

MORE THAN MONEY MATTERS: AN INTEGRATED MODEL OF GRADUATE
STUDENT PERSISTENCE

by

Terrell Lamont Strayhorn

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Dr. Don G. Creamer, Chairperson
Dr. Karen P. DePauw
Dr. Steven M. Janosik
Dr. Deborah Olsen

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ABSTRACT

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TERRELL L. STRAYHORN

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Advisor: Dr. Don G. Creamer

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Graduate student persistence rarely has been studied, yet it is a very important issue for many higher education constituents—including senior administrators, academic deans, faculty members, students, and families. In light of an alarming statistic that approximately 50% of all graduate students fail to complete their degree, there have been few studies to examine this phenomenon and no new models to explain the relationship between factors that influence graduate student persistence. This dissertation examined persistence by graduate students to degree using data from the National Center for Education Statistics' Baccalaureate and Beyond (B&B:93/97) Longitudinal Survey. First, I proposed a logical model of graduate student persistence using economic, academic, and non-academic variables. Then, I tested the model's ability to predict graduate student persistence to degree. Analyses were conducted to answer the following questions:

1. Does more than money matter in predicting graduate student persistence?
2. To what extent do economic, academic and non-academic factors included in the integrated model predict graduate student persistence?
 - a) Does this differ by graduate student status (e.g., master's and doctoral)? If so, how?
3. Using the integrated model, does the likelihood of persisting in graduate school vary by race/ethnicity? If so, how?
 - a) How do student aid and undergraduate debt influence the observed racial/ethnic group differences in persistence?

The results of this study suggest that more than money matters when predicting graduate student persistence. The integrate model of graduate student persistence, developed for this study, is statistically significantly better at predicting graduate student persistence than a model that only includes economic factors. The integrated model tested to be most fit for predicting persistence among doctoral students. And, finally, using the model, the likelihood of persisting in graduate school varies by race/ethnicity. Student aid tends to improve one's chances of persisting in graduate school while undergraduate debt is associated with failing to persist in graduate school.

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DEDICATION

My grandmother, Creola E. Warner, shaped many of the values and convictions I have today. Mother Creola, as she is affectionately known, is profoundly committed to the concept of education as a key to opportunity and advancement. She is the quintessential teacher and has taught for over 40 years—still teaching many years after retirement! She made numerous personal sacrifices in support of my education and has always been a constant source of hope, inspiration, love, and support. For all she has done and continues to do, I am eternally grateful. In her honor, I dedicate this dissertation.

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wholeheartedly and never give up...it may not seem like it...but all things can happen if you keep on believing!

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MORE THAN MONEY MATTERS: AN INTEGRATED MODEL OF GRADUATE
STUDENT PERSISTENCE

CHAPTER 1

INTRODUCTION

Research conducted in the past twenty years has examined undergraduate student persistence in college extensively (Bean & Metzner, 1985; Cabrera, Stammen, & Hansen, 1990; Nora, 1987; Stage, 1989; Terenzini & Pascarella, 1980; Tinto, 1975, 1987; Tracey & Sedlacek, 1987). Results indicate that the rate of dropout at most institutions of higher education (IHEs) is high and has remained high for more than 70 years (Bean, 1980). Moreover, among undergraduates, attrition rates ranged from 12% to 40% (Astin, 1975; Bean, 1980, 1981; Terenzini & Pascarella, 1980). Out of that period of study grew common assuredness regarding factors that were vital to the persistence of many college undergraduates, such as relationships with faculty and positive academic and social integrative experiences on campus (Terenzini, Pascarella, & Lorang, 1982; Tinto, 1975, 1987).

Other factors were found to be related to persistence of undergraduates. For example, a number of studies explored the effect of college GPA (Brewton & Hurst, 1984), high school grades and rank, college test scores (Richardson & Attinasi, 1982), and college major (St. John, Hu, Simmons, Carter, & Weber, 2004) on persistence. Among the most important indicators of persistence were previous academic performance and college GPA. Other factors that warrant attention include race and college major.

Representing a separate line of inquiry, a number of studies have been characterized as economic impact studies. These studies emphasize the importance of financial need, aid adequacy, and financial aid packages (St. John, Cabrera, Nora, & Asker, 2000) and results have been mixed. Peng and Fetters (1978) used ordinary least squares regression analysis and found that receipt of student aid is not significantly related to persistence in college. Terkla (1985), on the other hand, concluded that the receipt of student aid did have a significant effect on persistence to graduation. Voorhees (1985) studied a sample of urban commuter students and found that all forms of aid were positively related to persistence.

Moline (1987) used path analysis to explore the relationship among several variables, including financial factors, which had been shown to be related to student persistence. Such factors included: college GPA, ACT or PSAT score, and total aid awarded, to name a few. She found that college GPA and high school rank had the largest total effect on persistence while financial aid variables had no significant effect on persistence.

A few meta-analyses have been conducted on persistence research studies. Murdock (1987) conducted a meta-analysis of studies on persistence and found that men and women were equally affected by student aid. Minority aid recipients persisted less than non-minorities and scholarships had more positive effects than loans. Leslie and Brinkman (1993) considered 46 studies and found that grants had a more positive effect on student persistence than loans.

While most studies have examined only traditional measures of academic ability in explaining persistence, a number of studies have investigated the relationship

between persistence and non-academic or non-cognitive variables. One specific set of non-cognitive factors that have been found to be related to student persistence was proposed by Sedlacek and Brooks (1976). These seven dimensions are positive self-concept, realistic self-appraisal, understanding of and ability to deal with racism, preference for long-range goals over more immediate short-term needs, support of others for academic plans, successful leadership experience, and demonstrated community service.

Tracey and Sedlacek (1984, 1985, 1987) developed the *Non-cognitive Questionnaire* (NCQ) to assess these non-cognitive dimensions, as well as the added dimension of academic familiarity. They assessed the validity of all eight dimensions relative to both grades and persistence for both Black and White students. They found strong support for the factors in predicting future grades, but the most support for the relationship between these factors and persistence was for Black students.

In another study at the University of Maryland, Tracey and Sedlacek (1987) used the *Non-cognitive Questionnaire* (NCQ) (Tracey & Sedlacek, 1984, 1985) and found that African American students had a lower rate of persistence than did White students. They also observed differences in the rates within race and across years. Using stepwise discriminant analyses, they found that SAT scores did not significantly predict persistence and that many of the NCQ subscales were found to be positively related to persistence for Blacks. The most significant subscales were academic motivation, support for academic plans, community service, and self-concept.

A large body of persistence research is based on another theoretical model that suggests one must understand a student's integration into the academic and social

realms of college to understand persistence (Astin, 1975; Bean, 1982; Tinto, 1975, 1987, 1993). Tinto (1975) concluded that students enter college with precollege experiences and background traits that influence their educational expectations and commitments. These commitments change during the college years as a result of a student's integration into the social and academic life of the institution. The degree to which students integrate into these systems is significantly related to their decision to persist.

Nora (1987) conducted a study to test Tinto's model on a Chicano student population in two-year colleges. Using structural equation modeling, he found minimal support for Tinto's hypothesized relationship between measures of academic integration and persistence. He concluded that the hypothesized relationship between measures of social integration could not be supported, but rather measures of initial commitment (parent's education, encouragement, grades) had a significant, direct effect on retention. Other researchers found similar results (Bean, 1980; Bean & Metzner, 1985; Pascarella & Terenzini, 1983), though results are inconclusive as some studies do not support this relationship (Munro, 1981; Williamson & Creamer, 1988).

In addition, Tinto's model has been used most frequently to study persistence in traditional, residential student populations. For example, Munro (1981) used data from the National Longitudinal Study of the high school class of 1972 (NLS-72) to test Tinto's model using students enrolled in 4-year colleges. Her findings supported Tinto's model of academic and social integration. Yet, in another study by Williamson and Creamer (1988), social integration minimally influenced or had no influence on persistence in the institution. The latter study examined attrition among students at 2- and 4-year

institutions. Other studies had similar findings (Pascarella & Chapman, 1983; Pascarella & Terenzini, 1983).

To be sure, Tinto's model has served well to enhance our knowledge of the persistence-attrition issue in higher education. Nevertheless, its power to explain the phenomenon in various college settings, among various student populations, and in concert with other background, pre-college, academic, and financial variables is less well established. For example, studies rooted in the integration tradition, largely defined by Tinto (1975), generally overlook the role of financial aid and familial support on student persistence. Recently, researchers have extended these integration models to include the influence of financial factors such as ability to pay (Bean & Metzner, 1985; Cabrera, Nora, & Castaneda, 1992); financial aid (Murdock, 1987; St. John, Paulsen, & Starkey, 1996); and prices (St. John, 1990; St. John & Andrieu, 1995; St. John & Starkey, 1995, 1995). In short, this approach confirmed that economic factors play a significant role in persistence decisions and have either a direct or indirect effect on social and academic integration (Cabrera et al., 1992).

While the results of these studies provide useful data to understanding the persistence of undergraduate students, few studies have considered the factors that influence persistence of graduate students. In fact, the entire area of graduate education has been largely under-investigated (Andrieu, 1991; Malaney, 1987). Given the alarming statistic that less than 50% of graduate students complete their degree (Bowen & Rudenstein, 1992), one might expect to find a plethora of research literature on the topic. Instead, very little research examines the relationship between various factors that influence graduate student persistence. A wealth of research is still needed

as this problem continues to be of great concern to administrators, faculty members, and students.

While much of the research on undergraduate students tends to indicate that the receipt of student financial aid is associated positively with persistence (Astin, 1975; Jensen, 1983; Leslie & Brinkman, 1993; St. John, 1989, 1990), no large scale study on the funding of graduate education has been conducted. Since a considerable amount of the budget of full-time graduate students comes from some form of student aid or university stipends (Nyquist & Woodford, 2000), one would expect the topic of graduate student aid and its relationship to persistence to have received more attention than it has. Nevertheless, it is reasonable to suspect that financial aid might be related to graduate student persistence decisions.

A small set of studies on graduate student persistence have been conducted. One previous study used data from the *National Postsecondary Student Aid Study, 1987* (NPSAS-87) to propose a new model for research on within-year persistence of graduate students and to use the model to assess alternative approaches to measuring the impact of financial aid on within-year persistence (Andrieu, 1991). In a second study, Lyn (1998) used the work of St. John (1992); Hippensteel, St. John, and Starkey (1996); and Andrieu (1991) to study graduate student persistence. And, third, Asker (2001) used state-level data to examine the effects of financial aid on the within-year persistence of graduate students in two fields of study—education and business.

While these studies add to and expand our knowledge about factors that influence graduate student persistence, they leave much to be discovered. For example, all of these studies explore factors that influence within-year persistence and

do not address the issue of persistence to degree. In another direction, the 1992 Reauthorization of the Higher Education Act included significant changes relative to financial aid. Whether or not the relationship between financial aid and graduate student persistence has changed since the reauthorization is unclear. Further research on the effects of financial, academic, and non-academic variables on graduate student persistence will inform the ongoing debate on re-envisioning the Ph.D. (Nyquist & Woodford, 2000), preparing the future professoriate/professional (PFP²) (DePauw, 2004), and graduate education in the higher education policy arena.

In summary, student persistence in college is an important issue for both undergraduate and graduate students. This topic has been examined extensively relative to undergraduate students. Results of such studies suggest that undergraduate student persistence is a function of academic and social integration (Tinto, 1975) along with other influences like college GPA (Brewton & Hurst, 1984) and financial aid (Moline, 1987). Intuitively, it is reasonable to assume that these influences may be different for graduate students who often lead lives very different from undergraduate students. Moreover, using a cost of turnover model (Bean, 1990), one could argue that graduate student persistence is significantly more critical due to the costs associated with preparing a graduate student compared to an undergraduate.

Statement of the Problem

The persistence research, to date, has focused largely on undergraduate student populations and the relationship between persistence and economic factors such as financial aid. Recent studies have explored the relationship between grants and loans, scholarships and loans, and the amount of student aid and persistence. Results are

inconclusive in that some studies suggest that economic factors significantly affect persistence (Astin, 1975; Blanchfield, 1971; Jensen, 1983; Voorhees, 1985) while other studies do not (Fields & LeMay, 1973; Moline, 1987; Peng & Fetters, 1978). Moreover, a number of studies have substantiated the differential effects between grants and loans (Astin, 1975; Blanchfield, 1971;). Overall, the effect of financial aid on undergraduate persistence is unclear while its effect on graduate student persistence is underinvestigated.

There has been little or no investigation of the influence of economic, academic, and non-academic variables on graduate student persistence. Likewise, no studies exist that explore how the influence of these factors might vary by certain demographic characteristics. Consequently, further research is needed to examine the nature of the relationship between economic, academic, and non-academic variables and graduate student persistence. Such an investigation also should explore differences between graduate students on the basis of several background traits and demographic characteristics such as race.

Purpose of the Study

The purpose of this study was to set forth an integrated model of graduate student persistence consisting of economic, academic, and non-academic variables. Then, using that model, this study was designed to examine the effect of economic, academic, and non-academic variables on the persistence of graduate students in the United States. Specifically, I determined whether more than money matters when predicting graduate student persistence. Then, I explored the overall ability of the integrated model to explain the variance in graduate student persistence. Next, I

explored differences in the likelihood of persisting for various race/ethnicity groups. Finally, I examined potential sources of the observed racial/ethnic group differences in graduate student persistence.

Persistence was defined as both persistence to degree and continuance to degree. Persistence to degree is defined as persistence to completion of the graduate degree program in which one is enrolled. Continuance to degree is defined as continued enrollment in pursuit of a graduate degree. This definition of persistence is significantly different from the within-year persistence used in previous studies (Andrieu, 1991; Asker, 2001) and is necessary given the fact that many graduate students—particularly doctoral students—do not complete their graduate degrees within 4 years.

Economic variables were defined using items drawn from the *Baccalaureate & Beyond* (B&B):93/97 longitudinal survey. Such variables included total aid amount, total educational debt, and whether or not students received grants or loans for graduate study. Non-academic variables were defined as marital status, age, parental status, and values (e.g., importance of additional education) using items drawn from B&B:93/97 survey. Academic variables were defined as those factors relating to academic performance including undergraduate GPA, GRE test score, and SAT/ACT test score. These items also were drawn from B&B:93/97 survey. Race was defined as White, Black, Hispanic, Asian, and American Indian as set forth by the National Center for Education Statistics. Gender was defined as male or female.

Participants included a national sample of graduate students. A total of 10,976 students who completed their degree in the 1992-1993 academic year were included in the first B&B cohort. The second B&B follow-up was conducted in spring 1997 and

provided information on employment, graduate school, and progress in education.

3,328 graduate students were included in the sample for this study.

Research Questions

The following questions were addressed in this study:

1. Does more than money matter in predicting graduate student persistence?
2. To what extent do economic, academic and non-academic factors included in the integrated model predict graduate student persistence?
 - a) Does this differ by graduate student status (e.g., master's and doctoral)? If so, how?
3. Using the integrated model, does the likelihood of persisting in graduate school vary by race/ethnicity? If so, how?
 - a) How do student aid and undergraduate debt influence the observed racial/ethnic group differences in persistence?

Definition of Terms

Persistence to degree: persistence to the completion of the degree program in which one is enrolled.

Continuance to degree: continued enrollment of the student in pursuit of a degree; can be measured by enrollment status semester-to-semester or year-to-year.

Grants: monetary support in the form of scholarships or need-based grants that do not require student's to reimburse the lender or grantor; often available through state and federal funds.

Loans: subsidized and unsubsidized monetary support usually from the federal government that requires student's to reimburse or "pay back" the government after graduation or upon leaving the institution.

Graduate assistantship: a part-time position or job on campus, typically 20-25 hours per week, duties may involve providing administrative support, research, teaching, or other activities; usually funded by the department or institution.

Graduate research assistantship: a part-time job on campus, duties primarily involve conducting research or providing research assistance to faculty members, usually funded by the department, institution, or through a third-party, external grant.

Graduate status or level: the type of graduate degree the student is currently pursuing; for the purposes of this study, either masters or doctoral.

Graduate teaching assistantship: a part-time job on campus, duties primarily involve teaching, tutoring, or grading, usually funded by the department or institution.

Race: White, non-Hispanic; Black, non-Hispanic, Hispanic, Asian/Pacific Islander, and American Indian as defined in the B&B:93/97 survey.

Significance of the Study

There is a need to know more about the factors that influence graduate student persistence. Much of the research related to persistence has focused on undergraduate students and a preponderance of studies has focused solely on financial aid and its relationship to staying in college. However, recent studies have shown that several other factors may be related to persistence of college students. And, intuitively, one can imagine that many more factors might influence graduate students who are more likely to be older, married, and working while in school.

The present study was significant for several campus constituencies. For example, graduate faculty members may benefit from this study. This study provided data about the factors associated with persistence in graduate school. They may use this to design classroom experiences that emphasize these factors and may consider these finding when advising graduate students.

The results of this study might provide suggestions to administrators and faculty members who hope to attract and educate traditionally disenfranchised students. This study provided useful information about the factors associated with persistence in graduate study and how it may vary among various racial groups. Administrators and faculty may use these findings when designing recruitment strategies that target specific groups.

Another group that might benefit from the results of this study includes academic administrators and graduate deans. The results of this study provided deans with data about the relationship between persistence and a set of factors such as financial aid and aspirations. Administrators might use the results to design programs aimed specifically at alleviating financial barriers for students interested in graduate education.

Financial aid officers may also benefit from the results of this study. This study examined the relationship of economic, academic, and non-academic variables to persistence of graduate students in college. Financial aid officers may consider these results to shape scholarship requirements based on these variables.

Findings from the present study also may provide the impetus for future research related to a myriad of factors and graduate student persistence. This study considered persistence among graduate students in the United States. Future studies might focus

on graduate students in other countries. This would expand the available knowledge about persistence among college students in general and graduate students in particular.

There is also a need for research on whether factors that influence graduate student persistence vary by institutional type. For example, this study used national data and included a sample of graduate students attending research universities and comprehensive universities alike. Studying various institutional types will broaden what is known about factors that influence persistence in different campus environments.

The sample of this study included graduate students in the United States who participated in the B&B:93/97 longitudinal study. Future studies might examine the ability of economic, academic, and non-academic factors to explain persistence among professional students (e.g., medical and law). Such research would expand the literature base about these factors and how they relate to persistence among various groups of graduate students.

Finally, the study was significant in terms of future policy. The results provided data about the relationship between graduate student persistence and economic, academic, and non-academic variables. Admission officers may consider these results when reviewing current admissions procedures and deciding which factors to give weight to.

Additionally, graduate deans and admissions officers may consider these results when revising graduate application forms and questions for personal statements. The findings will inform them about whether eliciting information about non-academic and background variables would be reasonable. Admissions officers may also consider

including personal statement questions that gather information about an applicant's pre-matriculation experiences and aspirations.

Delimitations

As with all research, this study had some initial delimitations. The first related to the dataset used in the study—the Baccalaureate & Beyond:93/97 longitudinal study conducted by the National Center for Education Statistics (NCES). The study was limited to factors that could be defined or operationalized using items drawn from the B&B:93/97 survey. It is possible that the B&B:93/97 survey did not measure all of the variables needed to explain the variance in graduate student persistence.

It is also possible that the items on the B&B:93/97 used to measure certain constructs—such as values or economic factors—were inadequate or lacked validity. The ability to measure variables, such as values, continues to be a point of concern among other researchers (Bollen, 2002). If the items were inadequate, results might be influenced.

This study examined the ability of a set of factors to explain the variance in graduate student persistence among a national sample of graduate students in the United States. While the results of the study are largely generalizable, they are not sensitive to the unique characteristics of individual campuses and programs that might influence persistence as well. Neither do the data reflect the significant differences between academic departments and department cultures that influence the process of graduate education.

Another delimitation of the study may be imposed by the manner in which persistence was conceptually and operationally defined. For the purposes of this study,

graduate student persistence was defined as persistence to degree and continuance to degree. Defining persistence this way may bias my findings and any variation in measures for the dependent variables could have significant effects on outcomes of the analyses.

Despite these delimitations, this was a valuable study. It provided an initial foray into the relationship of economic, non-academic, and academic variables to graduate student persistence. This is an area that has not been thoroughly investigated in the literature.

Organization of the Study

This study is organized around five chapters. The first chapter described the topic to be examined, the purpose of the study, the research questions, and the significance and delimitations of the study. The second chapter reviews the literature that is relevant to the study including economic models that have been used to explore persistence, psychological models that have been used in persistence studies, and academic variables that have been explored. Chapter Three describes the methodology that was employed to collect the data and the data analysis procedures used in this study. Chapter Four reports the results of the research. Chapter Five discusses those results and the implications of the study for future research, policy, and practice.

CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

The purpose of this study was to propose an integrated model of graduate student persistence consisting of economic, academic, and non-academic variables. Then, using that model, this study was designed to examine the effect of such variables on the persistence of graduate students in the United States. Specifically, I determined whether more than money matters when predicting graduate student persistence. Then, I explored the overall ability of the integrated model to predict graduate student persistence noting differences by graduate status. Next, I explored racial/ethnic differences in the likelihood of persisting in graduate school using the integrated model. Finally, I examined potential sources of the racial/ethnic differences in persistence.

This review is divided into several sections. The first section is used to briefly review the body of research that relates to undergraduate persistence in college. The next section is presented to provide a discussion of studies that utilize economic variables to examine persistence among graduate students. The third section contains the literature related to graduate student persistence using academic variables. The fourth section is used to discuss the use of non-academic variables relative to graduate student persistence. And, the final section, presents an outline of the integrated model proposed for the present study.

Undergraduate Persistence Studies

This section sets the present study within a larger context and reviews the extant literature on college persistence among undergraduate students. For decades,

undergraduate student persistence has been an issue of interest to academicians, students, parents, and college administrators. Research has shown that “only 15 to 25 percent of all institutional departures arise because of academic failure” (Tinto, 1993, pp.81-82). The majority of students who depart from college prior to degree completion withdraw voluntarily. Hence, understanding college persistence involves much more than just determining how to improve students’ grades. It seems to involve other factors as well.

Economic Variables

Economics is the study of human behavior in the context of systems. While numerous academicians have explored the concept of college persistence, relatively few economists have investigated the issue. This fact is surprising, considering that pursuing higher education can be viewed as an economic decision. Attending college is in essence an investment in human capital (Leppel, 2002).

Ehrenberg and Sherman’s (1987) study about the effect of hours of employment on academic performance and persistence is one of the few articles by economists on college persistence. In their study, they limited the sample to males. However, Tinto (1993) suggested that college persistence varies with a student’s background. Females, he wrote, “are more likely than males to face external pressures which constrain their educational participation” (p. 77). Because the impacts of other independent variables on persistence may differ according to various background factors such as race, the present study estimates the effect of such factors on persistence. The study also examines the sources of such effects.

Economic models often consist of financial variables such as financial aid. A number of researchers have investigated the influence of financial aid on persistence of freshmen. Perna (1998) used a subsample from the *Beginning Postsecondary Student* (BPS) Survey of 1989 to determine the total, direct, and indirect effects of receiving financial aid on freshmen persistence. She found that the effects of financial aid on persistence depend on the type of aid received. For example, grants were more effective than loans in predicting persistence. But, neither grants nor loans were directly related to persistence.

Perna's study provided a unique perspective on the effects of financial aid on freshmen persistence. In her study, she considered both the direct and indirect effects while prior studies focused only on the direct effects of aid on persistence (Cabrera et al., 1990; Stampen & Fenske, 1988). Several other researchers have shown that financial aid may influence persistence directly and indirectly; consistent with Perna's research. Terkla (1985) used a subsample from the *National Longitudinal Study* (NLS) of the High School Class of 1972 and found that receiving financial aid had a large direct effect and significant total effect on persistence. In cases where financial aid had an indirect effect on persistence, the intervening variable can usually be described as academic (e.g., GPA) or non-academic (e.g., aspirations and intentions)(Bean, 1982).

In another study by Cabrera, Nora, and Castaneda (1992), financial aid was not found to be related directly to persistence among full-time, unmarried, dependent freshmen. However, receiving financial aid increased persistence indirectly through college grade point average (GPA). In fact, receiving financial aid had one of the largest effects on persistence—second only to intent to persist and cumulative GPA.

This is significant because it suggests that college student persistence is a function of economic (e.g., financial aid), academic (e.g., GPA), and non-academic (e.g., background and intentions) variables. This provides a theoretical basis for the model proposed in this study.

Academic Variables

An overwhelming majority of the literature on student persistence in higher education is based on studying undergraduate students (McGrath & Braunstein, 1997; Perna, 1998; St. John, Hu, & Tuttle, 2000; St. John, Hu, & Weber, 2000; Tinto, 1987). McGrath and Braunstein (1997) attempted to identify the best predictors of persistence to the sophomore year using a sample of 353 freshmen who began college during the 1994 Fall Semester. To collect data, they used the *College Student Inventory* (CSI) (Cairns, 1992; Schreiner, 1991) which measures predispositions, precollege academic experiences, and attributes that may influence persistence to the next year.

Seven independent variables appeared to relate to persistence: socioeconomic background, high school GPA, combined SAT scores, first semester grade point average, participation in financial aid program, and initial impressions of the institution. Stepwise logistic regression was used to test each of these variables and only two were statistically significant in predicting persistence—first semester grade point average and students' impressions of others. Results suggest that persistence is significantly influenced by academic variables. Findings also indicate that persistence is related to non-academic factors as well.

Non-Academic Variables

A number of persistence studies examine persistence using non-academic variables. By this, I mean that they are designed to explore the influence of non-academic independent variables such as aspirations, race, and gender on the ability of one to persist. For example, Nora (1987) included encouragement by significant others in his study to test a modified version of Tinto's model on Chicano college students. In similar fashion, Leppel (2002) included students' age, marital status, and race in her analysis of the *Beginning Postsecondary Students* (BPS) data. She found that being older and married lowers persistence rates for both men and women.

The use of non-academic variables dates back over 40 years. Spady (1970) arrived at the conclusion that social integration is important for persistence in college. In his analysis of college attrition, the author found that social integration—measured by friendship support, intellectual development, academic performance, and shared values—was significantly related to persistence. Figure 1 outlines Spady's model.

Tinto (1975; 1982; 1987; 1993) further clarified the importance of social and academic integration. He studied dropout behaviors of undergraduate students at one institution. The results of his study suggest that the more a student's experiences integrate the student socially and intellectually into the life of the university, the more likely that he or she will persist until degree completion. If a student is weakly integrated into the institution, the student is more likely to withdraw prior to degree completion.

Figure 2 presents a conceptual scheme based on Tinto's research. Studies rooted in the integration tradition, however, generally overlooked the role of finance and academics on student persistence. Instead, they focused on student-

student interactions and interactions between faculty members and students.

Interaction between faculty members and students has been found to be a strong predictor of persistence (Pascarella, 1980; Pentages & Creedon, 1978; Terenzini et al., 1982). Such interactions lead to higher grades (Pascarella, 1980), higher self-esteem (Astin, 1975), and higher levels of academic and social integration in the college (Tinto, 1975).

The existing research on college persistence suggests that there are other factors related to persistence. Among these factors are: finances, hours of employment, outside encouragement, family responsibilities, satisfaction, stress, and race/ethnicity (Bean & Metzner, 1985; Metzner & Bean, 1987). In their 1987 study, Metzner and Bean gathered data from 624 nontraditional (commuter, part-time) undergraduates at a Midwestern urban university. The results of this study suggest that nontraditional students fail to persist for academic reasons or because they lack the commitment necessary to stay in school.

Most of the literature on undergraduate student persistence suggests that there is a relationship between economic, academic, and non-academic variables such as intentions or values (Bean & Metzner, 1985; McGrath & Braunstein, 1997; Metzner & Bean, 1987; Moline, 1987; Perna, 1998; St. John, 1989; St. John et al., 2000; Voorhees, 1985). Some studies highlight the influence that economic variables have on persistence (Cabrera et al., 1992; Cabrera et al., 1990; Perna, 1998) while others are designed to examine the relationship among all three (Cabrera, Castaneda, Nora, & Hengstler, 1992; Cabrera, Nora, & Castaneda, 1993; Peng & Fetters, 1978). A review of the literature illustrates that such variables influence student persistence.

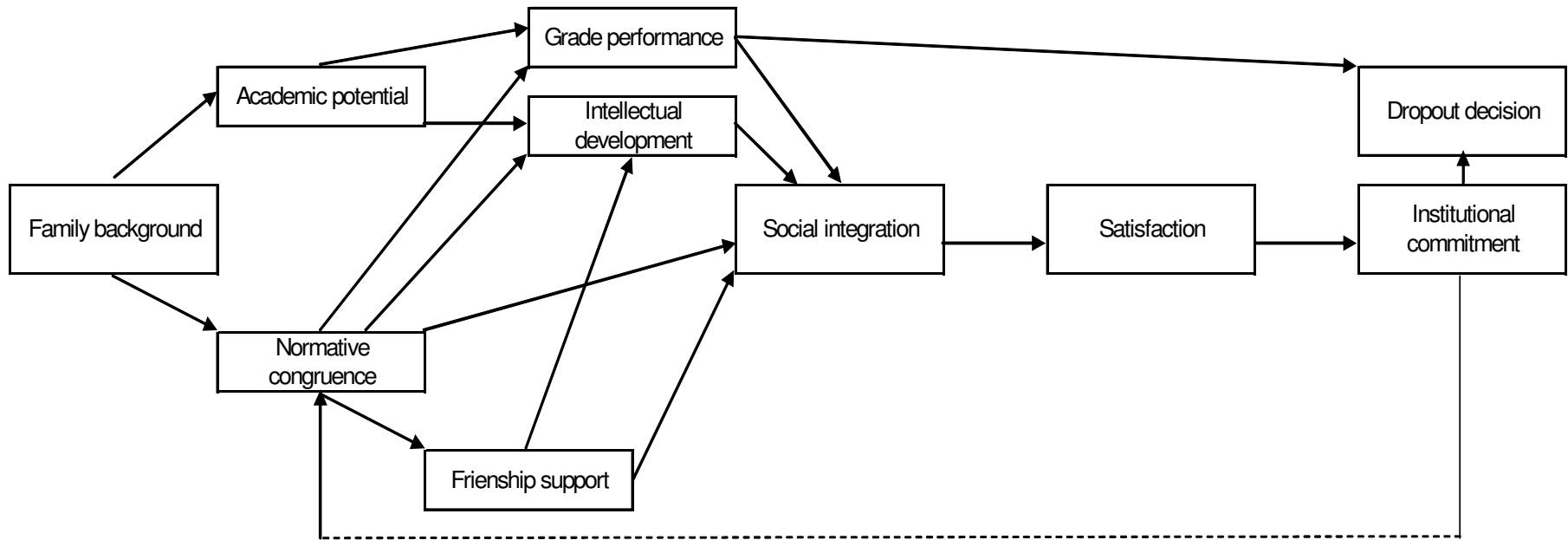


Figure 1. Theoretically Based Model of the Undergraduate Dropout Process

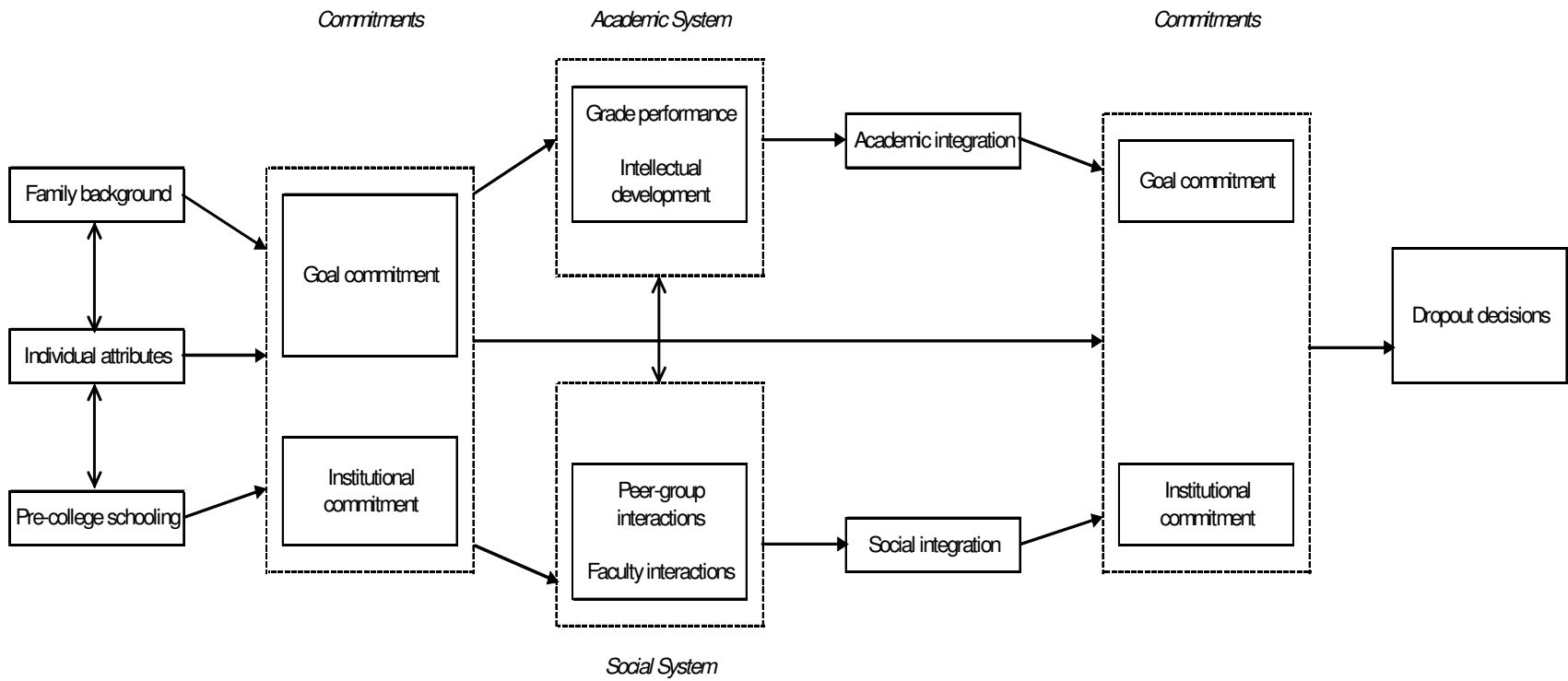


Figure 2. A Conceptual Scheme for Dropout from College

Persistence Variables

The findings of previous studies appear to be in general agreement with the fact that economic, academic, and non-academic independent variables have an effect on persistence. However, these studies vary widely in the way in which the dependent variable is measured and operationalized. Generally, the dependent variable has taken one of six forms: persistence to year-to-year versus persistence to degree, persistence defined by continuous enrollment versus earning a degree within a restricted period of time, and persistence as a continuous variable versus a dichotomous variable.

Several studies examine the relationship between certain independent variables and persistence year-to-year (Spady, 1971; Tinto, 1975; Williamson & Creamer, 1988). Spady (1971) found that each student entered college with certain dispositions, interests, expectations, and goals that were shaped by family background characteristics and previous experiences. These non-academic variables had an indirect effect on persistence while academic performance in college had a direct effect on the ability of students to continue in college year to year.

It is increasingly common for researchers to assess the effects of independent variables, like financial aid and GPA, on within-year persistence. Some researchers argue that this is an appropriate outcome measure in assessing the effects of financial aid, prices, and price subsidies (Kaltenbaugh, St. John, & Starkey, 1999; St. John, 1999; St. John et al., 2000; St. John et al., 2000). St. John, Hu, and Weber (2000) found that state aid to students can equalize opportunity across income and ethnic groups. Similarly, state aid contributed to the ability of students in Indiana to persist semester to semester.

Another approach has been used in a number of persistence studies. Under this approach, persistence is either a proxy for graduation or continuous enrollment. For example, Leppel (2002) used data taken from the 1990 survey of the *Beginning Postsecondary Students* (BPS), conducted by the National Center for Education Statistics (NCES) of the U.S. Department of Education to examine similarities and differences in persistence of men and women. She “defined a student as having persisted if he or she was enrolled at some time during 1990-1991” (p. 439). In this way, she captured any student who was enrolled continuously towards earning their degree.

Finally, persistence studies vary by whether the outcome measure is continuous or dichotomous. A continuous variable takes on many values and “can assume, at least in theory, any value between the lowest and highest points on the scale” (Howell, 1992, p.3). A dichotomous variable, on the other hand, is restricted to two values—for example, male or female and yes or no.

Moline (1987) used path analysis to explore the relationships between a number of variables and persistence. Her sample consisted of 227 full-time freshmen who enrolled during the 1982 Fall semester. In this study, persistence was measured by the number of credits completed over a two-year period. Consistent with previous findings, college GPA and another academic variable (high school rank) had the largest total effect on persistence. Kaltenbaugh, St. John, and Starkey (1999), in comparison, defined persistence as “yes” or “no” in their analysis of ethnic differences in persistence.

The examination of undergraduate studies provides a representation of what could be learned about graduate students once they are examined to a similar extent

and therefore provides a point of departure for this study of graduate student persistence. The next section provides an overview of the research that has been conducted on graduate student persistence. The integrated model for the present study is proposed in the last section.

Graduate Persistence Studies

This section reviews the literature on graduate student persistence. It is prima facie assumption of the present study that very little research exists on graduate student persistence in graduate school. Moreover, researchers vary in their operationalization of graduate student persistence in the same way that undergraduate persistence measures change. The present study explores persistence as defined by persistence to degree and continued persistence towards degree. Persistence to and towards degree completion is important to graduate students and their families because, on average, employment and earning prospects are better for individuals who have finished graduate school (Leppel, 2002).

There is a paucity of research on graduate student persistence. To date, two previous studies use the information from one institution to examine graduate students (Asker, 2001; Lyn, 1999). A third study was conducted using nationally-representative data (Andrieu, 1991). It is intended that the present study add to the knowledge base of graduate higher education and the body of literature relative to graduate student persistence.

Economic Variables

Many of the persistence studies of undergraduates indicated that non-traditional age, older students were more sensitive to economic factors such as financial aid and

prices (Hippensteel et al., 1996; St. John & Starkey, 1995). Baird (1993) also stressed the importance of economic variables such as sources of finance to graduate student retention. A few graduate persistence studies in the extant literature include economic or financial variables.

In a descriptive study, employing qualitative methods rather than quantitative analysis techniques, Luan and Fenske (1996) found that the type of financial assistance was important in graduate student persistence. Their sample consisted of 472 masters students. Results suggest that economic factors, age, and teaching assistantships affect persistence. These results were generally consistent with earlier findings based on undergraduate student populations.

One study surveyed 10,000 students who dropped out of graduate school at Berkeley. The factors cited most frequently as reasons for not completing their graduate degree were financial factors. A number of the respondents also cited academic and "personal" (non-academic) factors as leading causes of departure (Langlois, 1972).

In another qualitative study, the researcher conducted telephone interviews with 25 doctoral students who quit their degree program. The study was designed to identify the important factors that led to the students' decision to leave. Finances and departmental integration were most important to the persistence of doctoral students. Put another way, economic and both academic and non-academic variables were found to be related significantly to graduate student persistence.

Academic Variables

It is useful to note that no research has been conducted specifically to examine the influence of academic variables on graduate student persistence. Consistent with the pattern found among undergraduate persistence studies, much of the research focuses on financial variables and non-academic variables such as academic and social integration. Two studies, discussed later, conceptualize logical models. I will resume discussion of academic variables in a latter section of this report.

Non-academic Variables

Girves and Wemmerus (1988) proposed models of graduate student degree progress based on data collected from 324 master's students and 158 doctoral students. They used descriptive statistics to determine the most significant variables influencing graduate degree progress. They found that differences among the cohorts by graduate student level (e.g., master's or doctoral) and they found with-in group differences on the basis of enrollment status (e.g., part-time or full-time). They also found that involvement in one's own department of study was important to the completion of doctoral degrees. One important form of involvement was working as a teaching or research assistant.

Not only is involvement in one's graduate department important to persistence, but involvement with faculty members of the department—particularly one's own advisor—is critical to continuance. Based on data provided by a qualitative study involving in-depth structured interviews, the following reasons for leaving were cited: lack of goals, lack of financial support, and a negative change in the advisor-student relationship (Nerad & Miller, 1996). This study is important to the present investigation

because it supports the inclusion of economic, academic, and non-academic constructs in the proposed integrated model.

Finally, graduate student persistence is a function of race, gender, and age. Therefore, one should disaggregate sample populations when studying graduate students (Baird, 1993; Sedlacek, 2001). While this phenomenon makes sense intuitively, possible relationships between non-academic, academic, and financial variables have not yet been clarified. There is a need for a conceptual model that consists of three constructs: economic factors, academic factors, and non-academic factors that relate to graduate persistence. The primary purpose of this study is to propose a logical model for assessing these factors that influence graduate student persistence.

The Integrated Model of Graduate Persistence

In the only national research on graduate student persistence, Andrieu (1991) considered the influence of background, graduate experience, aspirations, expected earnings, and financial commitment on within-in year persistence. Students who re-enrolled in the spring semester of an academic year after having been enrolled in the fall semester were identified as “persisters.” She used *National Postsecondary Student Aid Study*, 1987 (NPSAS-87) data and a three-stage stratified sampling process to select students. The sample consisted of 6,559 graduate students, 54% males and 46% females.

From this analysis, a new logical model relative to within-in year graduate persistence was proposed. Graduate student persistence was proposed to be a function of five factors. The first factor was the student’s background and the variables

included gender, age, ethnicity, marital status, income, parent's education, and dependency status. The other factors included graduate experience, aspirations, expected earnings, and financial commitment. The graduate experience factor was composed of academic variables such as GPA and level of enrollment (e.g., master's or doctoral).

Another study explored graduate student persistence from an institutional perspective. Much like the previous study, the researcher depicts graduate student persistence as a function of five factors: student background variables, income, undergraduate GPA, and graduate status represented by five variables (grade level, enrollment status, graduate GPA, state residency, and degree program) (Lyn, 1998).

Finally, another doctoral student conducted research on graduate student persistence. This study was based on state-level data in Indiana provided by the Indiana Commission on Higher Education. The Commission collects these data each year makes it available to researchers. The sample consisted of 1,121 business graduate students and 1,799 education graduate students (Asker, 2001).

The model developed for this study was adapted from models developed by St. John and Somers (1997) and Lyn (1998). Again, these studies used within-year persistence as the dichotomous outcome variable. Persistence was viewed as a function of student background characteristics, graduate experiences, and financial aid packages. Student background variables included age, gender, and ethnicity. Graduate student experience variables ranged from level of enrollment (e.g., master's or doctoral) to graduate GPA. The financial aid factor consisted of student aid variables and combinations of variables called aid packages.

Conclusions

Based on the review of the literature, a logical model of graduate student persistence to degree was developed. The model postulates that graduate persistence to degree and/or continuance to degree is a function economic, academic, and non-academic factors. From this logical model, a statistical model for assessing the factors that influence graduate persistence to degree will be developed and tested. Finally, the statistical model will be used to assess differences among the sample on the basis of race and sources of racial/ethnic differences. Figure 3 presents the model proposed for this study.

The following chapter provides a description of the methodology used in this study. Specifically, the chapter describes the sample, instrumentation, and the statistical analysis used in the study. The results are presented in Chapter 4 and Chapter 5 outlines a discussion of the results.

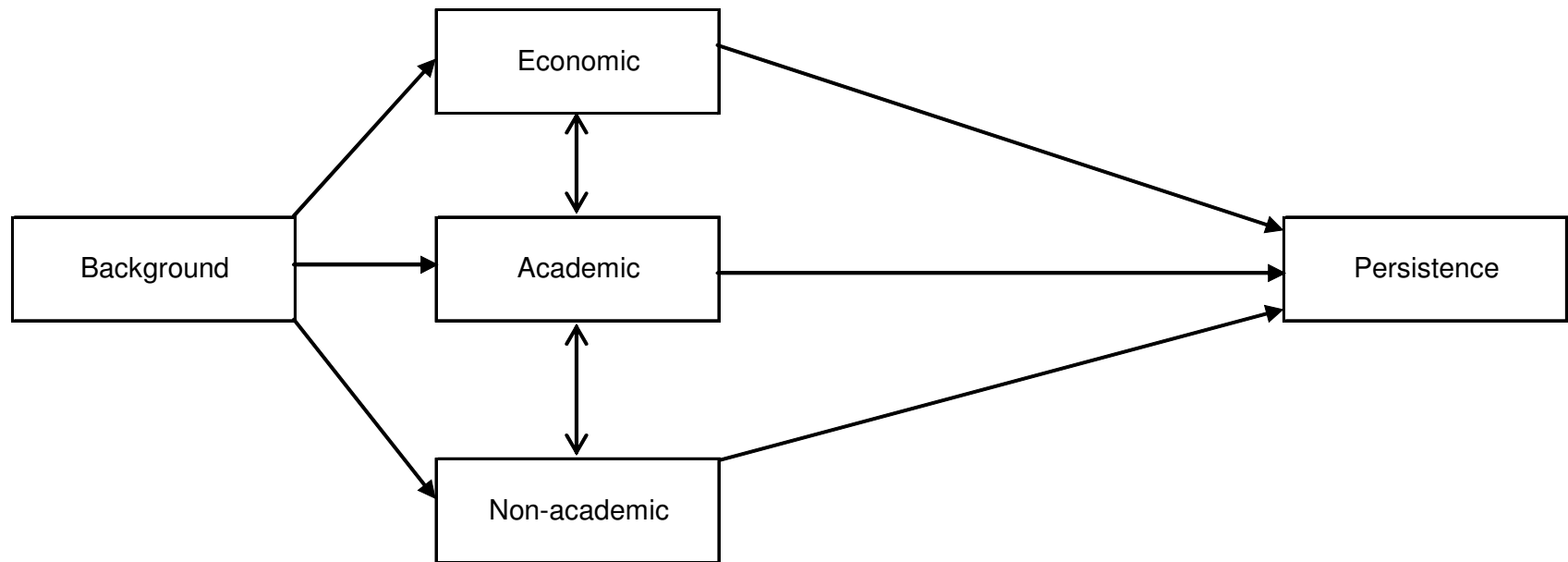


Figure 3. Proposed Model of Graduate Student Persistence

CHAPTER THREE

METHODOLOGY

Introduction

Two of the purposes of this study were to: (a) propose and test a conceptual model of graduate student persistence, and (b) to develop a statistical model based on the conceptual frame for assessing the factors that influence graduate persistence to degree as measured in this study. Specifically, the study was designed to explore the following research questions:

1. Does more than money matter in predicting graduate student persistence?
2. To what extent do economic, academic and non-academic factors included in the integrated model predict graduate student persistence?
 - a) Does this differ by graduate student status (e.g., master's and doctoral)? If so, how?
3. Using the integrated model, does the likelihood of persisting in graduate school vary by race/ethnicity? If so, how?
 - a) How do student aid and undergraduate debt influence the observed racial/ethnic group differences in persistence?

This chapter describes the methodology used to achieve these purposes. It begins by providing an overview of the Baccalaureate & Beyond Longitudinal Study, 1993/1997 (B&B:93/97) which was used as a database for the present study. The sampling and data collection procedures used for the B&B:93/97 database are also

described. Next, the research approach for the present study, including the proposed methods of data analysis, is discussed.

Baccalaureate & Beyond Longitudinal Study, 1993/1997

The Baccalaureate and Beyond Longitudinal Study (B&B) traces its roots to the widely used National Postsecondary Student Aid Survey (NPSAS). In 1987, NPSAS was designed and implemented by the National Center for Education Statistics (NCES) in response to a need for a comprehensive national database on postsecondary student financial aid. NPSAS is characterized by two major design features: (a) the definition of postsecondary institution used to determine eligibility for inclusion in the study is broad and encompasses various institutional types including both 2-year and 4-year institutions, and (b) NPSAS provided a broad picture of how student's finance their education by compiling information from several sources (e.g., students, parents, and institutions).

The first administration of NPSAS was in 1987. The study (NPSAS:87) examined financial aid from the individual student's perspective and included those who were enrolled in postsecondary education for the academic year, 1986-1987. NPSAS:87 identified students enrolled in undergraduate, graduate, and professional education programs in the fall of 1986 and obtained information on their enrollment status and characteristics, student aid status, student-reported as well as institution-determined costs, and demographic and socio-economic characteristics (Andrieu, 1991).

NPSAS:87 was conducted after an broad national field test in 1985-1986. After analyzing the field test data, the instruments for data collection were modified to reflect

the changes suggested during the field test. This was accomplished through collaborative efforts by Westat, NCES, the NPSAS Steering Committee, the NPSAS Advisory Group, and various work groups. The forms used in 1987 NPSAS were substantially different from the field test instruments (Smith, Garcia, & Malitz, 1990).

Subsequent NPSAS studies took place during the 1989-1990, 1992-1993, 1995-1996, and 1999-2000 school years. Each NPSAS survey provided useful information on the cost of higher education, the distribution of student aid, and the various ways in which students pay for college. The National Center for Education Statistics published three reports—*Undergraduate Financing of Postsecondary Education*, *Student Financing of Graduate and Professional Education*, and the *Profile of Undergraduates in U.S. Postsecondary Education Institutions*—following each NPSAS survey.

The NPSAS:93 study utilized a two-stage stratified sample design. In the first stage, 1,243 postsecondary educational institutions were identified using the broad definition discussed on page 41. Of those identified, 88% responded and provided lists of students. In the second stage, students were selected from the group of institutions that responded.

NPSAS is a comprehensive national study designed to provide information about how students and their families finance the cost of postsecondary education. NPSAS also addresses policy questions relative to financial aid programs. To elicit data concerning education and work experiences after completion of the bachelors degree, the NCES launched the Baccalaureate & Beyond (B&B) Longitudinal Study in 1993 as an off-shoot of the NPSAS:93 study.

Baccalaureate and Beyond (B&B) follows baccalaureate degree completers over time to provide information on work experiences after college and on progress and persistence at the graduate level. In fact, using NPSAS:93 as the base year, the B&B:93/97 Longitudinal study follows baccalaureate degree completers four to five years beyond their undergraduate graduation. The follow-up survey provides a unique opportunity to gather information concerning delayed entry into graduate education, graduate school aspirations, progress and persistence to degree, and the interaction between work and education beyond obtaining a bachelor's degree.

B&B:93/97 identified students who completed their undergraduate degrees in the 1992-1993 academic year and obtained information on their education and work experiences after college graduation. Data from all components of the NPSAS:93 are also available as base-year data for the B&B:93/97 sample. This includes the institutional record abstract, the student interview, financial aid information, and test scores as well as demographic and background characteristics.

The institutional record abstract is a component of both the NPSAS and B&B surveys. The institutional record abstract, also known as the student record abstract, consists of data relating to the student and his/her demographic characteristics. For example, year in school, major field of study, attendance status, GPA, and age are a part of the abstract.

The student interview is another component of the NPSAS that is included as base year data for the B&B cohort. The student interview consists of data relating to some of the same characteristics discussed above and other demographic

characteristics. For example, current marital status, age, race/ethnicity, and gender are included in the interview.

Test scores are also included the student record abstract and other components of the B&B:93/97 survey. Test scores include SAT math, SAT verbal, and SAT composite scores. But, more closely related to graduate school, the dataset includes GRE analytic, quantitative, and verbal scores for respondents.

Finally, the data set includes a wealth of information related to financial aid, student debt load, and how students pay for graduate education. This information ranges from the type and quantity of student aid awarded by the federal government to the type of assistantship provided by the institution. For example, assistantship type, total aid amount and type, total amount owed for education, and total educational debt are included in the records.

Sampling Procedures

The B&B sample design represents all postsecondary students in the United States who completed a bachelor's degree in the academic year 1992-1993. The original sample was a subsample of the students selected for the NPSAS:93 Study, a nationally representative sample of all postsecondary institutions. The base-year B&B study was followed up in 1994 and 1997.

The B&B:93/94 sample of baccalaureate degree graduates includes those students in the NPSAS:93 sample who were identified by the institution or during the student interview as having completed a bachelor's degree in the 1992-93 academic year. All NPSAS:93 sample persons who satisfied the subsample requirements were

included in the B&B:93/94 sample regardless of whether these persons were respondents or nonrespondents in NPSAS:93.

From the NPSAS:93 sampling criteria, 16,316 baccalaureate degree recipients were identified. All 11,810 of the identified students who completed the NPSAS interview were retained for base-year B&B. Additionally, student nonrespondents for which NPSAS parent data were available also were retained along with eligible cases with at least some data provided. The total sample included 11,192 cases and these were retained for future rounds, including the second follow-up.

The present study uses data taken from the B&B:93/97 second follow-up study. For the second follow-up, the total sample consisted of 9,274 respondents. Of these, 3,328 were pursuing a masters or doctoral degree. Table 1 shows the percent response for all sample members by graduate student level.

Data Collection Procedures

Data were obtained from multiple sources. The instruments used for data collection consisted in part of NPSAS:93 components, including the institutional record abstract, the student interview, parent survey, out-of-school student loan recipient survey, and the Department of Education Financial Aid Application/Loan records.

These were discussed in previous sections of this study.

Data collection for the second follow-up took place between April and December of 1997. The cohort was comprised of 11,192 individuals who were eligible for follow-up in 1997—that is, they had received their bachelor's degrees in 1992-1993 (4 years prior). For the second follow-up, 10,093 interviews were conducted and completed. 83% (9,274) of the sample responded to all three administrations of the B&B survey

(1993, 1994, and 1997). These respondents are classified as the B&B panel. The sample of the present study is a subsample of the B&B panel.

Interviewers from the National Opinion Research Center (NORC) at the University of Chicago called B&B sample members in the spring of 1997. In fact, interviewing began on April 8, 1997—approximately one week after the National Center for Education Statistics sent a letter and informational leaflet to all B&B:93/97 sample members. Telephone interviewing continued for a period of 16 weeks. 15% of the original sample refused to participate in the B&B:93/97 study.

To ensure quality of the data, supervisors monitored interviewers to identify any deviations in the interview process. They reported overall error rates in addition to error by item/question number. Interviewers were given an opportunity to provide their reactions during weekly feedback sessions.

According to the methodology report for the second-year follow study, several factors can be considered in assessing the efficacy of the instrument. First, the interview length measured by “time stamps” which provide information on the average amount of time required to complete each section. The average time to complete the interview was 33 minutes (U.S. Department of Education, 1999).

Secondly, NCES developed coding schemes to use with the computer-assisted interview instrument. These programs were used to code postsecondary institutions, elementary and secondary schools, fields of study, industry, and occupation. Interviewers were required to select the most appropriate code based on the respondent’s answer. To test the quality of the coding, NORC performed a test of inter-

observer consistency using specially trained coders (U.S. Department of Education, 1999). Coding was deemed to be accurate and consistent.

While the instruments used for both the NPSAS and the B&B surveys were found to be reliable through field testing and follow-up studies, adjustments must be made to compensate for “unequal probability of selection into the B&B sample and to adjust for non-response” (U.S. Department of Education, 1999, p. 108). Due to the complex sampling design discussed on page 42, it is necessary to use sampling weights when approximating the population of the 1992-1992 bachelor’s degree recipients in the longitudinal sample. The B&B:93/97 panel weight is appropriate for this purpose. To “minimize the influence of sample sizes on standard errors while also correcting for the oversampling of some groups, each case is weighted by the panel weight divided by the average weight for the sample” (Perna, 2004, p.492). Weighting will be discussed further in Chapter 4.

Methodology for the Present Study

The present study included a subsample of the students included in the B&B:93/97. The base-year of the B&B study consisted of students who completed their bachelor’s (BA) degrees in the 1992-1993 academic year. To be included in this research, a student must have indicated certain responses to the B&B:93/97 follow-up longitudinal survey. Respondents must have indicated that they met one of two criteria. First, the sample consists of all individuals who received their bachelor’s degree in 1992-1993 and enrolled in graduate school by 1997. In the 1997 follow-up, respondents could report that they were currently enrolled in graduate school (B2CURENR) to satisfy persistence as continued enrollment in pursuit of a graduate degree (see definition of

terms in Chapter 1). Secondly, respondents could have indicated that they had received either a master's or doctoral degree since completing their BA degree (B2HDGPRG). This met the condition of persistence to degree (see definition of terms in Chapter 1). If respondents met either of these conditions, they were considered a "persister" in the present study. All others who had enrolled by 1997 but failed to remain enroll or earn a graduate degree were coded as "non-persisters" in the present study. Operationalization of the dependent variable is discussed further in Chapter 4.

Table 1

Number and Percent of Masters and Doctoral Students in B&B:93/97 Sample

Type of student	N	%
Masters	2,533	76.1
Doctoral	795	23.9
Total	3,328	100

The sample for the present study totaled 3,328 graduate students, of whom 2,533 were master's students and 795 were doctoral students. The sample was composed of 1,509 males and 1,819 females. Table 2 presents the demographic characteristics of the sample. Additional characteristics of the sample are discussed in Chapter 4.

Integrated Statistical Model

The research questions presented earlier in this chapter focus on the basic issues addressed in this study. In short, the study is designed to determine whether more than money matters in predicting graduate student persistence. Secondly, this research tests the overall significance of economic, non-academic, and academic factors in predicting graduate student persistence noting differences in the strength of the model relative to masters versus doctoral students. Additional insight into the nature of the factors included in each category of variables is outlined in Chapter 4. Third, this study explores racial/ethnic differences in the likelihood of persisting in graduate school and potential sources of such differences.

Table 2

Number and Percent of Study's Sample by Race and Gender

Demographic	N	%
Gender		
Male	1,509	45.3
Female	1,819	54.7
Race/ethnicity		
AI/AN	13	.4
API	159	4.8
Black	214	6.4
Hispanic	180	5.4
White	2,761	83.0

Specification of the Model

The model developed for this study was developed using extant research literature as the basis for inclusion of certain factors. The scheme of the model used in this study as presented in chapter 2 and the specification outlined in Chapter 4 reflect findings from studies on both undergraduate and graduate student persistence. In that way, it represents a new approach to examining this issue.

In this study, the outcome variable was whether or not a student persisted in graduate study (e.g., “yes” or “no”). Under one condition, a respondent may be currently enrolled in graduate school and therefore is persisting towards their degree (If “yes,” then 1). Under another condition, a respondent may have already completed their graduate degree by the time of the second follow-up (If “yes,” then 1). In this way, the participant has persisted in graduate school. If one fails to meet either of these requirements, he/she has not persisted (If “no,” then 0).

In this study graduate student persistence was viewed as a function of three factors or sets of variables:

1. Economic variables (total aid amount, total amount borrowed, total educational debt, type of assistantship);
2. Non-academic variables (values, marital status, age, gender, race, parent’s education);
3. Academic variables (undergraduate GPA, SAT scores, GRE scores).

See Table 3 for listing of model factors and variables.

Table 3

Factors, Variables, and Codes for the Integrated Model

Factors	Variables	VARIABLE	Code
Dependent	Persistence	PERSIST	0=non-persister 1=persister
Economic	Total aid amount		
	Total aid received for graduate school	B2TOTAID	0=none 1=less than \$6,999 2=\$7,000-17,999 3=\$18,000-27,999 4=\$28,000 or more
	Total aid borrowed for graduate school	B2GRSCDB	0=none 1=less than \$11,999 2=\$12,000-34,999 3=\$35,000-56,999 4=\$57,000 or more
	Debt		
	UG debt	UGDEBT	0=none 1=less than \$4,000 2=\$4,000-7,999 3=\$8,000-12,599 4=\$12,600 or more
	Total debt (UG/G)	B2EDTOT	0=none 1=less than \$15,999 2=\$16,000-39,999 3=\$40,000-63,999 4=\$64,000 or more
	Institutional Aid Assistantship	B2RESAST B2TEAAST	0=no 1=yes 0=no 1=yes
Tuition reduction	B2TUIRED	0=no 1=yes	

Table 3 (continued)

Factors	Variables	VARNAME	Code
Academic	Grades		
	UG GPA	NORMGPA	0=2.9 and below 1=3.0 to 3.3 2=3.4 to 3.6 3=3.7 to 4.0
	SAT		
	Quartile score	SATQTR2	0=did not take SAT/ACT 1=lowest quartile 2=second quartile 3=third quartile 4=highest quartile
	GRE		
	Quartile score	GREAQ B2BREQQ	1=bottom quartile 2=second quartile 3=third quartile 4=highest quartile 1=bottom quartile 2=second quartile 3=third quartile 4=highest quartile
Non-academic	Background		
	Parent's education	PARED	1=no high school 2=high school 3=some PSE 4=two years PSE, AA 5=BA 6=advanced degree
	Marital status	B2MAR497	0=not married 1=married
	Parental status	PARENTAL	0=not a parent 1=parent
	Gender	B2RSEX	0=male 1=female
	Age at BA	B2AGATBA	0=below 22 years 1=22-24 years 2=25 and above
	Race	B2ETHNIC	1=AI/AN 2=Asian 3=Black 4=Hispanic 5=White

Table 3 (continued)

Factors	Variables	VARNAME	Code
	Proxies		
	Preparation/Train.	CCLASS	0=Research I 1=Doctoral-granting 2=Comprehensive 3=Liberal Arts I 4=Other (LAI, spec.)
	Estimated Family Contribution	EFC	0=no support 1=less than \$1,499 2=\$1,500-3,999 3=\$4,000-7,999 4=\$8,000 or more
	Inst. Quality	UG tuition	0=0 1=less than \$1,600 2=\$1,600-4.899 3=\$4,999-7,999 4=\$8,000 and above

Data Analysis Procedures

Data were analyzed to examine the research questions posed in this study. The research questions aimed to discover whether more than money matters in predicting graduate student persistence and the extent to which factors included in the integrated model, set forth by this study, influence graduate student persistence. Additional questions explored racial/ethnic group differences in the likelihood of persisting in graduate school while other questions examined potential sources of such differences.

It is important to note, however, that the outcome variable, graduate student persistence, is dichotomous—that is, “yes” or “no.” Given that the outcome variable or dependent variable in this study is dichotomous, binomial logistic regression procedures were used to analyze the data instead of ordinary least squares regression procedures (OLS)(Aldrich & Nelson, 1984; Andrieu, 1991; Asker, 2001; Howell, 1992; Kerlinger & Pedhazur, 1973). This type of regression is widely used because it is flexible and provides significant explanatory power. By flexible, I mean that the independent variables can be continuous, interval, integers, or categorical (Andrieu, 1991; Kerlinger & Pedhazur, 1973).

OLS regression assumes that the dependent variable is continuous. OLS regression is sometimes used when the dependent variable is dichotomous, but it is not an appropriate strategy(Aldrich & Nelson, 1984; Asker, 2001). Doing this violates an important assumption that the outcome variable is continuous and can lead to serious misestimations (Aldrich & Nelson, 1984).

In recent years, a number of researchers have used logistic regression techniques to examine the effects of different groups of variables on a dichotomous

outcome variable (Andrieu, 1991; Asker, 2001; St. John, 1990). When the outcome variable is dichotomous, the researcher is actually interested in the probability that an independent variable will have an effect on the dependent variable, unlike in OLS regression. In this case, a technique is needed that can act much like OLS or multivariate regression without the requirement of the dependent variable being continuous. Logistic regression is an appropriate technique for this study as it will predict the probability of a student persisting in graduate school.

In OLS or multivariate regression, the statistic R^2 is interpreted as the proportion of the variance in the dependent variable explained by the independent variables (Kerlinger & Pedhazur, 1973). In logistic regression, this statistic is modified to predict probability. The modified R^2 is referred to as a pseudo R^2 or a proportional-reduction-in-measure (“ R^2 ”) (Aldrich & Nelson, 1990; Andrieu, 1991; Asker, 2001) because it estimates the proportion of the variance in the dependent variable explained by the independent variables. A number of research studies set forth a formula to calculate the “ R^2 .”

The first question focused on whether more than money matters in graduate student persistence. This question is related to the title of this study and reflects one of the central hypotheses for developing an integrated model of persistence. To investigate this question, hierarchical binomial logistic regressions were used to predict the probability of a student persisting in graduate school using the factors included in the integrated model of graduate student persistence. Economic factors were entered first, followed by academic factors, and non-academic factors were entered in the last block.

Several statistics were computed to answer this question. First, the results of the hierarchical binomial logistic regression analysis were interpreted to assess the importance of academic and non-academic factors to predicting graduate student persistence. Second, the researcher interpreted change in deviance ($-2 \log$ likelihood) values, percent of cases correctly predicted, and tests of goodness of fit.

The second question explored the ability of all factors in the integrated model to predict graduate student persistence. To investigate this question, results of the hierarchical binomial logistic regression procedures were used and interpreted further. Change in $-2 \log$ likelihood values were examined and percent correctly predicted was considered.

In addition, goodness of fit measures were computed and interpreted. As suggested by others (Cabrera, 1993; Peng et al., 2002; Perna, 2004), several other indicators were used to evaluate the ability of the integrated model to predict graduate student persistence. Though not completely comparable to the R^2 statistic used in ordinary least squares regression, two pseudo- R^2 values were computed and interpreted. Another pseudo- R^2 value called the McFadden pseudo- R^2 was also computed and interpreted given the fact that it has been reported in a number of higher education research studies (Cabrera, 1994; Peng et al., 2002; Perna, 2004).

In addition, the researcher observed each independent variable's effect on the dependent variable by using the t-statistic for testing the null hypothesis that coefficient Beta was zero, which translates into the i^{th} variable had no effect on the dependent variable.

The second question was followed by a related sub-question that focused on differences by graduate student status (e.g., masters versus doctoral). To answer this question, the sample was divided into two groups: masters and doctoral students. Then, hierarchical binomial logistic regression procedures were used to determine the ability of the model to predict graduate student persistence. Change in -2 log likelihood values were examined and percent correctly predicted was considered per group.

In addition, several goodness of fit measures were computed for each group. Among these, the McFadden pseudo- R^2 was derived using the formula outlined in Chapter 4. Comparisons were made between the two groups to determine if the model better predicted persistence for one over the other.

The third question explored whether the likelihood of persisting in graduate school varied by race/ethnicity. To answer this question, the researcher used the regression equation derived from the hierarchical binomial logistic regression procedures to determine if the likelihood (predicting probability and predicted odds) varied by race/ethnicity. In addition, odds ratios were computed to compare differences among and within race/ethnic groups.

To further examine differences by race, the researcher calculated odds ratios to make between group comparisons (e.g., Asians to Whites and Blacks to Hispanics). The researcher also calculated odds ratios to compare the less likely to persist groups (Blacks) to the reference group (White).

To examine potential sources of the racial/ethnic differences in the likelihood of persisting in graduate school, the researcher computed predicted odds taking into

account certain variables (e.g., debt) and race. The predicted odds were transformed into odds ratios and interpreted to answer the research question.

Descriptive statistics were used to describe the sample of the present study, differences between persisters and non-persisters, and the variables included in the integrated model of graduate student persistence. Additional analyses were conducted as needed to explore the research questions posed in this study. These procedures are discussed in Chapter 4.

In conclusion, the purpose of this study was to examine the relationship between economic, academic, and non-academic variables and persistence among graduate students. The methodology described in this chapter was deemed sufficient to address the questions posed in the study.

CHAPTER FOUR

RESULTS

This chapter presents the results of the study and answers the research questions. The research questions for this study are:

1. Does more than money matter in predicting graduate student persistence?
2. To what extent do economic, academic and non-academic factors included in the integrated model predict graduate student persistence?
 - a) Does this differ by graduate student status (e.g., master's and doctoral)? If so, how?
3. Using the integrated model, does the likelihood of persisting in graduate school vary by race/ethnicity? If so, how?
 - a) How do student aid and undergraduate debt influence the observed racial/ethnic group differences in persistence?

The first section outlines the conceptual model proposed in this study and the variables related to each concept. The second section focuses on how the dependent variable was operationalized. The next section discusses two important issues related to the data analysis: missing data and weighting. The final section presents the findings of the study.

Conceptual Model

This study proposed and tested a conceptual model for predicting graduate student persistence that is based on an expanded economic theoretical framework consisting of economic, academic, and non-academic variables. Traditional economic

perspectives assume that individuals make decisions by weighting the monetary and non-monetary costs against the monetary and non-monetary benefits for all possible alternatives. In this frame, the individual selects the alternative that maximizes utility with respect to individual preferences, tastes, and expectations (Ehrenberg, 1991; Manski & Wise, 1983; Perna, 2004).

In most cases, the role of aspirations and values is generally ignored in econometric approaches to decision making. This research explores the value of expanding a traditional econometric approach to include measures of human, social, and cultural capital as proxies for individual values, aspirations, and exposure to resources that promote persistence in graduate school (Paulsen & St. John, 2002; Perna, 2000; St. John & Asker, 2001).

The conceptual model used in this study assumes that the decision to persist in graduate school is a function of sex, race/ethnicity, expected costs and benefits, financial factors, prior academic achievement, and non-academic factors related to one's social and cultural capital. In addition, a number of background variables are assumed to be related to graduate student persistence (e.g., age, marital status, parental status). Overall, the model can be described as an expanded econometric model that integrates concepts of human, social, and cultural capital using economic, academic, and non-academic variables.

People make decisions on the basis of their human capital presumably. Human capital theory focuses on the characteristics of individuals. It refers to the individual's investments in their own personal development such as the amount and quality of one's education and training (Becker, 1993).

In efforts to explain the factors that affect persistence and attrition in college among undergraduates, higher education researchers (Perna, 2001; Schultz, 1961; Smart, 1991; St. John, Cabrera, Nora, & Asker, 2000) have utilized expanded econometric models that incorporate concepts from human capital theory. With underpinnings in sociology, human capital theory (Becker, 1993) posits that outcomes are largely a function of factors derived from investments in education and training. Drawing on concepts from human capital theory, this study proposes an econometric model to explore the effect of economic, academic, and non-academic variables on graduate student persistence.

The economic variables included in this study relate to financial resources for both undergraduate and graduate study. Undergraduate debt load is one measure of financial resources. Because approximately one-half of 1992-1993 bachelor's degree recipients did not borrow to pay for college and because the amount borrowed is not evenly distributed among the sample, undergraduate debt load is coded as an ordinal variable: did not borrow (53% of sample); borrowed less than \$4,000 (10%); borrowed between \$4,000 and \$7,999 (13%); borrowed between \$8,000 and \$12,599 (12%); and borrowed \$12,600 or more (13%). The levels reflect the lowest to highest quartiles of the amount borrowed among those who borrowed.

Total aid received for graduate school is another measure of financial resources. Again, because over forty percent of 1992-1993 bachelor's degree recipients did not receive aid for graduate school, data were coded as an ordinal variable: received no aid (44% of cases); received some but less than \$6,999 (18%); received between \$7,000 and \$17,999 (25%); received between \$18,000 and \$27,999 (7%); received \$28,000 or

more (6%). The levels were calculated using the standard deviation of the mean amount of aid received.

Total educational debt from undergraduate and graduate school plus aid borrowed for graduate school were included in the analyses as two separate independent variables. Total educational debt was treated as an ordinal variable and coded as follows: no debt (33% of cases); owe less than \$15,999 (34%); owe between \$16,000 and \$39,999 (21%); owe between \$40,000 and \$63,999 (7%); and owe \$64,000 or more (5%). Aid borrowed for graduate school was measured much the same: did not borrow (54% of cases); borrowed less than \$11,999 (15%); borrowed between \$12,000 and \$34,999 (21%); borrowed between \$35,000 and \$56,999 (5%); borrowed \$57,000 or more (6%). The levels reflect approximately one standard deviation away from the mean for the sample on the variable of interest.

Finally, three other measures were included as economic factors and served as proxies for financial resources and work: whether or not the individual received a teaching assistantship, research assistantship, or tuition reduction. All three measures were coded dichotomously. "1" was used to indicate "yes," and "0" was used to indicate "no."

As mentioned in the previous section, human capital refers to an individual's investment in his or her own personal development (Becker, 1993). This is often done through education and training. Given the fact that the entire sample in the study received a bachelor's degree, all participants are assumed to have a level of human capital investment. Three other academic factors were included in this study as measures of an individual's preparation for graduate school and prior education:

undergraduate grade point average (GPA), Scholastic Aptitude Test (SAT) scores, and Graduate Record Exam (GRE) analytical and quantitative scores.

GPA was first normalized on a 4.0 scale and then transposed into an ordinal variable as follows: less than 2.9 (31% of cases); 3.0 to 3.39 (32%); 3.4 to 3.69 (21%); and 3.7 to 4.0 (17%). SAT scores were transposed into quartiles reflecting lowest to highest: did not take SAT/ACT (18%); lowest quartile (14%); second quartile (19%), third quartile (23%), and highest quartile (27%). It is important to note that this variable is a composite of SAT and ACT scores. ACT assessment scores were reported only for individuals who did not take the SAT.

GRE analytical scores were categorized into four groups: lowest quartile (1% of cases); second quartile (10%); third quartile (75%); and highest quartile (15%). GRE quantitative scores were groups similarly: lowest quartile (1%); second quartile (12%); third quartile (78%); and highest quartile (10%). It is reasonable to expect a majority of the sample to fall within the third and highest quartiles on both sections of the exam given the fact that competitive GRE test scores are required for admission to most graduate programs.

This research also explored the effect of expanding traditional econometric models to include measures of social and cultural capital as proxies for individual expectations, aspirations, and values. While most traditional econometric models ignore the role of such factors, social and cultural capital may influence graduate student persistence through the provision of knowledge and information about the costs and benefits of attending graduate school (DiMaggio & Mohr, 1985; McDonough, 1997) and the value of earning an advanced degree. Like human capital, social and cultural

capital are resources that may be obtained and invested to enhance an individual's productivity, opportunity, and other outcomes (Coleman, 1988; DiMaggio & Mohr, 1985; Lamont & Lareau, 1988).

Cultural capital refers to factors derived from one's parents that define an individual's status or class (Bourdieu & Passeron, 1977). Social capital, on the other hand, refers to social networks and the way in which such connections are maintained (Morrow, 1999). Passeron (1977) suggested that social capital is obtained through relationships with others, emphasizing membership in social networks or institutions.

The expanded econometric model proposed in this study includes measures of social and cultural capital. The total direct monetary contribution from one's parents is used as a proxy for the social capital derived from the relationship between the 1992-1993 bachelor's degree recipient and his or her parents (McNeal, 1999; Portes, 1998). This was measured using four categories: no support; received less than \$1,499; received between \$1,500 and \$3,999; received between \$4,000 and \$7,999; and received \$8,000 or more.

Two other measures of social capital were included in the present study. Carnegie classification of the undergraduate institution served as a proxy for preparation for graduate school and also represented the institution's relative emphasis on research and graduate education. The following classes were included in the analyses: research I, doctoral-degree granting, comprehensive I, liberal arts I, and other (e.g., liberal arts II, specialized schools). Tuition served as a proxy for institutional quality as recommended by McPherson and Winston (1993) and Perna (1998). It was recoded into quartiles.

Parent's educational attainment was included as a measure of cultural capital. The variable was organized into four groups: less than high school; high school; some postsecondary education, less than 2 years; two years, associate's degree; bachelor's degree, and advanced degree.

The analyses include several measures of an individual's values. The base-year component of the B&B:93/97 survey includes 11 items designed to measure the extent to which an individual values more education. The dimensionality of the 11 items was analyzed using exploratory factor analysis. Four principal factors were identified that explained 53% of the variance in these 11 items as shown in Table 4. The first factor, being successful in the labor market, consisted of four items: being successful in work (.757), able to find steady work (.748), having leisure time (.745), and getting away from area grew up in (.204). Reliability estimates were computed and the factor is marginally reliable ($\alpha = .417$).

The second factor, becoming a leader, consisted of three items: influencing political structures (.732), being a leader in the community (.693), and becoming an authority in field (.518). The alpha reliability coefficient is very low ($\alpha = .388$). Given such low reliability, this factor could be discarded as unreliable. However, because the items appear to measure the extent to which an individual values outcomes associated with graduate education, the factor is included in the analyses. The third and fourth factors had low alpha reliability coefficients ($\alpha = .379$ and $\alpha = .277$), were not related to outcomes of graduate education, and thus were not included in the analyses.

The base-year component of the B&B:93/97 survey also includes 13 items reflecting what one values as important in their future work. The dimensionality of the

13 items was analyzed using maximum likelihood factor analysis. Three criteria were used to determine the number of factors to rotate: the a priori hypothesis that the measure was unidimensional, the scree test, and the eigenvalues. The scree plot indicated that the initial hypothesis of unidimensionality was incorrect. Based on the plot, the eigenvalues, and previous research, four factors were rotated using a Varimax rotation procedure. The rotated solution, as shown in Table 5, yielded four factors that explained 57% of the variance in these 13 items.

Table 4

Correlations between the Importance Items and the Importance Factors

Items	Factors	
	Labor Market	Leader
Labor Market		
Being successful in work	.757	.145
Able to find steady work	.748	.004
Having leisure time	.745	-.002
Get away from area grew up in	.204	.187
Leader		
Influencing political structure	-.006	.732
Being a leader in community	.101	.693
Becoming authority in field	.149	.518

The first factor, quality of work life, included four items: work time for other activities (.742), allows root to be established (.730), independent work (.627), and interaction with others (.532). Estimates of reliability were computed for the factor and the factor is reasonably reliable ($\alpha = .895$).

The second factor, rewards and benefits, included five items: job security (.594), good income potential (.537), interesting work (.487), prestige and status (.449), and good starting income (.394). Estimates of reliability were computed for the factor and the factor is reasonably reliable ($\alpha = .732$). This factor was included in the analyses.

The third factor, freedom, was comprised of three items: previous experience (.279), freedom to make decisions (.613), and the importance of doing intellectually challenging work (.547). Because the factor reflects values that are consistent with graduate education (e.g., intellectually challenging work), the factor was included in the analyses. Estimates of reliability were computed and the factor is reasonably reliable ($\alpha = .677$). The fourth factor consisted of a single item: great deal of travel (.940) and thus was not included in the analyses.

Several background variables were also included: marital status (yes or no), parental status (yes or no), gender, and race/ethnicity. Age at receipt of bachelor's degree was included as a proxy for relative current age. Specification of the model is explained in Table 6.

Table 5
Correlations between the Future Work Items and the Future Work Factors

Items	Factors		
	Quality of Work	Rewards	Decisions
Quality of Work			
Time for other activities	.742	.297	.270
Can establish roots	.730	.354	.206
Independent work	.627	.225	.380
Interaction with others	.569	.296	.562
Rewards			
Job security	.236	.594	.239
Good income potential	.134	.537	.221
Interesting work	.306	.487	.394
Prestige and status	.257	.449	.346
Good starting income	.129	.394	.005

Table 5 (continued)

Items	Factors		
	Quality of Work	Rewards	Decisions
Decisions			
Freedom to make decisions	.561	.288	.613
Intellectually challenging	.399	.386	.547
Previous experience	.009	1.00	.279

Measuring Persistence

The dependent variable in this study was operationalized to measure graduate student persistence. Persistence was defined as both attainment of a graduate degree and being currently enrolled in graduate school. To be currently enrolled, participants must be actively seeking a masters or doctoral degree.

The B&B:93/97 longitudinal database provides information about 1992-1993 bachelor's degree recipients' life after college. For example, the database includes information about employment after graduation, changes in marital status, and participation in graduate and first-professional education.

However, there was no single item that measured graduate persistence in the database. To construct the two definitions of persistence status used in the various analyses, different variables had to be manipulated in the data set. The researcher created a new variable, PERSIST, for this purpose. The new variable was coded "yes" (=1) if the individual persisted in graduate school and "no" (=0) if the individual failed to persist.

The calculation of the dependent variable involved three steps. First, the researcher identified all 1992-1993 bachelor's degree recipients who enrolled in post-baccalaureate study. To do this, a new variable was created, GSENROLL. The new variable was coded "enrolled in graduate study" (=1) if the individual enrolled in graduate study after receiving his/her bachelor's degree. Information on post-baccalaureate enrollment was drawn from data provided on variable, B2HENPRG. If B2HENPRG = 4, 5, 6, 7, or 8; then GSENROLL = 1. All others were coded "did not enroll" (=0).

Table 6

Factors, Variables, and Codes for the Integrated Model

Factors	Variables	VARIABLE	Code
Dependent	Persistence	PERSIST	0=non-persister 1=persister
Economic	Total aid amount		
	Total aid received for graduate school	B2TOTAID	0=none 1=less than \$6,999 2=\$7,000-17,999 3=\$18,000-27,999 4=\$28,000 or more
	Total aid borrowed for graduate school	B2GRSCDB	0=none 1=less than \$11,999 2=\$12,000-34,999 3=\$35,000-56,999 4=\$57,000 or more
	Debt		
	UG debt	UGDEBT	0=none 1=less than \$4,000 2=\$4,000-7,999 3=\$8,000-12,599 4=\$12,600 or more
	Total debt (UG/G)	B2EDTOT	0=none 1=less than \$15,999 2=\$16,000-39,999 3=\$40,000-63,999 4=\$64,000 or more
	Institutional Aid Assistantship	B2RESAST B2TEAAST	0=no 1=yes 0=no 1=yes
Tuition reduction	B2TUIRED	0=no 1=yes	

Table 6 (continued)

Factors	Variables	VARNAME	Code
Academic	Grades		
	UG GPA	NORMGPA	0=2.9 and below 1=3.0 to 3.3 2=3.4 to 3.6 3=3.7 to 4.0
	SAT		
	Quartile score	SATQTR2	0=did not take SAT/ACT 1=lowest quartile 2=second quartile 3=third quartile 4=highest quartile
	GRE		
	Quartile score	GREAQ B2BREQQ	1=bottom quartile 2=second quartile 3=third quartile 4=highest quartile 1=bottom quartile 2=second quartile 3=third quartile 4=highest quartile
Non-academic	Background		
	Parent's education	PARED	1=no high school 2=high school 3=some PSE 4=two years PSE, AA 5=BA 6=advanced degree
	Marital status	B2MAR497	0=not married 1=married
	Parental status	PARENTAL	0=not a parent 1=parent
	Gender	B2RSEX	0=male 1=female
	Age at BA	B2AGATBA	0=below 22 years 1=22-24 years 2=25 and above
Race	B2ETHNIC	1=AI/AN 2=Asian 3=Black 4=Hispanic 5=White	

Table 6 (continued)

Factors	Variables	VARNAME	Code
	Proxies		
	Preparation/Train.	CCLASS	0=Research I 1=Doctoral-granting 2=Comprehensive 3=Liberal Arts I 4=Other (LAI, spec.)
	Estimated Family Contribution	EFC	0=no support 1=less than \$1,499 2=\$1,500-3,999 3=\$4,000-7,999 4=\$8,000 or more
	Inst. Quality	UG tuition	0=0 1=less than \$1,600 2=\$1,600-4,899 3=\$4,999-7,999 4=\$8,000 and above

Next, the researcher identified all 1992-1993 bachelor's degree recipients who enrolled in graduate study and had either attained their graduate degree or were still currently enrolled in graduate study. To do this, a new variable was created, PBSTAT. The new variable was coded "attained or enrolled post-BA" (=1) if the individual has attained his/her graduate degree or were currently enrolled and still pursuing their graduate degree. Information on post-baccalaureate attainment/enrollment was drawn from data provided on variable, B2ATTENR. If B2ATTENR = 4, 5, 6, or greater than 10; then PBSTAT = 1. All others were coded "neither attained nor enrolled" (=0).

The last step of calculating the outcome variable involved the interaction of the two new variables described above. To do this, the researcher identified all 1992-1993 bachelor's degree recipients who had enrolled in graduate school but failed to attain a graduate degree or remain enrolled in graduate school. Information about graduate student persistence status was drawn from two sources—GSENROLL and PBSTAT.

The new variable, PERSIST, was coded using two categories. The dependent variable was coded "persisted/persisting" (=1) if the individual had enrolled in graduate school and either attained a degree or were currently enrolled. The dependent variable was coded "non-persistent" (=0) if the individual had enrolled in graduate school but failed to attain a graduate degree or remain enrolled in graduate school. If GSENROLL = 1 & PBSTAT = 1, then PERSIST = 1. If GSENROLL = 1 & PBSTAT = 0, then PERSIST = 0. Note, all individuals who did not enroll (GSENROLL = 0) were excluded from this study. It is assumed that such individuals did not plan to attain a graduate degree following receipt of their bachelor's degree.

Sample Characteristics

The total B&B:1993/1997 longitudinal sample consists of 11,192 individuals who received their bachelor's degree during the 1992-1993 academic year. Of those, 30% (n = 3,328) enrolled in graduate school by 1997. A large majority (n = 7,865) did not enroll in graduate school by 1997. The sample for the present study consisted of the 3,328 students who enrolled in graduate school by 1997.

Exploratory descriptive analyses of the base-year component of the B&B:93/97 database suggest that 83% of 1992-1993 bachelor's degree recipients expected to enroll in graduate school after graduation from college. However, by 1997, the expectation declined to only 72%. Forty-one percent of those who completed their bachelor's degree in 1993 applied to graduate school. Only 35% were accepted (approximately 87% of those who applied) and 30% of the 1993 bachelor's degree recipients actually enrolled in graduate school by 1997.

Most enrollments were at the master's level by 1997. Of the 30% who enrolled in graduate school by 1997, more than three-fourths were master's (e.g., MBA/master's degree), 10% were doctoral, and 14% were first-professional (e.g., J.D., M.D.). The number of doctoral and first-professional students included in the sample is too small to warrant separate analyses. Descriptive analyses (Table 7) suggest that bachelor's degree recipients who enroll in doctoral degree programs are different from bachelor's degree recipients who enroll in master's degree programs in terms of their undergraduate major field, undergraduate GPA, and the Carnegie classification of bachelor's degree-granting institution. Individuals who enroll in doctoral degree programs appear to be more akin to individuals who enroll in first-professional degree

programs. For this reason, first-professional students are collapsed with doctoral students in the analyses.

Table 8 summarizes the demographic characteristics of the sample.

Table 7

*Distribution of Sample Across Selected Characteristics and Graduate Student Status
(N=3,327)*

Characteristics	Graduate Status		
	Masters	Doctoral	First-Professional
BA major			
Business/management	369	4	37
Education/social sciences	1,216	63	112
Engineering/Sci/Math	431	173	143
Other	515	88	176
UG GPA			
2.9 and below	853	62	99
3.0 to 3.39	802	101	165
3.4 to 3.69	511	70	114
3.7 and above	365	95	89
Amount borrowed for GS			
None	1,529	148	107
Less than \$11,999	417	45	22
\$12,000-34,999	503	77	118
\$35,000-56,999	69	22	74
\$57,000 or more	14	36	145
Total educational debt			
None	915	95	87
Less than \$15,999	954	100	75
\$16,000-39,999	543	75	80
\$40,000-63,999	103	22	98
\$64,000 or more	17	36	126
Parent's highest education			
No high school	97	7	13
High school	732	52	88
Some PSE	231	20	34
Two year PSE, AA	202	23	36
Bachelor's	551	80	106
Advanced degree	718	147	190
Parental status			
Not a parent	2,174	313	448
Parent	358	15	19
Total	2,532	328	467

Table 8

Description of students enrolling in graduate school, B&B:93/97

	N	%
Graduate Status		
Master's	2,533	76.1
Doctoral	795	23.9
Gender		
Male	1,509	45.3
Female	1,819	54.7
Race/Ethnicity		
White	2,761	83.0
Black	214	6.4
Hispanic	180	5.4
Asian	159	4.8
American Indian/Alaskan Native	159	4.8
UG Grade Point Average		
2.9 and below	1,014	30.5
3.0 to 3.3	1,068	32.1
3.4 to 3.6	695	20.9
3.7 to 4.0	551	16.6
Marital Status		
Married	1,490	44.8
Not married	1,837	55.2
Parental Status		
Parent	392	11.8
Not a parent	2,936	88.2
Age at BA receipt		
Below 22 years	1,932	58.1
22-24 years	614	18.4
25 and above	782	23.5

Persisters

Of those enrolled, a large majority persisted ($n = 2,355$). This represents 21% of the original B&B:93/97 sample, but over 70% of those who enrolled in graduate study after receiving their bachelor's degree. Table 9 presents the characteristics of persisters included in this study.

Non-Persisters

Though a majority of those who enrolled in graduate school by 1997 after receiving their bachelor's degree in 1993 persisted, 29% ($n=973$) failed to persist in graduate school. This represents 9% of the original B&B:93/97 sample ($N=11,192$). Table 10 presents the characteristics of non-persisters included in this study.

This study examined differences among these two groups—those who persisted and those who did not.

Missing Data

The analyses in the study are limited by the magnitude of missing data. The variables with the largest share of missing data are those pertaining to amount of educational debt (39% of the cases) and values toward additional education and future work (24% of the cases). List wise deletion would reduce the analytic sample from 3,328 cases to less than 2,500 (adjusted weighted sample sizes) and result in a sample that is not representative of the population of 1992-93 bachelor's degree recipients who enrolled in graduate study by 1997. Although men and women are equally likely to be excluded because of list wise deletion of missing data, the likelihood of being excluded varies by race/ethnicity,

Table 9

Description of persisters in graduate school, B&B:93/97 (N=2,355)

	n	%
Graduate Status		
Master's	1,724	73.2
Doctoral	630	26.8
Gender		
Male	1,087	46.1
Female	1,268	53.9
Race/Ethnicity		
White	1,979	84.0
Black	121	5.1
Hispanic	116	4.9
Asian	128	5.4
American Indian/Alaskan Native	11	.5
UG Grade Point Average		
2.9 and below	676	28.7
3.0 to 3.3	804	34.2
3.4 to 3.6	477	20.3
3.7 to 4.0	397	16.9
Marital Status		
Married	1,018	43.2
Not married	1,337	56.8
Parental Status		
Parent	260	11.0
Not a parent	2,095	89.0
Age at BA receipt		
Below 22 years	1,424	60.5
22-24 years	428	18.2
25 and above	503	21.4

Table 10

Description of non-persisters in graduate school, B&B:93/97 (N=973)

	n	%
Graduate Status		
Master's	808	83.1
Doctoral	164	16.9
Gender		
Male	422	43.4
Female	550	56.6
Race/Ethnicity		
White	781	80.4
Black	93	9.6
Hispanic	63	6.5
Asian	32	3.2
American Indian/Alaskan Native	3	.3
UG Grade Point Average		
2.9 and below	338	34.3
3.0 to 3.3	264	27.1
3.4 to 3.6	217	22.4
3.7 to 4.0	154	15.8
Marital Status		
Married	473	48.6
Not married	500	51.4
Parental Status		
Parent	132	13.5
Not a parent	841	86.5
Age at BA receipt		
Below 22 years	508	52.2
22-24 years	186	19.1
25 and above	279	28.6

with missing data more common among non-White individuals than among the sample as a whole. Individuals who enrolled in a doctoral program also appear to be more likely than other students to be missing data for at least one variable.

Researchers disagree on the minimum number of cases that is required per independent variable, but generally agree that larger sample sizes will generate more stable parameter estimates and more accurate X^2 distributions (Peng et al., 2002). To avoid the substantial reduction in sample size that would result from list wise deletion of missing data and to account for the tendency of cases to be missing data for more than one independent variable, the researcher took several steps to reduce the number of missing cases (Cohen & Cohen, 1983). First, mean scores are imputed for cases that are missing data for the continuous variables. The continuous variables in the present study include: B2TOTAID, B2GRSCDB, B2TOTUDB, B2OWENFM, B2EDTOT, and B2NDEPEN. These variables relate to the total aid received for graduate school, amount borrowed for graduate school (non family sources), total undergraduate debt, amount of education debt still owed, total education debt (undergraduate and graduate), and the number of children who are dependents respectively. While preserving sample sizes, this treatment of missing values may result in an underestimation of the standard errors. Therefore, the use of a rigorous threshold of statistical significance ($p < .01$) not only corrects for the design effects but also reduces the possibility that the parameters for these variables falsely appear to be statistically significant (Type I error).

A number of the independent variables used in the study provided scale data—for example, parent's level of education was measured using the following scale: (a) less than high school, (b) GED, (c) high school, (d) vocational, trade, or business

school-less than one year, (e) vocational, trade, or business school-one to two years, (f) vocational, trade, or business school-two or more years, (g) less than 2 years of college, (h) associates, (i) two or more years of college, (j) bachelor's, (k) master's, (l) first-professional, (m) other advanced professional, and (n) doctorate. However, some cases were missing data on such variables. In this case, the researcher used trend equations (Thomas & Heck, 2001) to impute values for the missing cases. Trend equations act much like regression equations and predict the imputed value using data provided on the valid cases in the sample. For example, to predict parent's level of education, a trend equation was developed using the valid cases. Then, missing data were calculated using the trend equation. In essence, the researcher predicted the missing data by splitting the sample into valid cases versus missing cases, calculating a regression equation using the valid cases, and then using the equation to predict missing data. The predicted value was imputed for all missing cases on scale items. These procedures have been recommended and used by other researchers (Perna, 2004; Thomas & Heck, 2001).

It is important to note that imputation of the sample mean in place of missing observations was used only for continuous independent variables, while trend calculations were used to impute values for missing observations on scale items. If the missing observations were for the dependent variable (PERSIST), the researcher excluded the missing observations from the analysis as recommended by others (Galloway, 2004; Perna, 2004).

Weighting

This research used data from the 1997 follow-up to the Baccalaureate & Beyond survey of 1992/1993 bachelor's degree recipients (B&B:93/97) to address the research questions aforementioned. The Baccalaureate & Beyond longitudinal survey tracks the experiences of individuals who received their undergraduate degree during the 1992-1993 academic year, with follow-ups in 1994 and 1997. As mentioned earlier, data for the base year were collected as a part of the 1993 National Postsecondary Student Aid Survey (NPSAS:93). The NPSAS:93 used a two-stage stratified sample design in which 1,234 eligible postsecondary educational institutions were first identified, and then students attending the 88% of the institutions that responded with lists of students were selected (Green, Meyers, Veldman, & Pedlow, 1999).

Data were collected from 73% of the 16,316 students who were initially identified as bachelor's degree recipients. Sub-sampling of non-respondents increased the sample size to 12,478. Further review of the interview and transcript data revealed that only 11,192 of the cases were eligible for inclusion in B&B (Green, Meyes, Veldman, & Pedlow, 1999). The B&B:93/97 includes data for 9,274 students, or 83% of the 11,192 students in the base-year sample, who responded to all three data collections (McCormick et al., 1999). The sample used in this study is limited to the 3,328 bachelor's degree recipients who enrolled in graduate school by 1997. These cases have valid data for the dependent variable, PERSIST.

Given the stratified, complex sampling design of the B&B:93/97 longitudinal survey, the researcher had to apply appropriate weights to the sample to "weight the sample up" towards the population (Galloway, 2004; Thomas & Heck, 2001). The

B&B:93/97 database contains a large probability sample of 1992/1993 bachelor's degree recipients. With probability samples, the probability that each member is included in the sample is known by the researcher. This is referred to as the probability of selection. There are many types of probability samples, including systematic samples, cluster samples, and stratified random samples (Galloway, 2004). All of them are characterized by an element of randomness in the actual selection of the sample.

Researchers working with probability samples have the ability to estimate how large their sampling error is—that is, how “far off” a sample result is likely to be when generalized to the population. For this reason, most databases are constructed from probability samples and estimates of the sampling error are provided. This makes it easier to discuss how much confidence the researcher has that results they found in the sample also occur in the population (Galloway, 2004).

The ability to generalize from the sample to the population is perhaps the most fundamental and necessary condition for any well-designed quantitative study. Using the probability of selection, researchers have the ability to “weight up” the responses from individuals in the sample to represent the entire population. By weighting the sample appropriately, the researcher of the present study addressed this issue and met the conditions for generalizability.

The B&B:93/97 panel weight is appropriate for approximating the population of 1992-1993 bachelor's degree recipients in the longitudinal sample. To minimize the influence of large sample sizes on standard errors while also correcting for the oversampling of some groups (i.e., those in teaching fields) each case was weighted by the B&B:93/97 panel weight divided by the average weight for the sample (Thomas &

Heck, 2001). Several quantitative experts in the field of higher education agreed with the researcher's procedure (D'Amico, 2004, personal communication; Perna, 2005, personal communication).

The raw weight is derived from the reciprocal of an individual's or observation's probability of selection. "Observations selected with a higher probability (i.e., oversampled) will have a smaller raw weight value" (Thomas & Heck, 2001, p.522). Adding together the raw weights for all observations, one can approximate the population N:

$$\sum_{j=1}^n w_j = N$$

Statistical packages differ in the way they use weights to calculate certain parameters and estimates. Most calculate the weighted mean using the following formula:

$$\bar{x} = \sum_{j=1}^n w_j x_j / \sum w_j$$

or as the sum of the products of each case's raw weight and value for x, divided by the sum of the raw weight, w. The sum of the raw weight ($\sum w_j$), in this way, is equivalent to the effective sample size (Thomas & Heck, 2001).

As with most large-scale government-sponsored surveys, the B&B:93/97 survey includes a set of raw weights for researchers and data analysts to consider. The weights accompanying most data sets of this type have been adjusted to account for non-response bias also. Therefore, such weights are considered more refined and rigorous than the simple reciprocal of the probability of selection described earlier. The

methodology report discusses the specific purpose of each weight included in the B&B:93/97 data file.

However, using the raw weight supplied with the survey data may lead to incorrect estimates. Thomas and Heck (2001) explain the consequence of using raw weights by stating, “when calculating standard error estimates, many statistical packages (SPSS included) are fooled into believing that the sample size is much larger than it really is” (p. 525). While the relative and raw weights yield the correct estimates for the mean in all software packages, in some packages using the raw weight results in a weighted sample size that is equal to the population N. This can seriously affect calculations that are sample size specific, such as variances and covariances. Moreover, this problem leads to incorrect results (Thomas & Heck, 2001).

This problem can be resolved with a simple correction to the raw weight. To preserve the effective sample size while still adjusting for non-response bias and oversampling, the researcher divided the raw weight by its mean:

$$w_i / \bar{w}$$

where $\bar{w} = \sum w_i / n$. The result of the B&B:93/97 panel weight divided by the average weight for the sample is referred to as the *relative* weight. By using the relative weight, the estimates of the means have been corrected for oversampling in the design and can be considered correct. The relative weight applied to the entire sample and used in all analyses.

To correct for the design effects of the B&B:93/97 survey that are associated with the nested nature of the data (i.e., bachelor’s degree recipients selected from within

selected institutions), a rigorous threshold of statistical significance ($p < .01$) was used to interpret the results (Thomas & Heck, 2001).

Methods

Given the nature of the dependent variable, a binomial logistic model, a special case of the general log-linear model, was used to examine the relationships between the dependent variable and the independent variables included in the integrated model developed for the present study (Kleinbaum, 1994). In addition, the binomial logistic model was used to explore the relationship between sex, race/ethnicity, and persistence status controlling for other variables in the integrated model. Binomial logistic models estimate the log-odds of an outcome occurring relative to the baseline category. In the present study, failed to persist (non-persister) by 1997 is the baseline category. If the baseline category is j , the model for the i^{th} category (e.g., persister) is:

$$\text{Log} (P_i / P_j) = B_{i0} + B_{i1}X_1 + B_{i2}X_2 + \cdots + B_{ip}X_p$$

The logistic regression coefficients taken from this equation may be interpreted as the change in log odds associated with one unit change in the independent variable (Kleinbaum, 1994). The interpretation of the binomial logistic coefficients is made easier by the use of odds-ratios, as outlined by the following equation (Pampel, 2000):

$$P_i / P_j = e^{B_{i0} + B_{i1}X_1 + \cdots + B_{ip}X_p} = e^{B_{i0}} e^{B_{i1}X_1} \cdots e^{B_{ip}X_p}$$

The odds-ratio reflects the change in the odds of a particular outcome (persistence) relative to the reference category (non-persistence) that is associated with a one unit change in a single independent variable holding all other variables constant (Pampel, 2000; Peng, So, Stage, & St. John, 2002). An odds ratio greater than one represents an increase in the odds or likelihood of persisting relative to not persisting in

graduate school. An odds-ratio less than one presents a decrease in the odds or likelihood of persisting relative to not persisting in graduate school.

As suggested by others (Andrieu, 1991; Cabrera, 1994; Olsen, personal communication, December 15, 2004; Peng et al., 2002), several indicators are used to evaluate the integrated model. Though not completely comparable to the R^2 computed in ordinary least squares regression, several pseudo- R^2 statistics indicate the strength of the relationship between the outcome variable and the independent variables (Peng et al., 2002). In addition, the percentage of cases that are correctly classified, the ratio of scaled deviance (G^2) to its degrees of freedom, and the model chi-square are three measures of model fit (Cabrera, 1994; Peng et al., 2002). The model chi-square “tests the difference in the -2 log likelihood between the final model and a model that includes the intercept only” (Perna, 2004, p. 498). The change in scaled deviance provides a measure of the improvement in fit that is associated with the inclusion of other predictor variables (Cabrera, 1994).

Findings

As stated previously, only 30% of those who received their bachelor’s degree in 1992-1993 enrolled in graduate school by 1997. Among these, the majority persisted (71%) while 29% failed to persist in graduate school. To explore differences among these two groups, analysis of variance (ANOVA) tests were conducted to evaluate the relationship between the two persistence groups (persister versus non-persister) on the continuous variables included in the study.

The first analysis of variance was conducted to evaluate the relationship between persistence status and the total amount of educational debt including undergraduate

and graduate debt (B2EDTOT). It is important to note that the analysis of variance was conducted on the original continuous variable reflecting the actual amount of educational debt. As previously described, sample means were imputed for missing cases. The independent variable, persistence status, included two levels: persister and non-persister. The dependent variable was the mean amount of educational debt. The ANOVA was significant, $F(1,3325) = 83.946, p < .001$. The standard deviations range from 18708.5 to 25640.8 indicating that the variances (standard deviations squared) are different from each other. The test of homogeneity of variance was significant, $p < .001$, indicating a significant difference in the population variances. Therefore, the

Table 11

Analysis of Variance for Educational Debt

	<i>M</i>	<i>SD</i>	<i>N</i>
Persisters	\$18,667	25640.8	2,355
Non-persisters	\$10,346	18708.5	973
<i>df</i>	(1,3326)		
<i>F</i>	83.946*		

**p* < .001

researcher interpreted the results of this test with caution. Table 11 presents the results of the first analysis of variance.

The second analysis of variance was conducted to evaluate the relationship between persistence status and the total amount of aid borrowed for graduate school (B2GRSCDB). It is important to note that the analysis of variance was conducted on the original continuous variable reflecting the actual amount of aid borrowed for graduate school. The independent variable or factor, persistence status, included two levels: persister and non-persister. Persisters were those who either attained a graduate degree by 1993 or those currently enrolled in a graduate degree program. All others were considered non-persisters. The dependent variable was the mean amount of aid borrowed for graduate school. The ANOVA was significant, $F(1,3326) = 81.874$, $p < .001$. The standard deviations range from 17426.7 to 24094.8 indicating that the variances (standard deviations squared) are different from each other. The test of homogeneity of variance was significant, $p < .001$, indicating a significant difference in the population variances. Therefore, the researcher interpreted the results of this test with caution. Table 12 presents the results of this analysis.

The third analysis of variance (Table 13) was conducted to evaluate the relationship between persistence status and the total amount of aid received for graduate school (B2TOTAID). It is important to note that the analysis of variance was conducted on the original continuous variable reflecting the actual amount of aid

Table 12

Analysis of Variance for Total Amount Borrowed for Graduate School

	<i>M</i>	<i>SD</i>	<i>N</i>
Persisters	\$14,248	24094.8	2,355
Non-persisters	\$6,538	17426.7	973
<i>df</i>	(1,3326)		
<i>F</i>	81.874*		

**p* < .001

Table 13

Analysis of Variance for Total Amount of Aid Received for Graduate School

	<i>M</i>	<i>SD</i>	<i>N</i>
Persisters	\$8,254	11935.8	2,355
Non-persisters	\$3,732.5	6623.9	973
<i>df</i>	(1,3326)		
<i>F</i>	123.8*		

**p* < .001

received for graduate school (all sources). The independent variable, persistence status, included two levels: persister and non-persister. The dependent variable was the mean amount of aid received for graduate school. The ANOVA was significant, $F(1,3326) = 123.8, p < .001$. The standard deviations range from 6623.9 to 11935.8 indicating that the variances (standard deviations squared) are different from each other. The test of homogeneity of variance was significant, $p < .001$, indicating a significant difference in the population variances. Therefore, the researcher interpreted the results of this test with caution. The strength of the relationship between mean educational debt and persistence status, as assessed by η^2 , was weak with the factor accounting for 4% of the variance in the dependent variable.

Question One

A central hypothesis of the present study is reflected in the title of this project—“More than Money Matters.” This is also the focus of research question one. The research literature on undergraduate persistence in college suggests that persistence is a function of money matters largely. Money matters include but are not limited to financial aid resources such as grants and loans. Given the factors that make graduate students qualitatively different from undergraduate students (i.e., graduate students tend to be older, are much more likely to work full-time while attending school, are more likely to have a spouse or partner), the researcher hypothesized that more than money would matter when predicting graduate student persistence.

In this study, I developed an expanded econometric theoretical framework for predicting graduate student persistence using economic, academic, and non-academic data from a nationally representative sample of baccalaureate degree recipients who

enrolled in graduate school by 1997. The expanded framework consisted of economic or financial variables, academic variables such as GPA and test scores, and non-academic variables including parent's educational attainment and marital status to name a few. Considering the central hypothesis, data were analyzed in such a way to determine whether the inclusion of academic and non-academic variables to the model consisting of only economic factors significantly increased the power of prediction.

To do this, the researcher ran hierarchical binomial logistic regression procedures on the graduate student sample. Economic factors were entered in block 1. Academic variables were entered in block 2. And, non-academic variables, plus the importance factors (cultural capital proxies), were entered in block 3. Table 14 summarizes the results.

The binomial logistic regression results suggest that adding academic, non-academic, and measures of social and cultural capital to traditional economic measures improved the explanatory power of a model of graduate student persistence. The change in deviance ($-2 \log$ likelihood) associated with the addition of academic and non-academic factors, measures of social capital, and measures of cultural capital to the model suggests a statistically significant improvement in fit. "Block 0" represented the state of affairs without any independent variables and the $-2 \log$ likelihood of Block 0 was equal to

Table 14

Effects of Economic, Academic, and Non-Academic Factors on Persistence

Factor	Models		
	Model 1 (β)	Model 2 (β)	Model 3 (β)
Tuition Reduction			
Reduction	-.387*	-.394*	-.361
No reduction (reference)			
EFC			
No support	.077	.116	.257
Less than \$1,500	-.664**	-.631*	-5.07
\$1,500-3,999	-.034	-.004	.104
\$4,000-7,999	.203	.203	.231
\$8,000 and above (reference)			
UG Debt			
Did not borrow	.949**	.899**	.858**
Less than \$4,000	.765**	.733**	.801**
\$4,000-7,999	.475**	.436**	.456**
\$8,000-12,599	.515**	.485**	.506**
\$12,600 or more (reference)			
Total GS aid			
None	-1.285**	-1.219**	-1.186**
Less than \$6,999	-1.060**	-1.015**	-.948**
\$7,000-17,999	-1.054**	-1.025**	-.985**
\$18,000-27,999	-.224	-.192	-.232
\$28,000 or more (reference)			
Total educational debt (UG/G)			
None	-1.218**	-1.169**	-1.214**
Less than \$15,999	-.770**	-.701**	-.686*
\$16,000-39,999	-.030	.016	.030
\$40,000-63,999	.126	.176	.181
\$64,000 or more (reference)			

Table 14 (continued)

Factor	Models		
	Model 1 (β)	Model 2 (β)	Model 3 (β)
UG GPA			
2.9 and below		-.001	-.009**
3.0 to 3.39		.248*	.201
3.4 to 3.69		-.136	-.173
3.7 to 4.0 (reference)			
SAT/ACT Scores			
Did not take SAT/ACT		-.079	.313*
Lowest quartile		-.447**	-.147
Second quartile		-.281*	-.106
Third quartile		-.006	.077
Highest quartile (reference)			
Parent's education			
No high school			-.443*
High school			-.391**
Some PSE			-.313*
Two years PSE, AA			-.474**
Bachelor's			-.109
Advanced degree (reference)			
Age at BA			
Below 22 years			.312**
22-24 years			.108
25 and above (reference)			
Race/Ethnicity			
AI/AN			.702
Asian			.392
Black			-.572**
Hispanic			-.368*
White (reference)			
Intercept	1.992	1.984	1.750
G ²	3767.410	3738.163	3686.518
df	3053	3051	3048
G ² /df	1.234	1.225	1.209
pseudo-R ² (McFadden)	.03	.04	.05
% correct predicted	70.8	71.0	72.5

* = $p < .05$, ** = $p < .01$

3888.123. “Block 3” represented the integrated model with significant predictors included. The -2 Log likelihood of Block 3 was equal to 3686.518 (difference of 201.605). As the regression equation fits better, the -2 Log likelihood values get smaller (Kleinbaum, 1994; Pampel, 2000; Pedhazur., 1973).

The percentage of cases that were correctly classified also increased when academic and non-academic factors were added to the model. Table 14 reports that adding such measures to a traditional econometric model increased the percentage of cases that were correctly classified from 70% to 73%. In fact, the percentage of cases that were correctly classified as non-persisters increased over the three models (from 1% to 15%).

Another test of goodness of fit is related to the Pearson chi-square value reported for all models. The significance of the omnibus tests of model coefficients suggests the significance of adding a variable to the model (step) and the overall test of the model's significance (model). The statistic used in logistic regression to test the significance of adding a variable to the model (step) is approximately equal to the $F\Delta$ used in ordinary least squares regression. In the case of the initial model including only economic variables, both the addition of economic variables and the overall economic model were significant ($p < .001$). In the case of the final model (the integrated model), both the addition of academic and non-academic variables and the overall integrated model were found significant ($p < .001$).

The results of the binomial logistic regression analyses suggest that adding academic and non-academic factors, including measures of social and cultural capital, significantly improve the explanatory power of a traditional economic model. These

results suggest that the underlying hypothesis is true—yes, more than money matters when predicting graduate student persistence. The results of this analysis also answer the first research question—Does more than money matter in predicting graduate student persistence? Again, the answer is yes. Academic matters and non-academic matters also matter when predicting graduate student persistence.

Question Two

The second research question is designed to assess the extent to which economic, academic, and non-academic factors included in the integrated model predict graduate student persistence. The final model included all three factors (economic, academic, and non-academic) and several tests indicated a goodness of fit between the model and the data.

First, the -2 Log likelihood values for the three models decreased from 3888.123 (Block 0) to 3686.518 (Block 3). This suggests that the integrated model, taking into account all three factors, is better at predicting graduate student persistence. For as the regression equation fits better or increases in predictive power, the -2 Log likelihood values decrease.

Second, the -2 Log likelihood values for the integrated model (Block 3) decreased as additional measures were added to the model. The -2 Log likelihood of the first step (3714.925) was reduced to 3686.518 after ethnicity, parent's educational attainment, and age at BA completion were added. Again, this suggests an improved fit over previous models.

The Hosmer-Lemeshow (2000) test is computed by dividing the predicted probabilities into deciles and then computing a Pearson chi-square that compares the

predicted frequencies to the observed frequencies. Low chi-square values and non-significance indicate goodness of fit. The results of the Hosmer-Lemeshow test, computed in the study, for the integrated model suggest goodness of fit, χ^2 (8, N=3,328) = 11.81, $p = .160$.

Taken together, these results provide useful information to assess the extent to which the integrated model, including economic, academic, and non-academic factors, was able to predict graduate student persistence. The integrated model was a statistically significant improvement over the traditional econometric model (Model 1). That is, the inclusion of academic and non-academic variables added significantly to the prediction of graduate student persistence.

As suggested by others (Cabrera, 1993; Peng et al., 2002; Perna, 2004), several other indicators were used to evaluate the ability of the integrated model to predict graduate student persistence. Though not completely comparable to the R^2 statistic used in ordinary least squares regression, two R^2 values may be computed for logistic regression. These two values are: Cox and Snell (1989) R -squared and Nagelkerke (1991) R -squared. The R -squared value used in ordinary least squares regression suggests the proportion of the variance in the dependent variable explained by the independent variables included in the model. However, this is problematic when the dependent variable is dichotomous such as in the present study. In such a case, variance is at a maximum for a 50-50 split on the outcome variable and the more one-sided the split, the lower the variance.

For this reason, comparing logistic R -squared values with R -squared values in ordinary least squares regression leads to incorrect conclusions. The two pseudo- R^2

values computed for logistic regression (Cox and Snell R -squared and Nagelkerke R -squared) are used to measure strength of association and should be interpreted with caution. The Cox and Snell R -squared value for the null model (pseudo- $R^2 = .039$) increased to .096 in the third model. The Nagelkerke R -squared value for the null model (pseudo- $R^2 = .056$) increased to .136 in the third model. The Nagelkerke R -squared value is modification of the Cox and Snell R -squared. The Nagelkerke R -squared increases the range of the Cox and Snell value to assure that its minimum is 0 and its maximum is 1 (Nagelkerke, 1991). The Nagelkerke R -squared value is the most commonly cited among these two pseudo-variance-squared measures.

Another pseudo- R^2 measure that has been reported in a number of higher education research studies (Cabrera, 1994; Peng et al., 2002; Perna, 2004) is the McFadden pseudo- R^2 . Again, though not completely comparable to the R^2 in ordinary least squares regression, the McFadden pseudo- R^2 indicates the strength of the relationship or extent of the relationship between the dependent variable and the independent variables. The McFadden pseudo- R^2 was computed using the following formula:

$$R^2_{McF} = 1 - \frac{\ln L(M_{full})}{\ln L(M_{int})}$$

The researcher calculated McFadden R^2 values for the three models: the first model consisting of economic factors, the second model consisting of economic and academic factors, and the third model representing the integrated model developed for this study. The McFadden R^2 value for the first model was .031. The McFadden R^2 value for the second model increased to .04. The McFadden R^2 value for the third model increased to .052.

These findings suggest that the integrated model (third model) is statistically significantly better for predicting graduate student persistence over a model with no predictors and the traditional econometric model that only includes economic factors. Parameter estimates and goodness of fit measures are shown in Table 15 for the three models. Table 16 presents the estimates for the parameters included in the integrated model of graduate student persistence.

Finally, it is important to note that the integrated model of graduate student persistence developed and tested in the present study consists of both social and cultural capital measures. In the final analysis (model 3), several of these factors were included as significant predictors of persistence in graduate school. For example, estimated family contribution (EFC) and parent's education were significant predictors of persistence.

The purpose of question two also includes assessing the extent to which the predictive power of the integrated model of graduate student persistence varies by graduate student status (e.g., masters versus doctoral). To answer this question, the researcher divided responses into two categories: masters and doctoral. Binominal logistic regression procedures were conducted on each group independently. In addition, the researcher calculated and compared -2 log likelihood values, percent correctly predicted, and pseudo-R² values.

The findings suggest that the integrated model of graduate student persistence, developed in this study, is better for predicting persistence among doctoral students. The significant predictors of graduate student persistence for master's students included: estimated family contribution, total student aid, total educational debt,

undergraduate debt, undergraduate grade point average, and race/ethnicity. The final model predicted 69.7% of the cases correctly. The Cox and Snell R-squared value was .084 and the Nagelkerke R-squared value was .118. The calculated McFadden R-squared value was .051.

The Hosmer-Lemeshow (2000) test is computed by dividing the predicted probabilities into deciles and then computing a Pearson chi-square that compares the predicted frequencies to the observed frequencies. Low chi-square values and non-significance indicate goodness of fit. The results of the Hosmer-Lemeshow test, computed in the study, for the integrated model suggest goodness of fit, $\chi^2 (8, N=3,328) = 8.835, p = .356$.

The significant predictors of graduate student persistence for doctoral students included: total student aid, total educational debt, SAT/ACT score, and parent's level of education. The final model predicted 81.2% of the cases correctly. The Cox and Snell R-squared value was .121 and the Nagelkerke R-squared value was .189. The calculated McFadden R-squared value was .074. The results of this study suggest that the integrated model of graduate student persistence explains more of the variance in the likelihood of persisting in graduate school for doctoral students when compared to master's students.

Question Three

The third research question explored whether the likelihood of persisting in graduate school varied by race/ethnicity. Specifically, the question asked: Does the likelihood of persisting in graduate school vary by race/ethnicity? To answer this question, the researcher used the regression equation derived from the

Table 15

Effects of Economic, Academic, and Non-Academic Factors on Persistence

Factor	Models		
	Model 1 (β)	Model 2 (β)	Model 3 (β)
Tuition Reduction			
Reduction	-.387*	-.394*	-.361
No reduction (reference)			
EFC			
No support	.077	.116	.257
Less than \$1,500	-.664**	-.631*	-5.070
\$1,500-3,999	-.034	-.004	.104
\$4,000-7,999	.203	.203	.231
\$8,000 and above (reference)			
UG Debt			
Did not borrow	.949**	.899**	.858**
Less than \$4,000	.765**	.733**	.801**
\$4,000-7,999	.475**	.436**	.456**
\$8,000-12,599	.515**	.485**	.506**
\$12,600 or more (reference)			
Total GS aid			
None	-1.285**	-1.219**	-1.186**
Less than \$6,999	-1.060**	-1.015**	-.948**
\$7,000-17,999	-1.054**	-1.025**	-.985**
\$18,000-27,999	-.224	-.192	-.232
\$28,000 or more (reference)			
Total educational debt (UG/G)			
None	-1.218**	-1.169**	-1.214**
Less than \$15,999	-.770**	-.701**	-.686*
\$16,000-39,999	-.030	.016	.030
\$40,000-63,999	.126	.176	.181
\$64,000 or more (reference)			

Table 15 (continued)

Factor	Models		
	Model 1 (β)	Model 2 (β)	Model 3 (β)
UG GPA			
2.9 and below		-.001	-.009**
3.0 to 3.39		.248*	.201
3.4 to 3.69		-.136	-.173
3.7 to 4.0 (reference)			
SAT/ACT Scores			
Did not take SAT/ACT		-.079	.313*
Lowest quartile		-.447**	-.147
Second quartile		-.281*	-.106
Third quartile		-.006	.077
Highest quartile (reference)			
Parent's education			
No high school			-.443*
High school			-.391**
Some PSE			-.313*
Two years PSE, AA			-.474**
Bachelor's			-.109
Advanced degree (reference)			
Age at BA			
Below 22 years			.312**
22-24 years			.108
25 and above (reference)			
Race/Ethnicity			
AI/AN			.702
Asian			.392
Black			-.572**
Hispanic			-.368*
White (reference)			
Intercept	1.992	1.984	1.750
G ²	3767.410	3738.163	3686.518
df	3053	3051	3048
G ² /df	1.234	1.225	1.209
pseudo-R ² (McFadden)	.03	.04	.05
% correct predicted	70.8	71.0	72.5

* = $p < .05$, ** = $p < .01$

Table 16

The Integrated Model of Graduate Student Persistence

Factor	Beta	S.E.	Exp (β)
Tuition Reduction			
Reduction	-.361	.198	.697
No reduction (reference)			
EFC			
No support	.257	.242	1.293
Less than \$1,500	-5.070	.275	.602
\$1,500-3,999	.104	.347	1.109
\$4,000-7,999	.231	.387	1.260
\$8,000 and above (reference)			
UG Debt			
Did not borrow	.858**	.168	2.359
Less than \$4,000	.801**	.191	2.228
\$4,000-7,999	.456**	.172	1.577
\$8,000-12,599	.506**	.170	1.659
\$12,600 or more (reference)			
Total GS aid			
None	-1.186**	.308	.305
Less than \$6,999	-.948**	.314	.388
\$7,000-17,999	-.985**	.306	.373
\$18,000-27,999	-.232	.353	.793
\$28,000 or more (reference)			
Total educational debt (UG/G)			
None	-1.214**	.296	.297
Less than \$15,999	-.686*	.278	.503
\$16,000-39,999	.030	.276	1.031
\$40,000-63,999	.181	.319	1.198
\$64,000 or more (reference)			
UG GPA			
2.9 and below	-.009**	.130	.991
3.0 to 3.39	.201	.128	1.223
3.4 to 3.69	-.173	.133	.841
3.7 to 4.0 (reference)			

Table 16 (continued)

Factor	Beta	S.E.	Exp (β)
SAT/ACT Scores			
Did not take SAT/ACT	.313*	.152	1.367
Lowest quartile	-.147	.143	.864
Second quartile	-.106	.128	.899
Third quartile	.077	.122	1.080
Highest quartile (reference)			
Parent's education			
No high school	-.443*	.226	.642
High school	-.391**	.112	.677
Some PSE	-.313*	.158	.731
Two years PSE, AA	-.474**	.160	.623
Bachelor's	-.109	.117	.896
Advanced degree (reference)			
Age at BA			
Below 22 years	.312**	.120	1.367
22-24 years	.108	.137	1.114
25 and above (reference)			
Race/Ethnicity			
AI/AN	.702	.708	2.018
Asian	.392	.214	1.480
Black	-.572**	.161	.564
Hispanic	-.368*	.178	.692
White (reference)			
Intercept	1.750	.438	5.754
G ²	3686.518		
df	3048		
G ² /df	1.209		
pseudo-R ² (McFadden)	.05		
% correct predicted	72.5		

* = $p < .05$, ** = $p < .01$

binomial logistic regression procedures run on the factors included in the integrated model.

In ordinary least squares regression, one could describe the relationship between an independent variable such as race and the outcome variable using relative beta coefficients. However, the beta coefficients computed by logistic regression analysis are different from the coefficients provided by ordinary least squares regression. In logistic regression, the coefficient is equal to the change in log odds of a particular outcome (e.g., persisting) associated with a unit-change in the independent variable.

One way to interpret logistic beta coefficients is to examine the sign of the coefficient. Positive coefficients suggest a positive change in the log odds of a particular outcome (such as persisting in graduate school) for a unit-change in the independent variable. In this study, positive coefficients were computed for both Asians and American Indian/Alaskan Natives (Table 16). These findings suggest that a positive change in the log odds of persisting is associated with these race/ethnicity groups. On the other hand, negative coefficients were computed for both Blacks and Hispanics. These results suggest that a negative change in the log odds of persisting in graduate school is associated with being a member of these groups.

It can be difficult to interpret log odds using the sign of the logistic beta coefficient. Three other measures are used commonly: predicted probabilities, predicted odds, and odds ratios. To calculate these three measures, several formulas were needed and are discussed in the sections that follow.

To further investigate differences by race, the research calculated predicted probabilities of persistence for each racial group. Predicted probabilities were calculated using the following formula:

$$p' = \frac{1}{1 + e^{-(B_0 + B_1X_1 + \dots + B_iX_i)}}$$

The results of this calculation suggest that the predicted probability of persisting in graduate school varied as a function of race (Table 17). For white students, the predicted probability was .85. This suggests that of all white students (reference), approximately 85% persisted. For American Indian/Alaskan Native students, the predicted probability was .92. This suggests that of all American Indian/Alaskan Native students, approximately 92% persisted. For Asian students, the predicted probability was .89. This suggests that of all Asian students, approximately 89% persisted in graduate school. Finally, the predicted probability for Black and Hispanic students was .76 and .80, respectively. This suggests that of all Black students, 76% persisted while approximately 80% of all Hispanic students persisted.

Predicted odds were also calculated to assess differences by race. Predicted odds suggest the odds of one outcome occurring compared to the other. For instance, the predicted odds used here suggest the odds of persisting in graduate school versus not persisting if you are a particular race versus any other. The equation used to calculate predicted odds was:

$$\text{odds}' = (\text{constant } \text{Exp}(\beta)) (\text{Exp}(\beta) \text{IV})^{\text{IV}(\text{value})}$$

The results of this calculation suggest that the predicted odds of persisting in graduate school varied as a function of race. For white students (reference), the predicted odds were 5.754. For American Indian/Alaskan Native students, the predicted

Table 17

Predicted Probability of Persisting in Graduate School by Race

Race	Predicted Probability
White	.85
Black	.76
Hispanic	.80
Asian	.89
American Indian/Alaskan Native	.92

odds were 11.612. The predicted odds for Asian students were 8.516. The predicted odds for Black and Hispanic students were 3.25 and 3.98 respectively. This suggests that the odds of persisting in graduate school are lowest for Blacks and Hispanics.

Table 18 presents the results of the predicted odds analysis.

Finally, odds ratios were calculated to examine the differences between racial groups in terms of persistence (Table 19). Odds ratios are often reported to make comparisons between groups (Kleinbaum, 1994; Peng et al., 2002; Perna, 2004). The formula for odds ratios calculated in the present study follows:

$$\text{odds ratio} = \frac{\text{odds}'_1}{\text{odds}'_2}$$

American Indian/Alaskan Native students were 2.018 times more likely to persist in graduate school than White students. Similarly, Asian students were 1.480 times more likely than Whites to persist in graduate school. Whites were more likely than both Blacks and Hispanics to persist in graduate school (odds ratios equal to .564 and .692 respectively).

American Indian/Alaskan Native students were more likely to persist in graduate school when compared to any other racial group (Table 20). Such students were 3.57 times more likely to persist than Black students and 2.92 times more likely to persist than Hispanic students. Finally, American Indian/Alaskan Native students were 1.36 times more likely to persist in graduate school than Asian students.

Asian students were also more likely to persist in graduate school than Blacks and Hispanics. For example, Asian students were 2.62 times more likely to persist than Black students. The odds ratio for Asian students compared to Hispanic students was

Table 18

Predicted Odds of Persisting in Graduate School by Race

Race	Predicted Odds
White	5.754
Black	3.25
Hispanic	3.98
Asian	8.516
American Indian/Alaskan Native	11.612

Table 19

Odds-Ratios for Persisting in Graduate School by Race, B&B: 93/97

Characteristic	<i>B</i>	<i>S.E.</i>	Odds-ratio
Race/Ethnicity			
AI/AN	.702	.708	2.018
Asian	.392	.214	1.480
Black	-.572**	.161	.564
Hispanic	-.386*	.178	.692
White (reference)			

Table 20

Odds-Ratios for Persisting in Graduate School by Race, B&B: 93/97

Characteristic	Exp (<i>B</i>)	S.E.	Odds-ratio	1/Odds-ratio
Race/Ethnicity				
White	5.754	.438	.496	2.016
Asian	1.480	.214	.734	1.362
Black	.564	.161	.280	3.571
Hispanic	.692	.178	.343	2.916
AI/AN (reference)				

equal to 2.14 indicating that Asians were twice more likely to persist in graduate school than Hispanics (Table 21).

Finally, the results suggest that Blacks and Hispanics are least likely to persist in graduate school. Even among these two groups, Hispanics were 1.22 times more likely to persist than Black students. As mentioned previously, Asians were almost three times more likely to persist in graduate school than Black students. These findings make clear that there are differences in persistence by race/ethnicity (Table 22 and 23).

This third question also explores sources of the observed differences in graduate student persistence. To do this, the researcher decided to compare the group with the lowest odds of persisting to the reference group (Whites). Previous research suggests that economic factors such as student aid and educational debt influence outcomes such as persistence. Student aid tends to increase one's ability to persist while educational debt is associated with decreased probability of persisting.

To test these two factors, the researcher calculated odds ratios using the results of the binomial logistic regression analyses. The odds ratios were calculated while controlling for all factors other than race/ethnicity and either student aid or debt. The odds ratio for Black students who did not borrow to White students who did not borrow was .56 indicating that Whites were more likely to persist than Blacks. However, the likelihood of persisting in graduate school increased as the amount borrowed (total graduate school aid) increased. For example, Black students who borrowed less than \$7,000 were still less likely to persist than Whites who did not borrow (odds ratio=.71). Black students who borrowed a lot (\$28,000 or more) were 1.85 more likely to persist than White students who did not borrow (Table 24).

Table 21

Odds-Ratios for Persisting in Graduate School by Race, B&B: 93/97

Characteristic	Exp (B)	S.E.	Odds-ratio	1/Odds-ratio
Race/Ethnicity				
White	5.754	.438	.675	1.48
AI/AN	2.018	.708	1.363	.73
Black	.564	.161	.382	2.62
Hispanic	.692	.178	.467	2.14
Asian (reference)				

Table 22

Odds-Ratios for Persisting in Graduate School by Race, B&B: 93/97

Characteristic	Exp (B)	S.E.	Odds-ratio	1/Odds-ratio
Race/Ethnicity				
White	5.754	.438	1.771	.565
Asian	1.480	.214	2.622	.381
AI/AN	2.018	.708	3.572	.280
Hispanic	.692	.178	1.225	.816
Black (reference)				

Table 23

Odds-Ratios for Persisting in Graduate School by Race, B&B: 93/97

Characteristic	Exp (B)	S.E.	Odds-ratio	1/Odds-ratio
Race/Ethnicity				
White	5.754	.438	1.446	.692
Asian	1.480	.214	2.141	.467
AI/AN	2.018	.708	2.917	.343
Black	.564	.161	.817	1.225
Hispanic (reference)				

Table 24

Odds-Ratios for Persisting in Graduate School, Race and Aid, B&B: 93/97

Characteristic	Amount of Student Aid		
	None (reference)	Less than \$7,000	\$28,000 or more
Race/Ethnicity			
Black	.560	.710	1.85
White (reference)			

Similarly, there were within-group differences in the likelihood of persisting in graduate school when considering Blacks students only (Table 25). Black students who borrowed less than \$7,000 for graduate school were 1.27 times more likely to persist than Blacks who did not borrow. The likelihood increased as graduate student aid increased. Black students who borrowed \$28,000 or more were 3.28 times more likely to persist than Blacks who did not borrow.

The results of this study suggest that Whites are more likely to persist than Blacks in almost all cases. However, Black students who borrowed \$28,000 or more for graduate school were 1.85 more likely to persist than White students who did not borrow. Similar to Black students, there were with-in group differences for White students (Table 26). White students who borrowed \$28,000 or more were 3.28 times more likely to persist than Whites who did not borrow. Whites who borrowed a lot were 2.58 times more likely to persist than Whites who borrowed less than \$7,000. Those who borrowed less than \$7,000 were 1.27 times more likely to persist than those who did not borrow. These results suggest that increased aid for graduate school increases the likelihood of persisting.

Educational debt is associated with decreased likelihood of persisting in college. To further investigate this issue, the researcher calculated odds ratios between Blacks and Whites for various levels of educational debt (Table 27 and 28). White graduate students with no undergraduate debt were 1.77 times more likely to persist than Black students with no undergraduate debt. However, this likelihood decreased as the level of educational debt increased. For example, White students with \$12,600 or more of

Table 25

Odds-Ratios for Persisting in Graduate School, Blacks Students Only, B&B: 93/97

Independent Variable	B	S.E.	Exp(B)	Odds-Ratio
GS Student Aid				
\$28,000 or more	1.750	.438	--	3.28
\$18,000-27,999	-.232	.353	.793	2.60
\$7,000-17,999	-.948	.306	.373	1.22
Less than \$7,000	-.948	.314	.388	1.27
None (reference)				

Table 26

Odds-Ratios for Persisting in Graduate School, White Students Only, B&B: 93/97

Independent Variable	B	S.E.	Exp(B)	Odds-Ratio
GS Student Aid				
\$28,000 or more	1.750	.438	--	3.28
\$18,000-27,999	-.232	.353	.793	2.60
\$7,000-17,999	-.948	.306	.373	1.22
Less than \$7,000	-.948	.314	.388	1.27
None (reference)				

Table 27

Odds-Ratios for Persisting in Graduate School by Race and Debt, B&B: 93/97

Characteristic	B	S.E.	Exp(B)	Odds-ratio
Undergraduate Debt				
\$12,600 or more/Black	1.750	.438	--	.24
\$8,000-12,599/Black	.506	.170	1.659	.40
\$4,000-7,999/Black	.456	.172	1.577	.38
Less than \$4,000/Black	.801	.191	2.228	.53
None/Black	.858	.168	2.359	.56
None/White (reference)				

Table 28

Odds-Ratios for Persisting in Graduate School by Race and Debt, B&B: 93/97

Characteristic	B	S.E.	Exp(B)	Odds-ratio
Undergraduate Debt				
\$12,600 or more/White	1.750	.438	--	.75
\$8,000-12,599/White	.506	.170	1.659	1.25
\$4,000-7,999/White	.456	.172	1.577	1.18
Less than \$4,000/White	.801	.191	2.228	1.67
None/White	.858	.168	2.359	1.77
None/Black (reference)				

undergraduate debt were less likely to persist in graduate school than Black students with no debt.

There were within-group differences as well (Table 29). Black graduate students who had undergraduate debt of \$12,600 or more were less likely to persist than Blacks with no debt. In other words, Blacks with no debt were over 2 times more likely to persist in graduate school than Blacks with large amounts of debt. And, Black graduate students with less than \$4,000 in undergraduate debt were twice as likely to persist than Black graduate students with excessive amounts of debt.

In summary, the results of this study suggest that more than money matters when predicting graduate student persistence. The integrated model proposed in this study was found to be significant and the regression equation resulting from the statistical analyses fit the data better than a traditional econometric model. The integrated model consisted of economic, academic, and non-academic factors such as age at BA completion, parent's education, and race/ethnicity.

In addition, several goodness of fit measures indicated the integrated model's fit. Binomial logistic regression analyses were conducted to explore the extent to which the integrated model improved prediction of graduate student status. In the final analysis, a higher proportion of the cases were correctly predicted indicating increased model fit.

Finally, the likelihood of persisting in graduate school varied with race. American Indians and Alaskan Natives were more likely than Whites to persist in graduate school. On the other hand, Blacks and Hispanics were less likely than Whites to persist. Economic factors, such as financial aid, increase the likelihood of persisting for Black students controlling for all other variables. Increased educational debt is associated

Table 29

Odds-Ratios for Persisting in Graduate School by Debt, Black Students Only, B&B:

93/97

Characteristic	B	S.E.	Exp(B)	Odds-ratio	1/ratio
<i>Undergraduate Debt</i>					
\$12,600 or more	1.750	.438	--	.42	2.38
\$8,000-12,599	.506	.170	1.659	.70	1.43
\$4,000-7,999	.456	.172	1.577	.67	1.49
Less than \$4,000	.801	.191	2.228	.94	1.06
None (reference)					

with a decreasing likelihood of persisting in graduate school controlling for all other factors.

CHAPTER FIVE

Discussion and Conclusions

The purpose of this study was to propose and test a statistical model's ability to predict graduate student persistence using an integrated scheme of economic, academic, and non-academic variables. Other purposes of this study were to explore differences by graduate student status and race. This chapter summarizes the results of the study and discusses the findings as they relate to prior research followed by a discussion of the implications for future practice, policy, and research. Limitations of the present study are also discussed. Finally, the chapter concludes with a discussion of the researcher's general impressions about the graduate school experience and factors that influence persistence to degree and degree completion. In addition, the researcher includes recommendations for enhancing the graduate school process and success rates of graduate students.

Overview of the Study

This was a national study of the effect of economic, academic, and non-academic variables on graduate student persistence using the Baccalaureate & Beyond (B&B:93/97) longitudinal survey. There were 11,192 individuals included in the original sample of 1992-1993 bachelor's degree recipients. Of those, 3,328 enrolled in graduate school by 1997. Those who enrolled in graduate school by 1997 represented the sample of this study.

Specifically, the study examined graduate student persistence as a function of economic, academic, and non-academic factors. Economic factors consist of various sources of financial support such as grants, loans, teaching assistantships, and work

experiences. Academic factors included undergraduate grade point average and scores on undergraduate and graduate entrance exams. Age at BA completion and parent's education were included as non-academic factors. Several proxies, such as estimated family contribution, were calculated as measures of social and cultural capital.

Descriptive analyses were employed to describe the sample and to report initial differences between those who persist and those who do not. Logistic regression techniques were used to analyze the relationship between economic, academic, and non-academic factors and persistence in graduate school. Moreover, binomial logistic regression procedures were used to test the ability of these factors to predict graduate student persistence.

Findings from this study suggest the importance that financial support, academic preparedness, and non-academic factors such as parent's education and age at BA completion have on persistence in graduate school. This information will be beneficial to graduate deans, faculty who teach graduate students, and policymakers who make decisions that affect graduate education.

Summary of Major Findings

This research contributes to our understanding of the under-representation of certain groups (e.g., minorities) among master's and doctoral degree recipients by examining two aspects of the educational pipeline: the enrollment of baccalaureate degree recipients in post-baccalaureate educational programs and persistence in post-baccalaureate programs. Of those who received a bachelor's degree in 1992-1993 and enrolled in graduate school by 1997, only 21% were persons of color. Less than 7%

were Black and less than 6% were Hispanic. By 1997, very few had attained their graduate degree or remained enrolled in graduate school. However, descriptive analyses suggest that more Asians enrolled and persisted in graduate school after receiving a bachelor's degree in 1992-1993.

Main Thesis: More than Money Matters

One of the central findings of this study supports the title of this research—more than money matters. Research on undergraduate student persistence (and attrition) suggests that economic factors such as financial aid are critically important to persisting in college. However, prior to present, there were no national studies of graduate student persistence that adopted an integrated model of student persistence consisting of economic, academic, and non-academic factors. The results of this study support the ability of the model developed in the present study to predict graduate student persistence as defined in previous chapters.

The final model resulting from the hierarchical binomial logistic regression procedures included economic factors such as financial aid, educational debt, and estimated family contribution (proxy for social capital); academic factors such as SAT/ACT scores and undergraduate GPA; and non-academic factors such as parent's education (proxy for cultural capital), age, and race. In short, more than money matters when predicting graduate student persistence.

Economic Factors

The economic factors included in the final statistical model were total aid received for graduate school, tuition reduction, undergraduate debt, total educational debt, and estimated family contribution (EFC). Generally speaking, the likelihood of persisting in graduate school increases as the amount of aid received for graduate school increases. Receiving a tuition reduction is associated with a negative change in the log odds of the dependent variable. That is, those who do not receive a tuition reduction are 1.43 times more likely to persist than those who receive such a reduction.

Educational debt was associated with decreases in the likelihood of persisting in graduate school. High levels of undergraduate debt (\$12,600 or more) reduced the likelihood of persisting for all groups. There were differences by race. For example, Whites who had no debt were almost 2 times as likely to persist as Blacks with no debt. Blacks with no debt, however, were 1.33 more likely to persist than Whites with high levels of debt (\$12,600 or more). Blacks with high levels of debt were less likely to persist than Blacks with no debt. Blacks with debt less than \$4,000 were also less likely to persist than Blacks with no debt. These results indicate that having no debt significantly increases the likelihood of persisting in graduate school while high levels of debt decrease the likelihood of persistence.

Though the ratio of Whites to Blacks, in most cases, yields a positive integer greater than 1—the ratio of Whites with high levels of debt to Blacks with no debt is an integer less than 1 meaning that Whites with high levels of debt are less likely to persist in graduate school than Blacks with no debt. This suggests that there is an optimal critical point where the benefits of race give way to the costs of debt.

Academic Factors

The academic factors included in the final statistical model were undergraduate grade point average and SAT/ACT scores. Those who had an undergraduate GPA less than 2.9 or between 3.4 and 3.69 were less likely to persist in graduate school than those with an undergraduate GPA between 3.7 and 4.0. Controlling for all other factors, those with a higher undergraduate GPA were more likely to persist in graduate school (odds ratios ranging from 1.0 to 1.23).

Several findings related to SAT/ACT scores are worth noting. First, individuals with SAT/ACT scores in the lowest and second-to-lowest quartiles are less likely to persist in graduate school than those with scores in the highest quartiles (odds ratios equal to .864 and .899 respectively). Those who scored in either the highest quartile or next-to-highest quartile on the SAT/ACT were more likely to persist in graduate school than those who scored in the second-to-lowest quartile. These results suggest that SAT/ACT score is a significant predictor of graduate student persistence and higher scores are associated with increased probability of persisting. It is interesting to note that GRE test scores did not significantly enter into the final model.

Non-academic Factors

The non-academic factors included in the final statistical model were parent's education, age at receipt of bachelor's degree, and race/ethnicity. In short, all individuals whose parents completed less than an advanced degree were less likely to persist in graduate school than those persons whose parents completed at least a master's. This variable was included as a cultural capital measure and the results suggest that cultural capital measures increase the explanatory power of traditional econometric models. Previous studies have shown that students whose parents have completed more education may have access to more information about graduate school and tend to have more realistic expectations of the graduate school experience (Paulsen & St. John, 2002; Perna, 2004; St. John & Asker, 2001; Zhang, 2005).

Another important finding of this research suggests that age is significantly but inversely related to the likelihood of persisting in graduate school. Graduate students aged 22 years and under are almost 1.5 times more likely to persist in graduate school than students who are 25 years and above. Even students who are between the ages of 22 and 24 are 1.11 times more likely to persist than those who are older. Results suggest that younger students are most likely to persist in graduate school and this may have implications on practice and policy. Such implications are discussed later in this chapter.

Finally, the results of this study suggest that the likelihood of persisting in graduate school varies by race/ethnicity. As presented in Chapter 4, Blacks and Hispanics are less likely to persist in graduate school than Whites. American Indians, Alaskan Natives, and Asians are all nearly twice as likely to persist in graduate school

when compared to White students. In fact, American Indians and Alaskan Natives in the present study were more likely to persist in graduate school when compared to any other racial group. These students were almost four times more likely to persist in graduate school when compared to Black students.

While the results of this study suggest that Blacks and Hispanics are least likely to persist in graduate school, several important distinctions emerged. Hispanics were more likely to persist than Blacks students. Therefore, of all groups in the present study's sample, Black students were the least likely to persist. These results suggest that the likelihood of persisting in graduate school varies by race/ethnicity.

To explore potential sources of racial/ethnic differences, the researcher explored the effect of student and educational debt on persistence. Student aid is often hailed as a way to increase one's ability to persist while educational debt, in previous studies, has been associated with leaving college. Controlling for all other factors, Black students who borrowed financial aid for graduate school (e.g., \$28,000 or more) were almost twice as likely to persist in graduate school as Whites who did not borrow.

There were within-group distinctions as well. For example, Black students who borrowed low amounts of aid for graduate school (less than \$7,000) were more likely to persist than Black students who did not borrow. Black students who borrowed \$28,000 or more were three times more likely to persist than Blacks who did not borrow. Similar results were found when only considering White students. These results suggest that increased aid to graduate students increased the likelihood of persisting.

Educational debt from undergraduate study was associated with decreased likelihood of persisting in graduate school. A number of important findings should be

noted. First, though White students with no debt were almost twice more likely to persist than Black students with no debt, White students with high amounts of debt were less likely to persist when compared to Black students with no debt. These findings suggest that there may be a critical point where the benefits of race give way to the costs of educational debt.

In summary, the results of this study suggest that the likelihood of persisting in graduate school varies as a function of race/ethnicity. Economic factors such as aid and debt are possible sources for these differences. A number of other factors may influence these differences as well, including age, prior academic achievement, and one's social and cultural capital.

Relationship of Findings to Prior Graduate Student Research

The literature review makes clear that very few studies of graduate student persistence were found. This is an area that is under-investigated largely. However, a national study of within-year graduate student persistence (Andrieu, 1991) and a state-level analysis of within-year graduate student persistence (Asker, 2001) relate to the findings of the present study. Before discussing the relationship of the findings in this study to prior graduate student research, I will discuss how these findings relate to the undergraduate persistence studies outlined in Chapter 2.

Attrition has been studied broadly as it relates to undergraduate student populations. A number of studies suggest that the attrition rate among undergraduates ranges from 12% to 40% (Astin, 1975; Bean, 1980; Terenzini & Pascarella, 1980). The results of the present study are consistent with this finding given the fact that nearly 30% of the sample did not persist in graduate school.

Several models exist to explain persistence and attrition. Tinto (1975) concluded that students enter college with pre-college and background traits that influence their educational experiences and commitments. These commitments change throughout college as a result of a student's integration into the social and academic life of the institution. The degree to which students integrate into these systems is significantly related to their decision to persist.

Tinto's model has served well to enhance our knowledge of the persistence-attrition issue in higher education. But, it is more closely related to the experiences of undergraduates. Its use to explain the phenomenon in various college settings, among various college students, and in concert with background, pre-college, academic, and financial variables is less well established. Recent studies suggest that such factors are equally as important to persistence (Bean & Metzner, 1985; Cabrera, Nora, & Castaneda, 1992; Murdock, 1987; St. John, Paulsen, & Starkey, 1996). In fact, St. John, Cabrera, Nora, and Asker (2004) advised that "a better understanding of factors impacting student persistence in college emerge when both of these lines of conceptualization inquiry [student-institution fit theories and econometric] are considered" (p.30).

One of the central purposes of this research was to propose and test the ability of a new conceptual model for exploring the relationship between persistence and economic, academic, and non-academic factors. This research expanded traditional econometric models that tend to include financial variables only. The integrated model developed for this study included measures of human, social, and cultural capital. It was designed to advance our knowledge about the importance of such factors to

graduate student persistence. In many ways, the statistical significance and improved fit of the final model is one of the most important findings of the present study. A number of other previous studies support the use of integrated approaches such as the one employed in this study (Perna, 2000; 2004).

Previous studies on undergraduate students provide useful information that suggests that economic, academic, and non-academic factors are important for understanding persistence in college. The results of economic studies have been mixed. Terkla (1985) found that receipt of aid has a significant effect on persistence. This is consistent with the results of the present study. Voorhees (1985) studied students and found that all forms of aid were positively related to persistence. The results of this dissertation support his findings as increasing amounts of student aid were associated with an increased likelihood of persisting in graduate school.

Moline (1987) used path analysis to explore the relationship between financial factors and other variables such as college GPA and test scores. She found that college GPA had a large effect on persistence while financial aid variables had no significant effect. My results support her findings and others (Brewton & Hurst, 1984) relative to college GPA. However, the results of my study contradict her findings relative to financial aid variables. The results of this study suggest that financial aid variables such as amount of aid received for graduate school, estimated family contribution, and educational debt are significant predictors of the likelihood of persisting in graduate school.

Several previous studies have examined differences by race. Murdock (1987) conducted a meta-analysis on persistence studies and found that minority aid recipients

were less likely to persist than non-minority recipients. The results of this dissertation suggest that minority students are less likely to persist than non-minority (White) students. However, financial aid acts as mechanism for improving one's likelihood of persisting. For example, in the present study, minority students who received high amounts of aid (as defined in Chapter 4, though it may be just enough to cover unmet need) were just as likely to persist in graduate school when compared to White students.

Richardson and Attinasi (1982) found that college test scores had a significant effect on persistence in college. My results support their conclusion as SAT/ACT test scores were significant predictors of graduate student persistence. Higher SAT/ACT test scores were associated with higher probabilities of persisting in graduate school.

While the results of such studies provide useful information for understanding persistence of undergraduate students, few studies have considered the factors that influence persistence of graduate students. For that reason, much of this discussion references undergraduate studies. However, a few graduate studies emerged from the literature review.

Andrieu (1991) used the National Postsecondary Student Aid Survey (NPSAS:1987) to measure the impact of financial aid on within year persistence. Asker (2001) used state-level data to examine the effects of financial aid on within-year persistence and found significant differences between graduate students in education and those in business as a major. This study used another national database, the Baccalaureate & Beyond Longitudinal Survey (B&B:93/97) second follow-up, to

measure the impact of economic, academic, and non-academic factors on persistence. This study also differed in how persistence was measured (see Chapter 4).

Several studies explored the effect of financial variables on graduate student persistence. Luan and Fenske (1996) used qualitative methods to determine that the type of financial aid was important in graduate student persistence. Another study by Langlois (1972) was conducted on 10,000 students who dropped out of graduate school at Berkeley. Financial factors were cited most frequently as reasons for not completing the graduate degree. The results of this study relate to these findings as a large number of the variables included in the final model are financial-related, correctly predict a large number of cases, and are significant predictors of graduate student persistence.

Leppel (2002) studied the effect of age, marital status, and race in her analysis of the Beginning Postsecondary Students Survey (BPS) data. She found that being older lowers persistence for students. The results of the present study support her conclusions as younger students were significantly more likely to persist than older students.

Significance of Study

There is a need to know more about the factors that influence persistence of graduate students. Much of the research related to persistence has focused on undergraduate student populations and economic factors such as financial aid and indebtedness. However, recent studies have shown that academic and non-academic factors may increase the power of a statistical model to predict graduate student persistence (Andrieu, 1991; Asker, 1995). This study is significant because it explores the effect of economic, academic, and non-academic variables on persistence in

graduate school. In addition, it is designed to explore differences by race and gender and this may inform the work of various campus groups.

This study was significant for several campus constituencies. For example, faculty members may benefit from this study. This study provided data about the academic and non-academic variables associated with persistence in graduate school. They may use this information to design classroom experiences that emphasize academic skills and development. Moreover, faculty members may consider these findings when advising graduate students for success in college.

Another group that might benefit from the results of this study includes directors of academic support programs. The results of this study provided directors with data about the relationship between academic and non-academic variables such as undergraduate GPA, SAT/ACT test scores, and age. Directors might use the results to design programs aimed specifically at addressing the needs of graduate students. Furthermore, they might use the results to determine what kinds of academic support are needed.

Financial aid officers may also benefit from the results of this study. This study examined the relationship between economic, academic, and non-academic factors and persistence among graduate students. Financial aid officers may consider these results to shape financial aid packages that meet the “unmet” needs of graduate students. Moreover, they might use the results to determine which source or sources of aid are most likely to help a student persist in graduate school.

Implications for Practice

The study has several implications for practice. The results provided data about the relationship between persistence in graduate school and economic, academic, and non-academic factors. Advisors and counselors may consider these results when providing guidance to undergraduate students who are considering graduate school.

One of the major findings of this study suggests that students with higher undergraduate grades and test scores are more likely to persist in graduate school. This may suggest that students who are focused on doing well in college are more likely to enroll in graduate school and thus more likely to persist. Nevertheless, it seems to highlight the importance of doing well in college if you intend to succeed in graduate school. This may suggest that students need to have attending graduate school as a goal early on in the college experience. Therefore, there may be a need for programs and activities that provide students with information about graduate school. Programs like graduate school fairs, the Ronald E. McNair Scholars Program, and Bridge may provide such an opportunity.

The title of this study reflects the main hypothesis that stood to be tested—does more than money matter in terms of graduate student persistence? The results of this study suggest that more than money matters. This has implications for practice in higher education. In essence, the results suggest that students may have “unmet” academic and non-academic needs that exceed their “met” financial needs and vice versa. Controlling of all other factors, individuals with high aid and low grades were almost three more likely to persist than those with low aid and high grades. This emphasizes the importance of financial support to persistence, but may mask the

nuances discussed previously. To ensure the success of more graduate students, academic and student affairs administrators may consider these results when creating programs that support student learning and promote academic success.

Implication for Policy

The study was significant in terms of future policy. The results provided data about the relationship between persistence in graduate school and economic, academic, and non-academic factors. Admissions officers or graduate faculty members may consider these results when refining current admissions procedures and deciding to which factors to give weight.

Additionally, graduate deans or faculty members may consider these results when revising graduate school application forms and personal statements. Findings may inform them about whether including non-academic variables (e.g., sources of financial support) on forms would be reasonable. Deans and faculty members may also consider whether revamping personal statement questions to ascertain data about an applicant's non-academic abilities and experiences is useful.

Financial aid policies influence the amount, type, and limits of financial support to graduate students. For example, a major shift in financial aid policy over the past two decades is best characterized as a movement away from grants and scholarships toward more loans. In addition, federal financial aid formulas limit the amount of money that a student (and his or her parents) can borrow per loan year. The results of this study may provide useful information to those who formulate such federal policies.

Implications for Future Research

Findings from the present study may provide the impetus for future research related to economic, academic, non-academic factors and persistence in graduate school. This study looked at persistence among master's and doctoral students included in the B&B:93/97 database. Future studies may focus on only masters or only doctoral students. This would expand the available knowledge about persistence among either of these groups in general.

In the present study, first-professional students are pooled with doctoral students. It may be useful to explore differences between masters, doctoral, and first-professional students. Future research may test the ability of the integrated model to predict persistence among these three groups.

There is also a need for research on the influence of factors on graduate student persistence at various types of institutions. This study explored the ability of economic, academic, and non-academic variables to explain differences in persistence of graduate students using a national sample. Other studies might examine differences among graduate students at research universities only or graduate students enrolled at comprehensive universities. Studying various institutional types will broaden what is known about the influence of such factors on persistence in different campus environments.

There is another need for research made evident by this study. This study explored the ability of economic, academic, and non-academic variables to explain differences in persistence of graduate students at all institutions. Other studies might examine differences among graduate students at either public, private, or for-profit

institutions. Studying various institutional settings will broaden what is known about the effect of such factors on persistence of graduate students. Moreover, the implications of institutional control on economic factors may warrant additional research. For example, public institutions tend to award grants and loans while private institutions award more scholarships and tuition assistance grants.

The sample for this study included masters and doctoral students who enrolled in graduate study after receiving their bachelor's degree in 1992-1993. Future studies might examine the ability of economic, academic, and non-academic variables to explain persistence among those enrolled in other post-baccalaureate programs (e.g., post-BA certificates, graduate certificates, trade and vocational school). Such research would expand the literature base about the effect of such factors and how they relate to persistence among various groups of graduate students.

The dependent variable used in this study was dichotomous. That is, the researcher operationalized persistence in such a way that only two categories are possible—"yes" or "no." For this reason, binomial logistic regression was chosen as the most appropriate statistical technique as it allows for models consisting of both continuous and discrete variables. However, logistic regression provides three statistics that are rather awkward to interpret—the logit, odds ratio, and probability. Scholars agree that results should be interpreted with caution (Galloway, 2004; Thomas & Heck, 2001).

It would be useful to construct a continuous dependent variable related to graduate student persistence. For example, the researcher could consider the number of graduate credit hours earned or the number of semesters enrolled. First, this would

allow for the use of either continuous or scale data instead of categorical data such as is found in the present study. Second, measuring persistence on a continuous variable would meet one of the assumptions for using ordinary least squares (OLS) regression techniques. The results of such analyses are easier to interpret and provide several statistics for testing the model's strength and significance. For example, the F test provides useful information about the model's overall strength, the R^2 statistic describes the proportion of the variance in the dependent variable explained by the independent variables included in the model, and the p values suggest the significance of each variable (beta coefficient) in the model.

However, measuring persistence as a function of the total number of graduate credits accumulated is not without blemish. For example, should a doctoral student who has earned 120 graduate credit hours be considered "most likely to persist" or "most likely to not persist?" Should a master's student, who has earned 60 credits in a 30 hour program, be considered "likely to persist?" These represent special cases and should concern the researcher to the extent that they are included in the sample.

The national database used in this study examined 1992-1993 bachelor's degree recipients over time. The 1994 follow-up was administered one year after graduation from college while the 1997 follow-up was administered approximately four to five years after receiving a bachelor's degree. In short, this allowed each individual included in the original 1993 sample only four to five years to enroll in and complete a graduate degree. In many cases, however, it may take two to four years to complete a master's degree while attending school full-time and up to four or five years to complete a doctoral degree. The 1997 follow-up may not allow enough time for participants to decide to

enroll in graduate school (which usually takes place after a few years of full-time work experience) and even less time to complete a graduate degree.

One way to address this limitation is to examine this issue at a later point in time—for example, seven to ten years after receiving a bachelor's degree. The National Center for Education Statistics will release the 2003 follow-up to the B&B:93/97 longitudinal study soon. This will allow researchers to study the 1993 cohort of bachelor's degree recipients ten years after degree completion. Using the forthcoming database significantly improves one's ability to measure persistence in graduate school, particularly for doctoral students who tend to take more time to complete their degree than master's students.

This study focused on persistence among master's and doctoral degree-seeking graduate students. First-professional students were added to the doctoral category as discussed in Chapter 4. Therefore, this study does not consider first-professional students, in fields such as veterinary medicine, law, medicine, and pharmacy, as a separate category. Such students were not singled out due to the small number of cases. Given their similarity with doctoral students, they were combined to make one category. However, future studies might examine these students independent of doctoral students. In the case of first-professional students, the economic variables may be significantly different from masters students because it costs more to educate and train a lawyer, doctor, and veterinarian. Also, the academic qualifications for first-time professional students can be significantly different from other graduate students.

Future research may advance this line of inquiry by considering the effect of such factors on persistence among first-professional students. It would be informative to

conduct such a study, to compare the results to the findings of the present study, and to compare various professional student groups (e.g., law students versus medicine students).

Finally, there are a number of other national databases that may be used to explore graduate student persistence. This study used data from the B&B:1993/1997 Survey, but several others exist and may be useful for this purpose. Future studies might use data from a recent administration of the National Postsecondary Student Aid Survey (NPSAS), the High School & Beyond Survey (HSB), the Beginning Postsecondary Student Survey (BPS), and the National Longitudinal Study of the High School Class of 1972 (NLS). All of these provide alternative ways of measuring graduate student persistence and the influence of various background and pre-graduate school factors on persistence.

Limitations

As with all research studies, this project is not without limitations. First, there are a few limitations associated with the design and implementation of this national survey. For example, the B&B:93/97 represents an over-sampling of individuals in the field of teaching (U.S. Department of Education, 1999). As such, the results of the raw database are biased towards those in teaching fields. In the present study, this limitation was corrected by using the B&B:93/97 panel weight described in Chapter 4.

Another limitation of this study related to the survey's design. The proposed model included a number of factors as proxies for social and cultural capital. Over 24 items were reduced to factors (see Chapter 4) to measure one's values for additional education and future work. None of these factors entered the final equation as

significant predictors of graduate student persistence. This is contrary to the findings of Perna (2004) who found that values are significantly related to the likelihood of enrolling in a post-baccalaureate program. This may suggest that values are important predictors for enrolling but are not significant predictors of persistence in graduate school. On the other hand, this may be an artifact of how the items are measured in the database. This research is limited in that measures of social and cultural capital must be drawn from the database.

A number of other limitations have been discussed already. For example, the present study uses data drawn from the 1997 follow-up to the B&B:1993 survey. This only allows an individual up to four years to enroll in graduate school and only measures persistence within that same time period. To the extent that individuals need longer to enroll and persist in graduate school, the generalizability of these findings may be limited. Nevertheless, this was an important study to conduct and contributes to our understanding of graduate student persistence.

Finally, the sample consisted of very few American Indian/Alaskan Native graduate students. In part, this is due to the number of such people who enroll in graduate study at either the masters or doctoral level. But, this may also be a consequence of the sampling technique used in the Baccalaureate & Beyond Longitudinal Study (1993/1997). With so few cases in this race category, results should be interpreted carefully and generalizations should be limited for this group.

Reflections on the Graduate Experience

The graduate experience is vastly different from being an undergraduate in college. Graduate students are faced with very different expectations and challenges.

For example, graduate faculty members tend to have higher expectations of graduate students in terms of preparedness, ability to manage workload, and commitment to their academic pursuits. For this reason, few faculty members see their role as helping graduate students adjust to college, working with graduate students to develop time management skills, and advising graduate students about their future professional goals.

However, the results of this study suggest that pre-graduate school experiences, parent's education, age, and race are significantly related to graduate student persistence. Faculty members, deans, and other administrators would do well to assist undergraduate students who are interested in attending graduate school. And, these findings may suggest that some older students and minorities face a number of challenges to persisting in graduate school.

Graduate school can be daunting for many. This is especially true for some older, less well prepared, and minority students. While the quantitative evidence provided in this study suggests that older students are less likely to persist in graduate school, anecdotal evidence suggests that older students feel less resilient to the demands of graduate school. For example, one graduate student explained, "I am enrolled in a year long statistics sequence. The professor requires us to use a graphing calculator and SPSS to complete our assignments and exams. First of all, I didn't know there were such things as graphing calculators—it's been over 20 years since I was in high school! Secondly, I am computer illiterate and rarely use anything other than Microsoft Word. How can I learn how to use a graphing calculator, SPSS, and statistics all at once?"

A doctoral student who received her master's degree from a historically Black college said this:

I am struggling in graduate school and I believe it is because of my preparation. Students in my department (business) are required to take at least four courses in statistics and research methods. For some of my colleagues who came from rigorous masters programs and who completed a thesis, this is a piece of cake. But, for others, this is very difficult as this is the first time that many of us have taken a statistics course. Prior to now, I thought that my masters program was hard and prepared me well for my career. But, I realize now that my program lacked the intensity, rigor, and research focus needed to prepare me for a doctoral program. I don't think it is a function of being a historically Black college, but rather a result of being too practice-focused or applied.

Several issues can be gleaned from the anecdotal evidence provided in these two cases. First, research skills and methods courses can be challenging, even fatal, for graduate students. This is particularly true for doctoral students who more often than not have to complete a dissertation or major research project to receive their degree. In my graduate school experience, I have tutored 11 graduate students in statistics and research methods ranging from ANOVA to multiple regression analysis. In addition, I have worked with two doctoral students on their analyses for dissertation projects. I am happy to report that most students improved their grades, scored better on future assignments and exams, and reported feeling like they learned something. However, despite my best efforts (and their professor's instruction), a number of these

students still lack the skills necessary to carry out independent research. In my opinion, this is due to lack of previous experience/preparation prior to graduate school in one-third of the cases, age (or resiliency) in another third of the cases, and a miscellany of factors in the last third of cases.

This relates to my next point—few problems simply arise in graduate school; most problems are pipeline issues. As reflected in the comments of the doctoral student in business, the first comment made by a graduate student, and the results of this study—success in graduate school is a function of factors prior to graduate school. Said differently, problems or deficiencies prior to graduate school lead to problems and deficiencies in graduate school. Likewise, success and achievement prior to graduate school may most likely lead to success and achievement in graduate school.

This phenomenon is closely tied to chaos theory. Chaos theory suggests that uncertainty arises from minute variations in the atmosphere because it is chaotic and not easily controlled. These uncertainties or problems—no matter how small and infinitesimal—may eventually overwhelm any calculation, erase any degree of accuracy, and complicate any forecasted outcome. This is also known as the “butterfly effect” and is reflected in the original theory:

For lack of the nail, the shoe was lost;

For lack of the shoe, the horse was lost.

For lack of the horse, the rider was lost;

For lack of the rider, the message was lost.

For lack of the message, the battle was lost;

For lack of the battle, the kingdom was lost.

With this in mind, we should think of education as an integrated experience that cuts across grades and levels. Rather than viewing American education as a composite of grades K through 12, plus four years of undergraduate study, and several years of graduate study, we might consider education as PK-16 and PK-20+. This acknowledges the fact that experiences in elementary and secondary education affect how students experience college and graduate school. It also highlights the relationship between preparedness, achievement, and persistence at the secondary level and success at the post-secondary level. Such a perspective may provide a framework for future persistence research that tracks achievement over time and its relationship to persistence in graduate school.

Another factor related to the graduate student experience is work experience. Currently, undergraduates are encouraged to gain full-time work experience before applying to graduate school. While this may be useful for weeding out the faint-in-heart, it may run counter to the factors that encourage success in graduate school. For example, the more work experience a student gets in the time between receiving their bachelor's degree and enrolling in graduate school, the older the student becomes. Older students are more likely to be married, to have children, to work while attending graduate school, and to attend graduate school part-time. However, older students are also less likely to persist in graduate school.

On the one hand, getting work experience prior to enrolling in graduate school is beneficial to the student and helps one determine if they should pursue a graduate degree in a particular subject area; on the other hand, it may significantly reduce one's chance of succeeding in graduate school. There appears to be a critical point where

the costs (e.g., increasing age, increasing distance from being a student) of working prior to enrolling in graduate school exceed the benefits (e.g., work experience, certainty of graduate major). Additional research is warranted to understand the needs and challenges faced by graduate students who are married, parents, part-time workers/full-time students, and full-time workers/part-time students. But, the question of how long should a student work before applying to and enrolling in graduate school also deserves attention.

Closing Reflections

In closing, there are a number of important questions that come to mind when considering the results of this study. For example, the results are based on the 1997 follow-up to the Baccalaureate & Beyond Longitudinal Study (B&B). The present study was conducted in 2005—nearly 10 years later. How has society changed over time? The base-year B&B study was conducted during the 1992-1993 academic year. The first year follow-up was conducted in 1994 and the second follow-up in 1997. To be sure, society changed over that time period in economic, political, and social ways of life. The results of this study should be interpreted carefully to give attention to the proper context and these findings should be generalized cautiously considering that context.

There are several other key questions that should be raised in light of these findings. For example, results suggest that the integrated model of graduate student persistence is statistically significantly effective at predicting graduate student persistence most of the time. However, there are still a number of cases for which it cannot be used. In addition, even after considering economic, academic, and non-

academic variables, a significant proportion of the variance in probability of persisting remains unexplained. These findings suggest that other factors come into play when predicting graduate student persistence. These factors take on greater importance for minorities, particularly African-Americans. What are these other factors? And, to what extent are they related to economic, academic, and non-academic dimensions? To what extent are non-academic factors such as racism and discrimination useful in explaining these differences?

Finally, the underlying assumption of this study is that all people who enroll in graduate school should earn a graduate degree. To what degree is this assumption accurate? To what degree is it appropriate? How many people enroll in a graduate program and make a conscious decision to leave? To what extent are departures from graduate school the result of a logical career decision? With these questions in mind, the results of this study should be interpreted carefully and generalized cautiously. And, as food for thought, which is more important: a credential or an education? Can you get one without the other?

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VITA

Terrell Lamont Strayhorn

110 Northview Drive, Apartment 28
 Blacksburg, VA 24060
 (540) 231-4471 (O)
 (540) 961-6013 (H)
terrells@vt.edu

EDUCATION:

Ph.D. Educational Leadership and Policy Studies Dissertation: <i>More than Money Matters: An Integrated Model of Graduate Student Persistence</i>	Virginia Tech	2005
M.Ed. Educational Policy Studies Thesis: <i>The Resegregation of Higher Education: The Effects of Eliminating Affirmative Action in College Admissions</i>	University of Virginia	2000
B.A. Religious Studies/Music	University of Virginia	1999

PROFESSIONAL EXPERIENCE:*Research*

Research Associate/Project Manager	The Helix Group Camp Springs, MD	2001
Research Associate/Info. Sys. Coord.	Council of Graduate Schools Washington, DC	2000
Research Assistant	Weldon Cooper Center for PS Charlottesville, VA	1999

Teaching

Instructor	Virginia Tech Blacksburg, VA	2002-
Music Teacher	John E. Howard Elementary Oxon Hill, MD	
Instructor	Marymount University Arlington, VA	2000

PROFESSIONAL HONORS AND AWARDS:

- Graduate Student of the Year Award, Virginia Tech, 2005
- Alpha Epsilon Lambda Honor Society, Virginia Tech, 2005
- Kappa Delta Pi Honor Society, Virginia Tech, 2004
- Chi Sigma Alpha Honor Society, Virginia Tech, 2003-

PROFESSIONAL ASSOCIATION LEADERSHIP AND MEMBERSHIP:

- Member, American College Personnel Association (ACPA)
- Member, National Association of Student Personnel Administrators (NASPA)
- Member, Association of American University Professors (AAUP)
- Member, National Association of Student Affairs Professionals (NASAP)
- Member, American Educational Research Association (AERA)

SELECTED PUBLICATIONS:

Books

Strayhorn, T. L., Creamer, D. G., & Miller, T. K. (in press). *Frameworks for Assessing Learning and Development Outcomes*. Washington, DC: Council for the Advancement of Standards in Higher Education (CAS). Anticipated publication date: Spring 2006

Refereed Journal Articles

Strayhorn, T. L. (2005). Democratic education and public universities in America: A review of the literature. *Journal of College and Character*, 6 (3).

Strayhorn, T. L. (in press). On a Different Mission: Historically Black and predominately White colleges and universities today. *Journal of Negro Education*.

Strayhorn, T. L. (in press). Cross' model of psychological nigrescence: A literature review. *African American Research Perspectives*.

Hirt, J. B., Strayhorn, T. L., & Bennett, B. R. (in review). The nature of student affairs work at research universities. *NASPA Journal*.

SELECTED PRESENTATIONS:

Strayhorn, T. L. (2005). Spiritual awareness and assessment in higher education. Presented at the 2005 ACPA National Convention, Nashville, Tennessee.