGPA*STUDENT	=	the interaction between the student's undergraduate GPA and international status; and
GMAT*STUDENT	=	the interaction between the student's GMAT score and international status.

GMAT and UNDERGPA test the first four hypotheses in this study, and should provide information whether these two samples produce results similar to those found in prior studies. The two interaction variables are the primary variables of interest in this study and test the final two hypotheses (H_5 and H_6, both a and b parts). UNDERGPA*STUDENT tests whether or not student undergraduate GPA explains performance in the MA program and the Graduate Accounting Theory class the same for domestic and international students. GMAT*STUDENT tests whether or not GMAT scores explain performance in the MA program and the Graduate Accounting Theory class the same for domestic and international students.

A positive relationship is predicted between GMAT and UNDERGPA and student performance, while directional relationships between GENDER and student performance are not as clear. Early studies by Mutchler et al. (1989), Lipe (1989), and Tyson (1989) found evidence that female students outperformed male students in undergraduate level classes. However, subsequent studies by Doran et al. (1991), Gist et al. (1996), and Eikner and Montondon (2001) did not find any significance differences between male and female students in undergraduate classes.

RESULTS

Relevant Means

Most graduate accounting programs use a student's undergraduate grade point average (GPA) and GMAT score, often as a composite score, to determine admissions to their programs. We calculated the means for these two relevant independent variables, UNDERGPA (student undergraduate GPA) and GMAT. These means by type of student (international or domestic) are shown in Table 2.

Table 2
Relevant Means for UNDERGPA and GMAT by Sample for International and Domestic Students

I. Relevant Means from MA Program Sample:

Variable[1]	[2]Domestic Students mean (std dev)	International Students mean (std dev)	Total mean (std dev)
UNDERGPA	3.35 (0.41)	3.34 (0.47)	3.34 (0.43)
GMAT	493.39 (89.70)	424.32 (132.61)	475.14 (106.74)

II. Relevant Means from Graduate Theory Class Sample:

Variable	Domestic Students mean (std dev)	International Students mean (std dev)	Total mean (std dev)
UNDERGPA	3.29 (0.43)	3.40 (0.46)	3.32 (0.44)
GMAT	493.36 (90.66)	437.50 (155.24)	479.00 (112.96)

[1]UNDERGPA = student undergraduate grade point average, coded on a four-point scale from zero to four. GMAT = student GMAT total score.

[2]Domestic students are students with undergraduate degrees from US colleges or universities, while International Students are students with undergraduate degrees from Non-US colleges or universities.

The UNDERGPA means are similar for both domestic and international students for the overall MA program (3.35 for the domestic students and 3.34 for the international students), while the international students taking the Graduate Accounting Theory class had a higher UNDERGPA than the domestic students (3.40 versus 3.29, respectively).

For both samples (MA and Graduate Accounting Theory students), the domestic students had higher GMAT scores than the international students. The differences were somewhat greater for the MA sample (493.39 domestic versus 424.32 for the international students, respectively).

Results from ANCOVA Models

The authors created two 2 X 2 X 2 ANCOVA models with relevant interactions to test the hypotheses. We first regressed the independent variables on GRADGPA (student's GPA from the MA program). For validity comparison, we then regressed the variables on THEORYGRADE (student's percentage grade in the Graduate Accounting Theory class). We used the Type III sums of squares to calculate each term's F Statistic. The ANCOVA models' results are reported in Table 3. Section I contains the results for the first model with variables regressed on GRADGPA, while Section II contains the results for the second model with the variables regressed on THEORYGRADE.

Table 3
2 X 2 X 2 ANCOVA Models' Results: GENDER, UNDERGPA, GMAT, USDEGREE, UNDERGPA*USDEGREE, AND GMAT*USDEGREE Regressed on GRADGPA and THEORYGRADE

I. ANCOVA Model Results from MA Sample (Variables Regressed on GRADGPA[1]):

Source[2]		DF	F Statistics	P-Values[3]
GENDER		1, 139	0.01	0.910
UNDERGPA		1, 139	15.22	0.000
GMAT		1, 139	6.67	.0011
STUDENT		1, 139	0.50	0.480
UNDERGPA*STUDENT		1, 139	4.57	0.034
GMAT*STUDENT		1, 139	4.58	0.038
Overall Test		6, 139	7.77	0.000

II. ANCOVA Model Results from Graduate Theory Sample (Variables Regressed on THEORYGRADE):

Source		DF	F Statistics	P-Values[4]
GENDER		1, 149	0.00	0.964
UNDERGPA		1, 149	12.41	0.000
GMAT		1, 149	16.32	0.000
STUDENT		1, 149	0.67	0.413
UNDERGPA*STUDENT		1, 149	0.53	0.470
GMAT*STUDENT		1, 149	5.34	0.022
Overall Test		6, 149	9.90	0.000

[1]GRADGPA is the cumulative GPA of each student upon graduation from the MA program. THEORYGRADE is the percentage grade that each student made in the graduate theory class.

[2]The independent variables are: GENDER, coded 0 if the student was male and 1 if the student was female; STUDENT coded 0 for a domestic student (undergraduate degree from a US college or university) and 1 for an international student (undergraduate degree from a Non-US college or university); GMAT, the score the student earned on the Graduate Management Admission Council test; UNDERGPA, the undergraduate grade point average of the student; UNDERGPA*STUDENT, the interaction between

the student's undergraduate GPA and international status; and GMAT*STUDENT, the interaction between the student's GMAT score and international.

[3]One-tail p-value for direction testing.

[4]One-tail p-value for direction testing.

Section I results show that the model fit the MA data very well (F Statistic = 7.77, p-value = .000). UNDERGPA and GMAT are the main variables that explain students' performances in the MA program. Both UNDERGPA and GMAT are positively related to performance; students with higher undergraduate GPA and higher GMAT scores perform better in the program. However, GENDER and STUDENT were not significant in explaining student performance. Apparently, male and female students performed similarly in the program, and international students performed overall as well as domestic students.

The results in Section II suggest that the model for the Graduate Accounting Theory sample was an even better fit (F Statistic = 9.90, p-value = .000). The same main variables were significant in explaining the percentage grade (THEORYGRADE) in the Graduate Accounting Theory class.

For both models, the main variable terms are consistent with prior research results. Thus, the first four hypotheses are all accepted. Both GMAT scores and undergraduate GPA significantly explain graduate accounting student performance. The results are similar for the MA program and for students taking the Graduate Accounting Theory class.

However, one of the major points of relevance for the study was to determine whether international and domestic students perform similarly across all levels of undergraduate GPA and GMAT scores. Thus, the interactions between the main variables, undergraduate GPA and GMAT scores, and international status of students (STUDENT) are of primary interest in this study.

The results for the two interaction terms in Section I illustrate the importance of looking at interactions between relevant variables, and not just main variable results. Both of the primary variables interact with the international status of the students. UNDERGPA*STUDENT (F statistic = 4.57, p-value = .034) and GMAT*STUDENT (F statistic = 4.58, p-value = .038) are both significant. These two interactions' results suggest that domestic and international students do not perform the same across all levels of undergraduate GPA and GMAT scores.

The results from the second model in Section II also illustrate that the GMAT*STUDENT interaction is still significant (F Statistic = 5.34, p-value = .022) for the Graduate Theory sample. However, the UNDERGPA*STUDENT term is no longer significant (F Statistic = 0.53, p-value = .470). The Graduate Accounting Theory class containing some students that did not complete the program likely causes the differing results.

Pair-Wise Contrasts' Results

The significant interaction terms found in the ANCOVA models warrant additional analysis to dig deeper into the specific areas of the interactions. The authors decided to create pair-wise contrasts to determine the levels of the interaction in explaining student performance. We divided the GMAT score into two levels, high and low, based on the overall mean. We then created a 2 by 2 GMAT*STUDENT interaction model for each dependent variable. The means for all four cells and the resulting relevant contrasts for each dependent variable are shown in Panels I and II of Table 4.

Table 4
Contrasts and Means for Student Graduate GPA (GRADGPA) and Student Performance in Graduate Theory Class (THEORYGRADE)

I. Means and Contrasts for Student Graduate GPA (GRADGPA) at High and Low Levels of GMAT by STUDENT

GRADGPA Means for 2 X 2 GMAT*STUDENT:

GMAT Level[1]	STUDENT = domestic mean (std dev)	STUDENT = international mean (std dev)
Low level (below the mean)	3.59 (0.24)	3.45 (0.27)
High level (above the mean)	3.64 (0.28)	3.65 (0.29)

Contrasts for GRADGPA (graduate GPA):	df	F stat	P Value[2]
GRADGPA differs by GMAT levels for domestic students: 1 0 -1 0	1	0.97	0.326
GRADGPA differs by GMAT for international students: 0 1 0 -1	1	4.64	0.033
GRADGPA differs for domestic and international students at low level of GMAT: 1 -1 0 0	1	3.38	0.068
GRADGPA differs for domestic and international students differ at high level of GMAT: 0 0 1 -1	1	0.02	0.875

II. Means and Contrasts for Student Performance in Graduate Theory Class THEORYGRADE) at High and Low Levels of GMAT by STUDENT

THEORYGRADE Means for 2 X 2 GMAT*STUDENT:

GMAT Level	STUDENT = domestic mean (std dev)	STUDENT = international mean (std dev)
Low level (below the mean)	0.87 (0.09)	0.78 (0.10)
High level (above the mean)	0.88 (0.77)	0.87 (0.08)

Contrasts for THEORYGRADE (graduate theory grade):	df	F stat	P Value
THEORYGRADE differs by GMAT levels for domestic students: 1 0 -1 0	1	0.48	0.488
THEORYGRADE differs by GMAT for international students: 0 1 0 -1	1	8.37	0.004
THEORYGRADE differs for domestic and international students at low level of GMAT: 1 -1 0 0	1	14.37	0.000
THEORYGRADE differs for domestic and international students at high level of GMAT: 0 0 1 -1	1	0.29	0.588

[1]GMAT was recalculated as a dichotomous variable, coded as Low if student observation was below the GMAT mean and coded High if student observation was above the GMAT mean. Then, GMAT*USDEGREE was regressed on GRADGPA and THEORYGRADE separately on the GMAT*USDEGREE to produce the contrasts.
[2]One-tail p-value for directional testing.

Panel I contains the means and relevant contrasts for GRADGPA across the four cells of the GMAT*STUDENT interaction, high and low GMAT scores by domestic and international students. The first contrast testing whether GRADGPA significantly differed at high and low levels of GMAT scores for domestic students is not significant (F Statistic = 0.97, p-value =

.326). However, the second contrast shows that GRADGPA is significantly different for the international students between low and high levels of GMAT (F Statistic = 4.64, p-value = .033). Thus, the first two contrasts indicate that GMAT is not useful in explaining MA performance for the domestic students. However, GMAT is important in explaining performance for the international students.

Contrasts three and four provide information on what level the interaction between GMAT and STUDENT is occurring. These two contrasts show that the differences mostly occur at the low levels of GMAT. Domestic and international students with low GMAT scores do differ significantly in performance in the MA program (F Statistic = 3.38, p-value = .068). Domestic students with low GMAT scores do significantly better in the MA program than international students with low GMAT scores.

Panel II shows the means for THEORYGRADE across the four cells of the GMAT*STUDENT interaction, and the relevant contrasts. The results are similar to those reported earlier for the entire program for each contrast, but even stronger (F Statistic = 8.37, p-value = .004 and F Statistic = 14.34, p-value = .000 for the two relevant contrasts, respectively). GMAT scores are important for international students in explaining the grade they earned in the Graduate Theory class. However, GMAT is not important in explaining domestic student performance in the Graduate Accounting Theory class. Again, the third contrast suggests the differences in importance of GMAT scores in explaining the differing performances between international and domestic students is at the low level of GMAT scores.

To further investigate the UNDERGPA*STUDENT interaction we restated UNDERGPA into two levels, high and low, based on the overall mean undergraduate grade point average of 3.34. We then created a 2 by 2 UNDERGPA*STUDENT interaction model for each dependent variable and performed relevant contrasts. The means for each cell, and the resulting contrasts, for each dependent variable are show in Panels I and II of Table 5.

Table 5
Contrasts and Means for Student Graduate GPA (GRADGPA Response) and Student Performance in Graduate Theory Class (THEORYGRADE)

I. Means and Contrasts for Student Graduate GPA (GRADGPA) at High and Low Levels of UNDERGPA by STUDENT

GRADGPA Means for 2 X 2 UNDERGPA*STUDENT:

UNDERGPA Level[1]	STUDENT = domestic mean (std dev)	STUDENT = international mean (std dev)
Low level (below the mean)	3.54 (0.25)	3.57 (029)
High level (above the mean)	3.75 (0.24)	3.48 (0.29)

Contrasts for GRADGPA (graduate GPA):

	df	F stat	P Value[2]
GRADGPA differs by UNDERGPA levels for domestic students: 1 0 -1 0	1	15.60	0.000
GRADGPA differs by UNDERGPA for international students: 0 1 0 -1	1	1.03	0.312
GRADGPA differs for domestic and international students at low level of UNDERGPA: 1 -1 0 0	1	0.23	0.632
GRADGPA differs for domestic and international students at high level of UNDERGPA: 0 0 1 -1	1	11.39	0.001

II. Means and Contrasts for Student Performance in Graduate Theory Class (THEORYGRADE) at High and Low Levels of UNDERGPA by STUDENT

THEORYGRADE Means for 2 X 2 UNDERGPA*USDEGREE:

	STUDENT = domestic	STUDENT = international
UNDERGPA Level	mean (std dev)	mean (std dev)
Low level (below the mean)	0.85 (0.11)	0.83 (0.12)
High level (above the mean)	0.91 (0.04)	0.80 (0.07)

Contrasts for THEORYGRADE (graduate theory grade):

	df	F stat	P Value
THEORYGRADE differs by UNDERGPA levels for domestic students: 1 0 -1 0	1	9.18	0.003
THEORYGRADE differs by UNDERGPA for international students: 0 1 0 -1	1	0.53	0.470
THEORYGRADE differs for domestic and international students at low level of UNDERGPA: 1 -1 0 0	1	1.58	0.211
THEORYGRADE differs for domestic and international students at high level of UNDERGPA: 0 0 1 -1	1	15.96	0.000

[1]UNDERGPA was recalculated as a dichotomous variable, coded as Low if student observation was below the UNDERGPA mean and coded High if student observation was above the UNDERGPA mean. Then, UNDERGPA*USDEGREE was regressed on GRADGPA and THEORYGRADE to produce the contrasts.

Panel I contains the means for GRADGPA for the four cells, high and low levels of UNDERGPA by domestic and international students. The means and resulting contrasts show opposite interaction effects from the GMAT interaction results reported earlier in Table 4. The first contrast is significant (F Statistic = 15.60, p-value = .000), indicating UNDERGPA is significant in explaining MA performance for domestic students. However, the second contrast is not significant (F Statistic = 1.03, p-value = .312), thus indicating that UNDERGPA is not significant in explaining MA performance for international students. The final contrast is also significant (F Statistic = 11.39, p-value = .001), indicating that the interaction effect primarily occurs at high levels of UNDERGPA.

Domestic and international students with below average undergraduate GPAs perform similarly in the MA program. However, international students with above average undergraduate GPAs perform significantly worse than domestic students with above average undergraduate GPAs. This result suggests that undergraduate GPAs may not be a useful measure for determining admissions to a MA program for international students, and that undergraduate GPAs of international students may be over-inflated somewhat as a measure of prior knowledge.

Panel II shows the results with the interaction term regressed on THEORYGRADE. The means and contrasts for the four cells with high/low levels of UNDERGPA by student status show similar results as reported in Panel I for GRADGPA. Again, undergraduate GPA is significant in explaining student performance in the Graduate Accounting Theory class for the domestic students (F Statistic = 9.18, p-value = .003), but not for the international students (F Statistic = 0.53, p-value = .470). The remaining contrasts again suggest that this interaction primarily occurs at the above average level of undergraduate GPA. Thus, even though the UNDERGPA*STUDENT was not significant in the main multi-variate ANCOVA model for

THEORYGRADE (Table 3 results), the contrasts do indicate a significant interaction, but it is only at the higher levels of undergraduate GPA. Thus, the interaction test across all levels of UNDERGPA was not strong enough to capture this interaction fully, but the contrasts were able to pinpoint the interaction more precisely.

Combining the overall interaction tests in the ANCOVA model and relating contrast tests, Hypothesis five is accepted, both parts a and b. GMAT scores are more important in explaining international student performance in the graduate accounting program and in the theory class than it is in explaining domestic student performance. This GMAT effect is particularly important for students that have below average GMAT scores. International students with below average GMAT scores do not do as well in the graduate program as domestic students with below average GMAT scores.

The overall models' ANCOVA results and relating contrasts also lead to accepting Hypothesis six, both a and b parts. Undergraduate GPA is not significant in explaining international student performance in the graduate program, while it does significantly explain the performance of the domestic students. This undergraduate GPA interaction effect with student status is mostly occurring at the high levels of undergraduate GPA. International students with above average undergraduate GPAs do not do as well as domestic students with above average undergraduate GPAs in the MA program. Again, the results were similar when using the percentage grade in the Graduate Accounting Theory class as the measure of performance.

Overall, the results of this study add to prior research and provide additional evidence concerning the complex factors affecting performance in a MA program by investigating interactions among the variables of interest. Using a second sample of students taking the Graduate Accounting Theory class further strengthens the validity of this study, especially since the results mostly agree with the results for the overall program sample.

CONCLUSIONS

GMAT scores and undergraduate GPA both explain student performance in a MA program, but not equally for domestic and international students. GMAT is more important in explaining student performance for international students, while undergraduate GPA is more important in predicting success for domestic students. GMAT scores do not appear to explain student performance for the domestic students; domestic students with below average GMAT scores do as well as those with above average GMAT scores. However, GMAT scores do appear to explain significantly student performance for the international students. GMAT scores are particularly significant in explaining performance for international students with below average GMAT scores.

Undergraduate GPA is very important in explaining MA performance for domestic students but not for international students. These results strongly suggest that the undergraduate GPAs of international students, as a group, are not useful in explaining international student performance in a MA program, and those GPAs for some international students may be overstated.

This study extends prior research by looking at the interaction of GMAT and undergraduate GPA in explaining performance in the MA program. Our results extend prior research by suggesting that the two do not explain performance equally well for domestic and international students. Graduate Program Directors and schools should consider using differing approaches for domestic and international students when evaluating acceptance to their MA

programs. For domestic students, GMAT scores may not be a good indicator of subsequent performance in a graduate accounting program; thus, the school may want to limit the importance of GMAT for admissions of domestic students. For domestic students, schools should place a greater emphasis on undergraduate GPA than on GMAT in determining admissions to their MA programs.

For international students, schools should take the opposite approach to the two variables in evaluating admissions. Undergraduate GPA is not an important indicator of subsequent performance for international students, while GMAT is very significant in explaining performance in the MA program for international students. Our study suggests schools should consider deemphasizing undergraduate GPA and placing greater importance on the GMAT scores for international students.

This study improves its external validity by examining both of the two measures of student performance used in prior research, overall GPA and performance in one of students' first graduate class. The measure most used by prior research is the graduate GPA of students in the program. The weakness of this measure is that only students graduating, and thus somewhat successful, are in the sample. We also measure student performance in the Graduate Accounting Theory class that all students normally take their first semester of coursework. Only a few studies have looked at a different measure of performance for a particular class.

All studies dealing with student performance suffer from sampling limitations, in that results can be class and program specific, thus limiting the generalizability and external validity of education studies. Although our study is also limited by this problem, we attempt to moderate this limitation by using two samples to verify the strength of this study's results. The main sample in this study in the overall MA sample, while the purpose for the second sample of Graduate Accounting Theory students is to see if results are similar to the MA sample. Similar results increase the validity of the results and suggests that the results are not as sample specific. Overall, the results in this study were similar for both samples, particularly the contrasts for the interaction terms.

ENDNOTES

[1]This study is not covered by the University Institutional Review Board's (IRB) regulations. The research did not involve interaction or intervention with the individuals and the data are collected and stored in a manner that prevents subjects from being identified either directly or through identifiers linked to the subjects.

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