An Examination of Master's Student Retention & Completion

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ABRSTRACT

This study was conducted at a research-extensive public university in the southeastern United States. It examined the retention and completion of master's degree students across numerous disciplines. Results were derived from a series of descriptive statistics, T-tests, and a series of binary logistic regression models. The findings from binary logistic regression models indicate that standardized test scores (GMAT or GRE) did not affect graduation and impacted retention only for GMAT majors. Students who were full-time were much more likely to be retained and graduate than part-time students. Receiving an assistantship or fellowship impacted the speed of graduation of students, but not the overall ability of a student to graduate within three years. For GMAT students, students who received an assistantship or fellowship were more likely to graduate in two years or less. For GRE majors, students who received an assistantship or fellowship were less likely to graduate in two years or less. However, all of the influence of receiving an assistantship or a fellowship on graduation went away in the graduation in three years or less models (for both the GRE and GMAT majors). For GRE students only, the age of students at the start of their program negatively impacted graduation in both the two years or less and three years or less graduation models, (i.e., the older the student is at the start of their program, the less likely they were to graduation).

<u>Introduction</u>

As lawmakers continue to press higher education leaders to produce results that impact the economy and society, the role of graduate education has received renewed interest for its part in achieving such results. With the increased national attention on the issue of graduate education, studies on graduate retention and completion have come become increasingly relevant. Much of the increased governmental attention on retention and persistence is due, in large part, over accountability and efficiency concerns of higher education. Greater governmental oversight is pushing institutions to justify the large government subsidies they are receiving. If a student does not successfully graduate from an institution, a question commonly asked is why was the student not successful? Examining the influences on retention and completion can provide useful data that can help retention efforts. The most successful institutions consistently look for ways to understand their students' progression towards degree completion; the more they know about their students and what makes them successful, the more it allows an institution to design effective academic policies and retention programs.

Historically the majority of research on completion and retention focused on undergraduate students. There have been though over 20 major studies examining doctoral retention and completion, but similar research for master's level degree (masters) students, who are awarded 87% of all graduate degrees (Bell, 2009), is scarce. In 2007, Nevill and Chen from The National Center of Educational Statistics (NCES) predicted that the master's degree would become the fastest growing sector of higher education as 63% of undergraduate students planned to complete a master's degree or higher in effort to be more competitive in their profession or to make a career change.

In 2004, the Dean of the Graduate School at university of this study began examining doctoral student retention and completion in conjunction with the Council of Graduate School's (CGS) Ph.D. Completion Project. This initiative lasting from 2004-2010 was groundbreaking in that it was the first study to determine and publish the completion and retention data of fifty-four leading U.S. and Canadian universities. The study allowed for a national comparison of baseline data based on field of study, race, gender, and citizenship status to add to the existing research on graduate retention and completion

(Adkins-Hutchinson, 1996; Bowen & Rudenstine, 1992; Golde 2005; Lovitts, 2001; Nerad & Miller, 1996). The primary outcomes from the Ph.D. Completion Project were various rates of completion and retention. The project (CGS, 2008) reported ten-year completion rates for doctoral students by discipline, race, gender, and citizenship with completion rates ranging from 49.3 percent for the Humanities to 63.6 percent for Engineering.

Although extensive research has been conducted to examine the completion of doctoral degrees, very little evidence of empirical master's degree completion research exists. In October of 2010, CGS formally announced the formation of the Master's Completion Project, which is similar in focus to their Ph.D. Completion Project, but focused on master's students. The pilot of the Master's Completion Project will run over 27 months, concluding in January 2013. One of the purposes of this particular study is to build on the institutional knowledge gained during the Ph.D. Completion project and use it in conjunction with the upcoming CGS Master's Completion Project. This study tries to fill in some gaps about master's students and examines their retention and completion as related to student demographics, academic ability, and discipline. The data will also be examined to determine whether the phases encountered by students in doctoral study are present for master's students.

Literature Review

There are several reasons why most of the research on graduate student retention and completion has focused on doctoral students; there is an argument that the role of doctoral students is often more salient than that of master's students to the goals of research extensive universities and thus, have been more studied. Universities have a vested interest in doctoral students as faculty collaborate with them to produce research findings, increase grant funding, and educate institution's undergraduate and master's degree students. Faculty and universities specifically invest a significant amount of time, effort, and funding for doctoral students (Baird, 1993; Most, 2008). When dropout occurs, there is little return on that investment and society misses out on any scientific or social advancement the student may have contributed after completion.

Traditionally, retention refers to the ability of an institution to retain a student from admission to the institution through graduation (Berger & Lyon, 2005). Although retention and persistence often are used interchangeably, Mortenson (2005) references the National Center for Education Statistics as distinguishing the terms by using 'retention' as an institutional measure of remaining enrolled and 'persistence' as a student's measure of the same result; "institution's retain and students persist" (p. 92). Research on masters degree completion and retention is increasingly relevant as approximately 75 percent of all graduate students are enrolled in master's degree programs and 87 percent of graduate degrees are awarded to master's students. More growth and institutional opportunity is expected in the near future as 63 percent of undergraduate students plan to complete a master's degree (NCES, 2006).

NCES (2006) reported master's degree completion data disaggregated by gender and race/ethnicity. The overall three-year completion rate for all students is 69.9 percent with 72.1 percent for males and 68.3 percent for females. Completion rates differ from doctoral completion by the student's ethnicity with Hispanic students having 51.3 percent rate, White students 69.8 percent, Black/African-American students 75.4 percent, and Asian American students 87.4 percent. However, the large current enrollment and likely increase in master's degree students is not congruent with the scarcity of research on this topic. Further in-depth research is crucial in order to determine master's degree completion rates by field of study, why these differences occur (Redd, 2007), and the most salient predictors of master's completion.

With the scarcity of research on master's retention and completion, a logical step is to build upon the research on retention and completion of doctoral, as well as undergraduate students. Research on undergraduate completion and retention indicates the most influential reasons for bachelor degree completion are the level of student academic preparation, level of student commitment to their studies, and the intensity of student involvement within the institution (Seidman, 2005). Some notable specific examples of student retention studies following this strategy have used student demographic characteristics (Pascarella & Terenzini, 1980; Paulsen & St. John, 2002; St. John, Hu, Simmons, & Musoba, 2001; Tinto, 1975, 1997; Titus, 2006), student ability (Perkounkova, Noble, and McLaughlin,

2006; St. John, Hu, Simmons, & Musoba, 2001; Titus, 2006), student social integration/involvement (Astin, 1977, 1984, 1993; Pascarella & Terenzini, 1980; Tinto, 1997; Titus, 2006), student academic integration (Pascarella & Terenzini, 1980; Tinto,1997), and student financial aid/socioeconomic status (Paulsen & St. John, 2002; St. John, Hu, Simmons, & Musoba, 2001; Perkounkova, Noble, and McLaughlin, 2006; Titus, 2006).

In addition to the finding established by the numerous studies on undergraduate retention and completion, there have been a few notably studies as to why some doctoral students' dropout while others retain and graduate. Some notable specific examples of doctoral student retention and completion studies have used student background characteristics (Baker, 1998; Girves & Wemmerus, 1988; Lott, Gardner, & Powers, 2009; Lovitts, 2001; Most, 2008), student ability (Attiyeh, 1999; Kuncel, Hezlett, & Ones, 2001), and student wealth/socioeconomic status (Attiyeh, 1999; Bair & Haworth, 2004; Bowen & Rudenstine, 1992; Council of Graduate Schools, 2004; Ethington & Pisani, 1993; Girves & Wemmerus, 1988). The research on doctoral retention and completion studies is built on a foundation of literature underlined by the idea of the existence of multiple and distinct phases throughout a degree program (Council of Graduate Schools, 2005; Gardner, 2009; Girves & Wiemmerus, 1988; Golde, 1998; Nerad, 1991;). Although the models vary in terms of the number of and specific content in each step, it is clear that certain milestones occur during to doctoral degree completion process.

Gardner (2009) proposed a three-phase framework necessary for retention and completion. Entry, the initial phase, includes admissions, transition into doctoral education, and the beginning of coursework. Although performance on entrance tests and in undergraduate coursework are routinely collected and used in making admissions decisions, there are no significant differences in GRE scores and undergraduate graduate point averages between completers and non-completers (Burton & Wang, 2005; Haworth, 1996; Lovitts, 2001; Smallwood, 2004). Instead, it is argued (Lovitts, 2001), that a discrepancy between expectations and the reality of a doctoral program is what differentiates those students who graduate from those who do not. In this crucial phase, during which 40 percent of all non-completers leave (Bowen & Rudenstine, 1992), it is essential that doctoral students develop an accurate

representation of their program with the assistance of establishing relationships with faculty and peers, a comprehensive orientation, and the necessary and correct information during the admissions process (Gardner, 2009; Lovitts, 2001).

Phase II, which Gardner (2009) termed as Integration, begins after the first year of coursework and continues up to the dissertation process. Thirty percent of non-completers dropout in this phase during which the student is expected to complete all coursework and pass the examinations necessary for candidacy. Students are also expected to make the transformation from understanding the current literature in their field to contributing to their field through research, writing, teaching, and service. Similar to Phase I, it continues to be important that students have an accurate understanding of the objectives and processes required to successfully accomplish the requirements of Phase II. Faculty and peer support through collaborating on research articles and conference presentations, participating in symposiums, and open discussions about the field are paramount to integration. Integration is more likely to occur when a student is funded by a departmental research assistantship as this type of assistance allows for opportunities for the student to both complete program research requirements during the assistantship hours and continuously interact with fellow scholars in the same field.

Candidacy represents the final phase of Gardner's (2009) doctoral student development model. The candidacy period includes the time period beginning when the student achieves candidacy by passing the examinations through defense of the dissertation. Thirty percent of attrition occurs in this phase characterized by a lack of a clear roadmap for how to complete a dissertation. Doctoral students must develop and implement a plan that will be successful for their personal style while also determining the best procedures for completing their research and data collection, which format their dissertation should look like, how long it should be, what content should be included, and the length of time it is expected to take to write. This stage is especially daunting because as the student is delving through the ambiguity of completing their dissertation, while they also receive less interaction and support from faculty and their peers (Gardner, 2009; Lovitts, 2001).

Research Questions

In order to best determine what factors impact master's student program the institution, the authors build this project on the findings of the NCES (2006) study and with an eye towards the upcoming CGS Master's Completion Project by examining which master's students are likely to persist and complete as related to student's demographics, academic ability, and discipline. Additionally, the data will be examined to determine whether the phases encountered in doctoral study (Gardner, 2009; Lovitts, 2001) are present for master's students. The specific research questions for this study include:

- Is there a difference between master's degree students in their retention and completion patterns?

    o If there is a difference, what are the causalities of the differences?

    Ex: major, standardized test score, gender, etc.

- Are the phases for doctoral completion applicable to master's students?

    o If it is applicable, how does it impact students and institutions?

Sample

Mortenson (2005) suggests that the foundation of measurement for student persistence studies is through the use of cohorts (a clearly defined group), identification of demographic and enrollment characteristics, and tracking of these characteristics over time. The data for this study includes students who enrolled in a masters program between the summer semester 2006 and spring 2008 (two fiscal year cohorts, 2007 and 2008; 3799 student headcount – 3876 student cases[1]). Table 1 presents the number of students across academic disciplines[2] represented in the study. 60.4% of the students in the study are female while 70.8% students are white, 11.0% are international, 9.5% are Black/African-American, 2.3% are Asian, 1.6% are Hispanic, and 2.9% are of unknown race/ethnicity. The mean age of students at the start of their programs was 27.8 years, with students in the College of Business (32.2) and Education

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[1] 77 students switched to another master's program after their initial enrollment and were considered dropouts for the degree programs they initially enrolled in during the two fiscal years (2007 and 2008).
[2] Programs in Engineering were included, even though they had small enrollments (N) due to these are new and
[2] Programs in Engineering were included, even though they had small enrollments (N) due to these are new and expanding programs and there was desire to establish a baseline of data in the initial phases of the programs.

(30.1) having the highest mean age and students in Physical & Earth Sciences (25.6) and Social Sciences

(25.9) having the lowest mean age.

Table 1: Students by college

	N	% of Total
Arts & Humanities	257	6.6
Business	843	21.7
Education	1073	27.7
Engineering	19	0.5
Life Sciences	564	14.6
Physical & Earth Sciences	151	3.9
Social Sciences & Psychology	261	6.7
Other	708	18.3
Total	3876	100

If a student switched masters programs during this time period (77 students did), they were

considered a dropout from first program and a new enrollee in the second master's program. Student

demographic, assistantship, and fellowship data were paired with academic activity for each student.

Students were tracked for three years, 9 semesters, from official university files. Students were identified

for graduation and retention purposes at three time points based on Gardner's (2009) three phases of

doctoral student development, retained to second year and graduation in two-years or less and graduation

in three-years or less. A student was considered retained if the student had graduated or was still enrolled

in the same masters program in which they initially enrolled. A student was considered not retained if

they had not graduated and were not enrolled at the start of the second year.

The institution in this study is a large, research-extensive public university located in the

Southeast. As the state's flagship and land-grant university, it offers over 150 undergraduate and 140

masters degree programs in 16 colleges and schools. The undergraduate student body is comprised mostly

of traditional age students (18-22 years of age) enrolling primarily from the local region (~88% of

students are resident, in-state students). In fall 2010, there were around 26,000 undergraduates and over

7,000 graduate students enrolled at the institution.

Methods

A series of descriptive statistics and T-Tests (independent sample) were developed followed by a series of binary logistic regressions to examine potentially contributing factors of students continuing to their second year of their masters program and onto graduation (research question 1). Basic descriptive statistics and T-tests provide an understanding of the students who persisted through their masters programs and the general relationship among factors (variables) that relate to persistence. The descriptive statistics and T-tests were also used to examine when students dropped-out of their masters programs; as part of the examination of whether the stages of masters student development is similar to doctoral student development (Gardner, 2009; research question 2).

The binary logistic regressions were developed to determine the affect of each independent variable on the dependent variable(s). Binary logistic regression was chosen due to the dependent variables being binary (Yes, student retained or graduated and No, student was not retained or did not graduate) and is a model that can appropriately handle binary dependent variables. The series of regression models were developed designed on the three phases of Gardner's (2009) doctoral student development: retention to the second year of study, graduation in 2 years or less, and graduation in 3 years or less. The series of models were developed and applied to two distinct groupings of students: students in programs requiring GRE standardized test scores (GRE programs) and students in programs requiring GMAT standardized test score programs (GMAT programs). Two models for each of the groups were developed for each of the three dependent variables, one for retention to the second year, graduation within 2 years and graduation within 3 years.

Since there are a limited number of studies on doctoral retention and persistence, this study combined previous findings on undergraduate retention and completion studies with findings on doctoral student retention and completion. As noted in the literature review section of this paper, retention refers to the ability of an institution to retain a student from admission through graduation, most often related to a single institution as opposed to a student's transfer between colleges (Berger & Lyon, 2005). The independent variables for this study selected based on previous studies on doctoral student retention and

completion includes Bair & Haworth, 2004; Baker, 1998; Bowen & Rudenstine, 1992; CGS, 2004; 2008; Ethington & Pisani, 1993; Girves & Wemmerus, 1988; Lott, Gardner, & Powers, 2009; Most, 2008; NSF, 1998. The independent variables selected based on undergraduate retention and completion includes Pascarella & Terenzini 1980; Paulsen & St. John 2002; Perkhounkova, Noble, & McLaughlin 2006; St. John, Hu, Simmons, & Musboa 2001; Tinto 1975, 1997; and Titus 2006. The independent variables included in the binary logistic models were:

- Gender

- Age

- Race/Ethnicity

- Discipline of academic program

- Standardized test score (GRE/GMAT)

- Received an assistantship or fellowship

- Full-time/Part-time status

Student age was determined based on age of the student at the start of their program. Student majors were grouped into eight distinct disciplines (Arts and Humanities, Business, Education, Engineering, Life Sciences, Physical and Earth Sciences, Social Sciences and Psychology, and Other[3]. The assistantship/fellowship variable is binary coded (yes/no) based on whether student received an assistantship or fellowship, at minimum for one semester during their time in a masters program. Enrollment status of students (full-time or part-time) was determined by using credit hour load (attempted) in first term of enrollment. Students in Business Administration (MBA), Accounting, and Marketing Research were the only majors using GMAT scores. These accounted for most, but not all (Economics majors for example were not included) of master's students in the College of Business.

Students' dropout patterns were examined in an attempt to compare master's students to the phases of Gardner's (2009) of doctoral student development (research question 2). We hypothesized Gardner's Phase I (Entry) being similar to the first year of a masters program as this includes admissions, transition into graduate education, and the beginning of coursework. Phase II (Integration) we hypothesized as being similar to the second year of a master's program with graduation in 2-years or less

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[3] Majors counted as part of the Other discipline include: Historic Preservation, Housing & Consumer Economics, Journalism & Mass Communication, Landscape Architecture, Non-Profit Organizations, Public Administration, Religion, Social Work, Speech Communication, and Textiles, Merchandising, & Interiors.

being expected as students complete their coursework and comprehensive exams. We hypothesized Phase

III as being the time after the second year of master's enrollment as these 3rd year master's students are

advanced students and have finished most, if not all, of the course work and program exams; but have not

completed all of the requirements of their program.

Findings

A total of 3394 students (87.6%) were retained to the second year, 2163 graduated in 2 years or

less (55.8%) while 3054 students (78.8%) graduated in 3 years or less. There were distinct differences

between disciplines in retention and both (2-year and 3-year) graduation rates. Engineering had the lowest

rate of retention (78.9%), graduation in 2-years or less (10.5%) and graduation in 3-years or less (42.1%)

of any of the disciplines in the study. Social Sciences & Psychology had the highest rates of retention

(96.6%), graduation in 2-years or less (75.5%) and graduation in 3-years or less (91.2%) of any of the

disciplines studied. Table 2 presents the retention rates by disciplines while table 3 presents rates of

graduation (in 2-year or less and 3-year or less), continuation of enrollment after the 3rd year and dropouts

by disciplines.

Table 2: Retention rates by disciplines

	N	Retain_2yr	% of Total
Arts & Humanities	257	213	82.9
Business	843	783	92.9
Education	1073	870	81.1
Engineering	19	15	78.9
Life Sciences	564	490	86.9
Physical & Earth Sciences	151	125	82.8
Social Sciences & Psychology	261	252	96.6
Other	708	646	91.2
Total	3876	3394	87.6

Table 3: Rates of graduation, enrollment after 3-years, and dropout by disciplines

	Grad_2Yr	Grad_3Yr	Enrolled_3yr	Dropout	N
Arts & Humanities	38.1	72.0	5.4	22.6	257
Business	65.2	89.9	3.4	6.6	843
Education	52.8	73.3	6.5	20.1	1073
Engineering	10.5	42.1	15.8	42.1	19
Life Sciences	44.5	69.1	9.2	21.6	564
Physical & Earth Sciences	27.8	57.0	15.2	27.8	151
Social Sciences & Psychology	75.5	91.2	3.4	5.4	261
Other	64.1	85.0	4.2	10.7	708
Total	55.8	78.8	5.9	15.3	3876

Examining dropouts further, a total of 59.5% of all dropouts occurred in the 1st year of the program. For GRE majors, 59.2% of all dropouts occurred in the 1st year while for GMAT majors it was 63.0%. Dropouts in the 2nd year of their program accounted for 24.7% of all dropouts. For GRE majors, 24.5% of dropouts occurred during the 2nd year while for GMAT majors had 26.1%. Dropouts after their 2nd year in the program accounted for 15.8% of all dropouts. For GRE majors, 16.3% of all dropouts occurred after the 2nd year of coursework while for GMAT majors, only 10.9% of dropouts occurred.

Examining the differences of graduates and non-graduates both at the two years or less and three years or less marks, GMAT major graduates had differences in GMAT scores statistically higher (p<.01) from non-graduates (591.9 to 555.9 for two years or less and 581.5 and 543.0 for three years or less). GRE major graduates and non-graduates had no statistically difference (p>.114) in test scores (for both verbal and quantitative). Since there was no difference in GRE scores for graduates and non-graduates, the next step was to examine differences in GRE scores by academic discipline. For GRE verbal, Engineering students were the only discipline with a statistical difference between graduates and non-graduates (p<.01). For the quantitative GRE score, only students in Education and Physical Sciences & Psychology had statistical difference (p<.01) between graduates and non-graduates where graduates had significantly higher GRE quantitative scores than non-graduates.

In order to more fully examine the relationship between master's students and the contributing factors leading to them being retained or graduated, a series of binary logistic regression models were developed. As described previously, the three models (dependent variables) were retained to second year,

graduation in two years or less, and graduation in three years or less. For each dependent variable, two sets of models were developed; one for GRE majors and one for GMAT majors based on the required test for admissions into the program. The independent variables for each of the three models were the same and listed previously in the method section. For each of the models (dependent variable), the models were further broken out by enrollment status (full-time vs part-time). This resulted in 6 separate models for each dependent variable (GRE all students, GMAT all students, GRE majors full-time only, GRE majors part-time only, GMAT majors full-time only, and GMAT majors part-time majors only) for a total 18 distinct models in the analysis. For each of the models, the disciplines of Arts & Humanities (GRE), Marketing Research (GMAT) and race/ethnicity of multi-racial were used as controls.

In binary logistic regression models, Cox-Snell R^2 and Nagelkerke R^2 are attempts to provide a logistic analogy to R^2 in OLS regression. The Nagelkerke measure adapts the Cox-Snell measure so that it varies from 0 to 1, as does R^2 in OLS. The pseudo R^2 produced by both measures provide good explanations in the variance of who graduates or is retained. For most of the models, the pseudo R^2 was not very high (strong) indicating that much of the variance of why students are retained or graduate are not controlled for by these models. The highest Nagelkerke R^2 of any of the 6 retention models was .244 indicating for that particular model (GMAT majors full-time students only); it explained 24.4% of the variance. For graduation in 2-years or less, the GMAT models had a high pseudo R^2 of .584 (GMAT majors – all students) while GRE models had much lower score at .126 (GRE majors all students). For graduation in 3-years or less the GMAT models had a high of .469 (GMAT majors – full-time students only) while GRE models were less again at .114 (GRE models full-time students only). In general, the GRE models were not very strong models with highest of the pseudo R^2s (Nagelkerke) ranged from .064 to .126 indicating most of the reasons why GRE majors are retained or graduate were not controlled for in the models (see tables 4, 5, and 6 for specific details). However, the GMAT models appeared much stronger models with pseudo R^2s (Nagelkerke) ranged between .108 to .584 (see tables 4, 5, 6 for specific details).

The Hosmer and Lemeshow Goodness-of-Fit Test divides subjects into deciles based on predicted probabilities, and then computes a chi-square from observed and expected frequencies (Hosmer & Lemeshow, 2000). For each of the 18 models, the p-values indicated that logistic models were good fits (If the Hosmer and Lemeshow Goodness-of-Fit Test is .05 or less, we would reject the null hypothesis and that there is no difference between the observed and predicted values of the dependent variable) except for the two GRE models graduation in two years or less by attendance status (GRE majors full-time students only and GRE majors part-time students only). For these two models the p-values were all less than .05, implying that model's estimates do not fit the data at acceptable levels, indicating we reject the null hypothesis that there is no difference between GRE major students who graduate in two years or less and those who do not based on the variables in the model(s).

Table 4 presents the significant independent variables and the results for the six models for retention to the second year. The Exp (B) is the label for the odds ratio of the row independent with the dependent (retained to second year) and the statically significant variables are displayed for each of the six models. The Exp (B) is the predicted change in odds for a one unit increase in the corresponding independent variable. Odds ratios less than 1.0 correspond to decreases in odds while and odds ratios more than 1.0 correspond to increases in odds. Odds ratios close to 1.0 indicate that unit changes in that independent variable do not affect the dependent variable (neutral effect). In the model for GMAT all students, for every 10 point (a single unit for GMAT test scores in this analysis was in 10 point increments) increase in a student's GMAT test score, the odds of being retained to the second year increase by a factor of 0.939 (actually decreasing in probability). For GMAT all students, if a student was a full-time student, the odds of them being retained to the second year increased by a factor of 3.051 (actually increasing in probability).

Examining GRE and GMAT all students models, the findings from the binary logistic regression indicate that for both groups, if a student was a full time student they are more likely to be retained to the second year (GRE 1.424, GMAT 3.051). If a student received a fellowship or an assistantship, it influenced retention for only GRE students (positive, 1.597). There were two disciplines, Social Sciences

& Psychology (5.348) and Other (2.389), which had (positive) significant affects on retention to the second year. Only GMAT majors had their standardized test score influence student retention with a score of 0.939, indicating that the higher a student's GMAT score, the less likely they were going to be retained to the second year.

Table 4: Binary Logistic Regression Model – Retention to 2nd Year

Pseudo R2 (Naglekerke)	0.074 GRE	0.125 GMAT	0.081 GRE-Full	0.064 GRE-Part	0.244 GMAT-Full	0.108 GMAT-Part
Female	*	*	*	*	*	*
Age	*	*	*	*	*	*
Asian	*	*	*	*	*	*
Black/African-American	*	*	*	*	*	*
Hispanic	*	*	*	*	*	*
Native American	*	*	*	*	*	*
White	*	*	*	3.191	*	*
Unknown	*	*	*	*	*	*
International Student	*	*	*	3.696	*	*
Education	*	-	*	*	-	-
Engineering	*	-	*	*	-	-
Life Sciences	*	-	1.998	*	-	-
Physical Sciences	*	-	*	*	-	-
Social Sciences & Psychology	5.348	-	9.941	*	-	-
Other	2.389	-	1.909	2.916	-	-
Accounting	-	*	-	-	*	*
MBA	-	*	-	-	*	*
GRE Verb	*	-	*	*	-	-
GRE Quant	*	-	*	*	-	-
GMAT	-	0.939	-	-	*	0.925
Assistantship (Y/N)	1.597	*	*	2.844	*	*
Fulltime Student	1.424	3.051				

Not Significant = *
Not included in model = -

Further restricting the retention models into separate models for full-time and part-time students, the assistantship variable was significant (positively, 2.844) for only GRE part-time students suggesting that part-time GRE students and not full-time GRE students were more likely to be retained by receiving an assistantship or a fellowship. The GMAT score variable was only significant for GMAT part-time students suggesting that the higher the scores for part-time GMAT students, and not full-time GMAT students, were less likely to be retained to the second year. The GRE models indicate students with a

major in the Other grouping for both full-time and part-time students, but only full-time students in Life

Sciences and Social Sciences & Psychology were more likely to be retained.

Table 5: Binary Logistic Model – Graduation in Two Years or Less

Pseudo R2 (Naglekerke)	0.126	0.584	no fit	no fit	0.508	0.375
	GRE	GMAT	GRE-Full	GRE-Part	GMAT-Full	GMAT-Part
Female	*	*	*	*	*	*
Age	0.973	*	*	*	0.908	*
Asian	*	*	*	*	*	*
Black/African-American	*	*	*	*	*	*
Hispanic	*	*	*	*	*	*
Native American	*	*	*	*	*	*
White	*	*	*	*	*	*
Unknown	*	*	*	*	*	*
International Student	*	*	*	*	*	*
Education	1.524	-	*	*	-	-
Engineering	0.133	-	*	*	-	-
Life Sciences	*	-	*	*	-	-
Physical Sciences	0.396	-	*	*	-	-
Social Sciences & Psychology	2.841	-	*	*	-	-
Other	1.970	-	*	*	-	-
Accounting	-	*	-	-	*	93.31
MBA	-	*	-	-	*	*
GRE Verb	*	-	*	*	-	-
GRE Quant	*	-	*	*	-	-
GMAT	-	*	-	-	*	*
Assistantship (Y/N)	0.742	15.850	*	*	18.016	*
Fulltime Student	2.232	4.696				

Not Significant = *
Not included in model = -

Table 5 presents the significant independent variables and the results for the six graduation in two

years or less models. Examining GRE and GMAT all students models, the findings from the binary

logistic regression indicate that for both groups, if a student was a full time student they were more likely

to graduate in two years or less (GRE 2.232, GMAT 4.096). If a student received a fellowship or an

assistantship, it influenced graduation in two years or less negatively for GRE students (0.742), but

positively for GMAT students (15.850). There were three disciplines, Education (1.524), Social Sciences

& Psychology (2.841) and Other (1.970), which had positive significant affect on graduation in two years

or less while two disciplines, Engineering (0.133) and Physical & Earth Sciences (0.396) had a negative

affect. Student age negatively affected (0.973) graduation in two years or less for GRE students (i.e. the older the student was at the start of their program, the less likely they were to graduate).

Further restricting the graduation in two years or less models into separate models for full-time and part-time students, as previously discussed only the GMAT models met the goodness of fit test (the GRE models did not pass the Hosmer and Lemeshow Goodness-of-Fit Test and thus, not significant). The assistantship variable was significant for GMAT full-time students only (18.016), indicating that students receiving an assistantship or fellowship were more likely to graduate than those who do not receive one. The age of a student for GMAT full-time students (0.908) negatively affected graduation in two years or less (i.e. the older the student was, the less likely they were to graduate). For GMAT part-time students, only the discipline of Accounting was significant (93.31) indicating that students who were Accounting majors were more likely to graduate.

Table 6 presents the significant independent variables and results for the six models for graduation in three years or less. Examining GRE and GMAT all students models, the findings from the binary logistic regression indicate that for both groups, if students was a full time student they were more likely to graduate in three years or less (GRE 1.864, GMAT 3.469). There were two disciplines, Social Sciences & Psychology (3.157) and Other (2.136), which showed positive significant affects on graduation in three years or less while two disciplines, Engineering (0.335) and Physical & Earth Sciences (0.393) had negative affects. The age of a student negatively affected (0.974) graduation in three years or less for GRE students (i.e. the older the student was at the start of their program, the less likely they were to graduate). Female students (1.291) were more likely to graduate in three years or less than male students for GRE majors.

When further constricting the graduation in three years or less models into separate models for full-time and part-time students, the GMAT models did not yield any significant independent variables to explain the variance. The assistantship variable was significant for GRE part-time students only (2.597), indicating that students receiving an assistantship or fellowship were more likely to graduate than those who do not receive one. The age of a student for GRE full-time students (0.954) negatively affected

graduation in three years or less (i.e. the older the student was, the less likely they were to graduate).

Female students (1.340) were more likely to graduate in three years or less than male students for GRE

full-time students. There were two disciplines, Social Sciences & Psychology (4.652) and Other (2.421),

which had positive significant affect on graduation in three years or less for GRE full-time students while

two disciplines, Life Sciences (0.403) and Physical & Earth Sciences (0.110), had a negative affect on

graduating in three years or less for GRE part-time students. GRE full-time students who identify as

Native American (0.0089) were less likely to graduate in three years or less. GRE part-time students who

identify as Black/African-American (4.768), White (3.115), or an International (4.929) student were more

likely to graduate in three years or less.

Table 6: Binary Logistic Regression Model – Graduation in Three Years or Less

Pseudo R2 (Naglekerke)	0.113	0.212	0.114	0.108	0.469	0.162
	GRE	GMAT	GRE-Full	GRE-Part	GMAT-Full	GMAT-Part
Female	1.291	*	1.340	*	*	*
Age	0.974	*	0.954	*	*	*
Asian	*	*	*	*	*	*
Black/African-American	*	*	*	4.768	*	*
Hispanic	*	*	*	*	*	*
Native American	*	*	0.089	*	*	*
White	*	*	*	3.115	*	*
Unknown	*	*	*	*	*	*
International Student	*	*	*	4.929	*	*
Education	*	-	*	*	-	-
Engineering	0.335	-	*	*	-	-
Life Sciences	*	-	*	0.403	-	-
Physical Sciences	0.393	-	*	0.110	-	-
Social Sciences & Psychology	3.157	-	4.652	*	-	-
Other	2.136	-	2.421	*	-	-
Accounting	-	*	-	-	*	*
MBA	-	*	-	-	*	*
GRE Verb	*	-	*	*	-	-
GRE Quant	*	-	*	*	-	-
GMAT	-	*	-	-	*	*
Assistantship (Y/N)	*	*	*	2.597	*	*
Fulltime Student	1.864	3.469				

Not Significant = *
Not included in model = -

Discussion

As a result of the analyses of the two cohorts or masters students' retention and graduation, four major themes emerge: standardized test scores did not impact graduation, full-time students were significantly more likely to be retained and graduate than part-time students, receiving an assistantship or fellowship impacted the speed of graduation, and for GRE students only, the age of a student at the start of their program impacted graduation (older students were less likely to graduate). There were some mixed results for gender and race/ethnicity on their impact on retention and graduation. For GMAT students, gender and race/ethnicity was not a significant factor in retention nor for graduation. For GRE students, gender did not show up as a significant factor till the models for graduation in three years or less. This result (female students being more likely to graduate in three years or less) is inconsistent with national benchmark data that shows males having higher graduation rates (72%) than females (68%; NCES 2006). Perhaps one of the reasons for this finding is the small number of students from traditionally male disciplines (Engineering and Physical & Earth Sciences) in the sample. The positive affect of being female on graduation in three years or less for GRE students was a small (1.291) and the difference in the national data was small as well (4%) which leads credence to this idea.

The significant race/ethnicity variables for GRE student models were only present in the models that broke out full-time and part-time status and were not present in the all-student models. For retention to the 2nd year models, only White and International part-time students were more likely to be retained while there was no effect of race/ethnicity in the full-time student model. For graduation in three years or less for GRE full-time students, Native American students were significantly less likely (0.089) to graduate however there were very few of these students (N=11) in the sample and the impact of a single student with a group is heighten when the group is relatively small to the entire sample. As for GRE part-time students, Black/African American (4.768), White (3.115), and International (4.929) students had significant increases in the likelihood they would graduate. The White and International findings mirrored the retention model findings and the Black/African American findings are inline with national benchmark data showing that Black/African American (75%) students having higher graduation rates than the

national norm (70%; NCES, 2006). The finding for no effect of race/ethnicity for Asian American on retention and graduation however is not in alignment with national benchmark data showing Asian American students having higher graduation rates (85%, NCES 2006) than the national norm. A possible explanation for this is the small number of students identifying as Asian American (N=89, 2.3% of total sample) in the study. As with the finding for Native American students in the retention model, the impact of a single student with a group is heighten when the group is relatively small to the entire sample.

The finding that standardized test scores did not influence graduation is align with previous research on graduate (doctoral) completion (Burton & Wang, 2005; Haworth, 1996; Lovitts, 2001; Smallwood, 2004). This appears true for both GRE and GMAT majors, even though the academic programs varied in length and credit hour requirements. This is particular interesting as the GMAT majors at the institution in the sample have a structured, sequenced course requirements while the GRE majors were more open in course taking patterns in which students can choose to pursue. Perhaps once students meet a minimum level of academic competency (as measured by standardized test scores), regardless the type of program, the desire and drive of a student to complete is what really matters. As Lovitts argues (2001), those who can navigate the discrepancy between the expectations and the reality of a doctoral program differentiates the students who graduate from those who do not.

The finding that full-time students were significantly more likely to be retained and graduate than part-time students is very logical. By their nature, full-time students take larger credit hour loads than part-time students. By taking larger credit hours per semester, these students are able to complete the required coursework quicker; which is evidenced by the larger positive coefficients for full-time students (for both GRE and GMAT majors) in the graduation in two years or less models than the coefficients in the graduation in three years or less models. Part-time students likely have other obligations (work, family, etc.) outside of their schoolwork, which take away their time and focus from course work. It can be argued that full-time graduate students' job is school while this is not necessarily the case for part-time students. While the construction of this variable (students were marked as full-time or part-time based on first term of enrollment) possibly conceals some changes in enrollment status over the course a student's

progression in a program (students switching from full-time to part-time status and vice-versa) which could alter this finding, we felt identifying students based on first term of enrollment was a fair representation, for the most part, of a students' enrollment status during their time in academic program.

The finding that receiving an assistantship or fellowship impacted the speed of graduation was of particular interest. For the GMAT majors, this finding indicates that students receiving financial support were significantly more likely to graduate than non-recipients in two years or less. This variable was not significant in the graduation in three years or less model. As stated previously, for the most part, the GMAT majors have structured and sequenced course requirements and students enter the program en mass (as cohorts) designed to graduate in two years (based on a full-time credit-hour load). Students in GMAT majors, regardless of receiving an assistantship or fellowship had very similar course taking patterns, so this was not an issue. Students receiving an assistantship or fellowship are typically some of the more gifted (academically) students who applied for a particular program (hence why they were given the award). This is particularly interesting in light that standardized test scores (GMAT for this example) were not a significant influence on graduation. One of the criteria typically used by a program in comparing to award fellowships or an assistantship is academic ability. This ultimately indicates the GMAT major programs awarded their assistantships and fellowships through a very thorough process and not necessarily dependent on a student's GMAT scores. It appears to have had good success in picking students who ultimately graduated within the predicted two-year time frame regardless of their GMAT scores.

The finding for GRE majors who received an assistantship or fellowship were less likely to graduate in two years or less was very curios. At first glance, this result would seem to be counter-intuitive. As mentioned previous, students who receive an assistantship or fellowship are typically some of the more academically gifted students. The result showing that these students are less likely to graduate in two years or less than students who did not receive an assistantship or fellowship is not necessarily what program administrators would want to find. However, looking at the graduation in three years or less model, this particular variable is not significant. This suggests that students who received an assistantship

or fellowship were less likely to graduate in two years or less, but were no different than students who did not receive an assistantship or fellowship in graduating in three years or less. Looking further into the students who received an assistantship or fellowship, many of these students are in the sciences and often in labs conducting independent research or working closing with faculty. It is difficult to complete a master's degree in two years with these types of responsibilities and projects. In addition, many students who seek assistantship or fellowship awards are likely thinking about continuing their education after their master's programs with an eye towards doctoral programs. Perhaps students who received an assistantship or fellowship are more interested in learning or gaining as much experience as they could rather than the speed in which they complete their degree.

The finding for GRE students that the age of the student at the start of their academic program was a negative influence is worth noting. Essentially, what this finding means is that the older the student, the less likely they were to graduate (for both graduation models). This factor was roughly the equivalent for both graduation models (0.973 for two years or less and 0.974 for three years or less) meaning this impact on graduation was fairly consistent across the years. What was perhaps the most interesting part of this finding is that this variable was not significant for the retention model. This suggest the older students were not having a problem continuing in a program to the second year, but for some reason were not completing their degree at the same rate as their younger counter parts. Perhaps these older students have outside responsibilities (family, work, etc.) that pulled them away from their studies? Academic programs have a vested interest in working with their older students and designing ways (programs) to help their older students complete the degree requirements. This finding will be examined further with an eye towards developing programs to address this situation.

In addressing the second research question, the phases of doctoral retention and completion do not seem to fit master's students. The phases for master's students only seem to have some overlap at the second phase. For the first and the third phase, there were large differences in the number of students who dropped out of the program between master's and doctoral programs. Master's students (~60%) had a higher percentage of dropouts in the first phase than doctoral students (40%; Gardner 40%). For the third

phase, the phases also did not match up well theoretically; the third phase of a doctoral program is when a student is past candidacy and working on a dissertation while for master's students it was simply just students still enrolled after two years from initial enrollment, nor did the percentage of dropouts match up (Doctoral students had 30% of dropouts in this phases, Gardner 2009, while master's had roughly 15 %). Only with the second phase were there close approximation of dropouts between master's (~25%) and doctoral (30%; Gardner 2009) students. On the surface, taking the phases of doctoral retention and completion would seem to work as both are graduate programs and students have completed at least (in most cases) a baccalaureate degree. But it appears in this study (institution) to not really work and brings attention to the need to build a separate theory of master's student retention and completion.

Future Research

This study points to a real need for more research on master's student retention and completion. There is little empirical work on master's students, especially on a national scale. Coupled with the low power (pseudo R2 – Naglekerke) of the binary logistic regression models, it seems clear that more empirical research is needed. The authors of this paper plan to conduct more research on master's students with a focus on students' prior academic preparation and background. Which institutions supplied students? What were the student undergraduate GPA and major? Are students going into a masters program going into a different discipline than their undergraduate degree program? In short, more work is needed on master's student academic preparation. Also, taking a more in-depth examination of financial variables, cost of attendance, and opportunity costs would provide additional understanding of master's students' retention and completion. What is a student's debt load and financial aid packages? Does this affect master's students retention or completion? Some research on doctoral students (Attiyeh, 1999; Bair & Haworth, 2004; Bowen & Rudenstine, 1992; Council of Graduate Schools, 2004; Ethington & Pisani, 1993; Girves & Wemmerus, 1988) indicates that student wealth and finances influences retention and completion at the graduate degree level.

Additional work is needed on interdisciplinary programs. There is predicted growth in these programs over the next few years both locally as well as nationally. Perhaps one of the biggest challenges with interdisciplinary programs is how to define them for measurement purposes (inclusion into quantitative models). Does one examine all interdisciplinary programs the same, or does one look at programs differently? If differently, how does one choose to group particular interdisciplinary programs together? This will be one of the toughest tasks in getting work started examining interdisciplinary graduate programs. Lastly, as this study illustrates, there is a real need for a theory of or phases of master's student retention and completion. The phases of doctoral students did not seem to fit very well for master's students. As this was perhaps the closest group (by type) of students with a theory of retention and completion, this just underscores the issue of the lack of research focused on master's students retention and completion. As the vast majority of graduate students are master's students (75%; NCES 2006), this just seems to be a gap in the research on a large group of students in higher education.

Limitations

With any research study, there were number of limitations. First, and perhaps foremost, this study focused on a single institution and the results are difficult to apply other institutions or even beyond a single institution (regionally, nationally). Using one institution with a relatively selective admissions process could produce a sample appearing moderately homogenous. Each institution has its own culture, values, and traditions. These institutional characteristics need to be considered when researching student retention and completion, especially at the graduate level. Second, the low power of the binary regression models indicates the vast majority of the reasons (variance) why master's students are retained or complete were not controlled for in these models. Many of the reasons conceived as to why students do not complete or are retained (for example, a student with significant family obligations) are extremely difficult to quantify and ultimately model. Third, there was no differentiation in the analysis between one year and two year masters programs (based on credit hour requirements). For the most part, master's degrees at the campus in this study are designed for completion in two years; but there are a few programs

that are designed to be shorter (MACC in accounting for example). For modeling and analyses simplicity all program types were lumped together in this study. This likely made some of the findings not as exact as the truly exist. Fourth, there is very little national and regional data to compare master's student retention and completion. The upcoming Master's Completion Project by CGS will provide good national baseline data. But this is well over three years from completion and it will likely be even longer before the results are released.

Lastly, the timing of students examined comes at time in this country (U.S.A.; 2007-2011) where the local, state, and national economies experienced a deep recession. This created numerous budget cuts for higher education institutions while private industry cut back deeply on jobs. The economy plays a significant role in college attendance and not just at the undergraduate level. Students may choose to enter a graduate program due to the lack of employment. They also may leave when a good opportunity comes along. Maybe some of the findings of this study were influenced by the timeframe of this study with students having an incentive to stay in school more than in the past? How the recession and the economy ultimately impacted student retention and completion in this study will likely never be known, but it is worth noting the role it probable played.

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