University of San Diego

Digital USD

Dissertations

Theses and Dissertations

2006-01-01

They Who Persist: A Longitudinal Quantitative Case Study of a University Student Cohort

Kenneth J. Marra PhD
University of San Diego

Follow this and additional works at: <https://digital.sandiego.edu/dissertations>

Part of the [Leadership Studies Commons](#)

Digital USD Citation

Marra, Kenneth J. PhD, "They Who Persist: A Longitudinal Quantitative Case Study of a University Student Cohort" (2006). *Dissertations*. 764.

<https://digital.sandiego.edu/dissertations/764>

This Dissertation: Open Access is brought to you for free and open access by the Theses and Dissertations at Digital USD. It has been accepted for inclusion in Dissertations by an authorized administrator of Digital USD. For more information, please contact digital@sandiego.edu.

**THEY WHO PERSIST:
A LONGITUDINAL QUANTITATIVE CASE STUDY
OF A UNIVERSITY STUDENT COHORT**

by

KENNETH J. MARRA

A dissertation submitted in partial fulfillment
of the requirements for the degree of

Doctor of Philosophy
Leadership Studies

University of San Diego

2006

Dissertation Committee

Dr. Fred J. Galloway, Ed.D., Chair
Dr. Kenneth Gonzalez, Ph.D.
Dr. Linda Siefert, Ed.D.

© Copyright by Kenneth J. Marra 2006
All Rights Reserved

ABSTRACT

Since the first published work on student persistence in 1929 by Edgerton and Toups, there have been literally thousands of studies that have attempted to unravel the mystery of why some higher education students persist through to graduation while others do not. Many of these studies have been qualitative in nature, restricting their generalizability, while those that have used the few existing national databases to quantitatively study persistence have been restricted to looking within a single year at multiple institutions. What is clearly missing from the literature are methodologically sound, year-to-year persistence studies conducted at individual institutions. This deficiency in the literature is remedied by this study.

The study examined the year-to-year persistence of an entire entering cohort of 1,030 students in a private, religiously affiliated liberal arts university in the southwestern United States. Specifically, this study examined the extent to which such variables as student demographics and family background; academic preparation and achievement; institutional financial aid and personal financial factors; as well as select qualities of the collegiate experience influenced the year-to-year persistence of these freshmen over a five-year period. In addition, the study also examined the extent to which the importance of these factors varied as students progressed through their studies to graduation.

From an analytic perspective, descriptive statistics were used to characterize the cohort, and hierarchical logistic regression analysis used to estimate a series of nested regression models that examined the year-to-year persistence of each student in the cohort. Results suggest that: demographic and pre-college preparation factors become less significant as students progress through college; institutional experiences can be

significant but need to be better recorded across the campus in order to enhance prediction effects; and financial factors such as Net Price and Pain Index vary in significance and influence according to need category and enrollment status. Hopefully, these results can be used by institutional researchers, enrollment managers, and financial aid administrators to help institutions better understand what they need to do to increase retention on their campuses, to allocate scarce financial aid resources, and to inform policy decision interventions aimed at optimizing favorable student retention.

DEDICATION

I dedicate my dissertation to my daughter, Noelle Katherine Marra, who was so tragically killed by a drunk driver in her senior year of high school and never got to experience the joys of attending college. She left this earth a mere few days before receiving her first letter of acceptance to university. I also dedicate my dissertation to my spouse, Christine Louise Marra, who had to bear the horrible burden of the loss of our beautiful daughter to so senseless an act.

ACKNOWLEDGMENTS

This research effort could not have been accomplished without the support and encouragement of so many family, friends, and colleagues. I will attempt to acknowledge as many of you as I can with apologies to anyone I may have overlooked. The Good Lord knows who you are even if I so clumsily fail to recognize it here.

My family support has been crucial to my continuing this work to completion especially when I was experiencing early on difficulties with data collection and later with the regression models. Chris, my spouse, and Jennae and Dianne, our daughters, you were always there and I am grateful to you. I love you all and fully acknowledge the family time lost in order to complete this work. Also, I acknowledge my parents, Peter and Gloria Marra, who finally get to see their son earn his PhD. Thank you for waiting.

My committee, Fred Galloway, Linda Siefert, and Ken Gonzalez, I consider you colleagues and friends. Thank you, Fred, for personally coming to my office to announce my acceptance into the program, advising me all these years as a doctoral student, making statistics understandable and fun, and leading the committee at the end. Thank you, Linda, for inspiring me to follow your research lead and helping me better understand logistic regression. Thank you, Ken, for keeping this quantitative study conscious of qualitative contribution.

I thank my colleagues at the case university for their assistance without which data for this study could not have been collected: for admissions data, Warren Muller and Steve Pultz; for Registrar data, Ruey Shivers, Orlando Menezes, and Susan Bugbee; for housing data, Dayanne Izmirian; and for financial aid data, the late Sister Dale Brown,

Judy Lewis-Logue, Carol Lawrence, Marge Costanzo, and Betsy Weiss who crawled the cellar vault for the detailed financial aid data not recorded on university computers.

I acknowledge others on campus who gave me support whenever I needed it: Dirk Yandell for statistical advice; Marcus Jeffers for getting my computer restored after a catastrophic hard drive crash; Merrick Marino for providing insight into student learning initiatives; Cel Johnson for institutional research assistance; Pat Moulton, my executive assistant at the university, who kept me focused on my real job without sacrificing my research commitment; Beth Yemma who made sure my research was completed on time and in proper form; Curtis Cook, my former Dean and boss who believed in the value of my work and always offered encouragement and a good word; and Dean Paula Cordeiro, whose efforts in continuous program improvement have been infectious.

I also want to thank the people who gave me moral support whether they knew it or not: David Nichols, a Master Statistician for SPSS ready to help when I needed technical support; Stephanie Richards-Wilson, a former colleague and fellow doctoral student who has gone off into teaching elsewhere; Tom Dalton of the business faculty who put up with my above par performances on the golf course during those needed breaks; and Dave Walsh, my new boss, who gave me the flexibility to finish my degree.

Finally, I want to acknowledge the pioneers of the new PhD program that is replacing the EdD at the case university. We are the first seven students to have been selected and have blazed the trails together. Joining me in this exciting venture is: Dayanne Izmirian; Jodi Robledo; Kevin Petti; Mark Peters; Rebecca Bustamante; and Tricia Bertram-Gallant. We expect great things from all of us as we take our degrees forward. Thank you all for your friendship throughout our academic journey.

TABLE OF CONTENTS

IRB CLEARANCE.....	iv
ABSTRACT.....	v
DEDICATION.....	vii
ACKNOWLEDGMENTS	viii
LIST OF TABLES.....	xiii
CHAPTER 1 Introduction.....	1
Background	1
Some Historical Perspective	5
Statement of the Problem.....	11
Purpose of the Study	13
Research Question	14
Significance of the Study.....	14
CHAPTER 2 Review of Literature	16
Introduction.....	16
Understanding the Lexicon	18
Research Methodologies in Persistence Studies	22
Retention Models in the Literature	24
A Thematic Breakdown of Persistence Studies in the Literature	29
Studies on the Effects of Financial Aid on Retention.....	30
Retention Studies of College Freshmen.....	34
Retention Studies of College Upper Classmen.....	40
Retention Studies of Two-Year College Students	42
Retention Studies of Minority Students.....	44
Policy Research in Retention	44
Conclusion: The Place for This Study in the Literature	47
CHAPTER 3 Methodology.....	49
Introduction.....	49
Rationale for the Study	50
The Basic Model	52
General.....	52
Data Sources	53
Selection of the Model Variables.....	54
The Financial Variables – Net Price and Pain Index	55
Decision Rules for Missing Data Elements	56
Pre-Enrollment / Admissions Office Variables	56
Registrar Variables.....	57
Housing Variables.....	57
Financial Aid Variables	57
Statistical Analysis – The Case for Logistic Regression.....	58
Quantitative Research Design and Data Analysis Methods	59
Descriptive Analysis	59
Inferential Analysis.....	60
Models 1 – 30: The Individual Factors Models	60
Models 31 – 60: The Multiple Factors Models.....	61

Models 61 – 70: The Full Models.....	61
Models 71 – 103: The Full Models By Financial Need Categories.....	61
Tests of Statistical Significance	61
Limitations	63
CHAPTER 4 Results.....	66
Introduction.....	66
Dependent Variables.....	66
The Enrollment Variables	66
The Degree Variable	67
Independent Variables - Twenty-Four Demographic / Pre-College Experiences	67
The General Demographic Variables.....	67
The High School Performance Variables	68
The Parental Education Variables.....	70
The Ethnicity Variables	70
Independent Variables - Thirty-One College Experiences	71
The College Academic Variables	71
The Residence Variables.....	73
The Extracurricular Variable	73
Independent Variables - Fifty-Seven Financial Factors.....	74
The Cumulative Pain Index Variables	77
The Decision Pain Index Variables.....	77
The Total Cumulative Pain Index Variable	77
The Decision Net Price Variables.....	77
The Total Cumulative Net Price Variable	78
The Financial Need Variables.....	78
The Total Financial Need Variable.....	78
Description of the Data	79
Continuity of Study.....	79
Discussion of the Population Demographic Independent Variables.....	80
Discussion of the Population Pre-College Independent Variables	88
Discussion of the College Independent Variables	90
Discussion of the Financial Factors Independent Variables	96
Regression Results.....	101
The Analyst and the Practitioner – Different Perspectives.....	101
General Interpretation of the Logistic Regression Model.....	102
Methodology of Evaluation of the Models	105
Prelude	105
Evaluation of the Degree Models	106
Evaluation of the First Year Models.....	109
Evaluation of the Second Year Models	111
Evaluation of the Third Year Models	113
Evaluation of the Fourth Year Models.....	114
Evaluation of the Fifth Year Models	117
An Analytical Look at the Financial Need Models	120
No-Need Student Models.....	120
Low-Need Student Models	121

High-Need Student Models.....	121
Model 104 – A Special Model for Hispanic Students	121
CHAPTER 5 Summary of Findings	123
Introduction.....	123
Summary of Major Findings.....	124
Availability and Use of Institutional Data	124
Factors Influencing Year-to-Year Persistence	126
Variation of Factors between Classes and Among Groups of Students	129
The Case of the Low-Need Student.....	133
Degree Attainment Examined by Financial Need Categories	134
This Study as it Relates to the Literature	137
This Study as a Guide for Institutional Policy and Practice	142
Admissions Criteria	142
Campus Residency.....	144
Financial Aid Policies and Procedures	144
The First and Third Year Transfers	146
Implications for Further Research	146
Conclusion	148
REFERENCES	151
APPENDIX A: Model Details.....	160
APPENDIX B: Model Results.....	174
APPENDIX C: Enrollment Flow Chart.....	198
APPENDIX D: Logistic Regression Cut Point Calculations.....	199
APPENDIX E: Degree Attainment by Financial Need Categories	203

LIST OF TABLES

Table 2-1:	Six Year Graduation Rates from Selected Studies	20
Table 4-1:	Bureau of Labor Statistics CPI Corrections for Base Year 1998.....	76
Table 4-2:	Comparison of Enrolled Demographics: Siefert (2002) and Marra (2006)..	80
Table 4-3:	Enrollment and Graduation Population Breakdown	81
Table 4-4:	College Background of the Fathers of the Student Population.....	83
Table 4-5:	College Background of the Mothers of the Student Population	83
Table 4-6:	Ethnicity Percentages of the Student Population.....	84
Table 4-7:	Demographics of Initial and Graduation Populations Year 4 and Year 5	85
Table 4-8:	Mileage from Home of Record to the University	88
Table 4-9:	Admissions Profiles for Initial Enrollment and Graduation Populations	88
Table 4-10:	Declared Majors of Enrollment and Graduation Populations.....	90
Table 4-11:	Semester of Major Declaration of Initial and Graduation Populations.....	91
Table 4-12:	Cumulative Semester Units for Initial and Graduation Populations.....	91
Table 4-13:	Cumulative Grade Point Averages for Initial and Graduation Populations..	92
Table 4-14:	Campus Residency of Enrolled and Graduation Populations.....	94
Table 4-15:	Extracurricular Activities for Enrollment and Graduation Populations	95
Table 4-16:	Cumulative Pain Index Proximate to Next Semester Enrollment Decision .	97
Table 4-17:	Decision Net Price Proximate to Next Semester Enrollment Decision	98
Table 4-18:	Decision Pain Index Proximate to Next Semester Enrollment Decision.....	99
Table 4-19:	Selected Cumulative Pain Index and Net Price Comparisons	100
Table 4-20:	Percentage of No Financial Need Students Each Semester	117
Table 4-21:	Number of Students Choosing Not to Reenroll	118
Table 4-22:	Hispanic Student Enrollment and Graduation	122
Table 5-1:	Demographic and Pre-College Factor Predictors of Significance	129
Table 5-2:	College Experiences Factor Predictors of Significance.....	130
Table 5-3:	Financial Factor Predictors of Significance	131
Table 5-4:	The Low-Need Student Financial Factors in Reenrolling	133
Table 5-5:	Comparison of Four-Year Graduation Rates by Financial Need.....	134
Table 5-6:	Financial Factor Predictors of Significance by Financial Need.....	135
Table 5-7:	Degrees Awards According to Initial Admissions Rate	136
Table 5-8:	Comparison to National Data of First-to-Second Year Retention.....	149
Table 5-9:	Comparison to National Data of Six Year Graduation Rates	150
Table A-1:	Specification of Variables in the Persistence Model	160
Table A-2:	Organization of Independent Variables	169
Table A-3:	Specification of the 103 Logistic Regression Models	170

CHAPTER 1

Introduction

Background

Anytime new students enter a university or college in the United States, or for that matter elsewhere, the issue of individual continued enrollment through to graduation, referred herein as persistence, is a question often posed by governmental and institutional policy makers and studied by researchers. Persistence in the context of higher education is retention in college to graduation, or as Lenning, Beal and Sauer (1980) refer to it as “success in achieving some goal or objective”. Persistence refers to individual student effort to stay in school, the personal context. Retention, on the other hand, deals with institutional success in keeping students enrolled from year to year to graduation. In this institutional context, the university is concerned about retaining its students while the individual student is (or should be) concerned about persisting to graduation.

The subject is of interest to both practitioners and scholars. Practitioners are concerned about managing enrollment. Scholars want to know why students drop out of college, especially after having exerted considerable effort to get there in the first place.

Given the availability of numerous guides on the selection of colleges and universities and the enormous amount of attention that parents, students, and college officials focus upon the college selection process, it is puzzling that almost one half of students entering two-year colleges and more than one fourth (28.5%) of students entering four-year collegiate institutions depart these institutions at the end of their first year. (Tinto, 1993, in Braxton, Sullivan, and Johnson, 1997; Smart (Ed.), 1997)

Intuitively, one can imagine the costs whenever a student drops out of college. These are: the personal cost to the student of tuition and time lost in not finishing; the reputation cost to the university that admitted a student who did not complete; the

financial cost to the institution in having to recruit and replace the student; the societal cost in losing a potential college graduate; and, the government cost in subsidizing a student who did not earn a degree.

To better position the persistence and retention problem in higher education in proper context, consider six recent trends derived from government commissioned studies conducted over the past two decades.

One, college drop out rates are higher than expected. In 1990, the National Institute of Independent Colleges and Universities (NIICU) published a two-year study on undergraduate persistence and retention at four-year institutions of higher learning, and its findings were revealing. Using a national survey of 28,000 high school seniors in 1980 developed by the National Center for Education Statistics under the US Department of Education, the NIICU report concluded that: "Degree completion was lower than anticipated from a review of earlier literature. Only 41 percent of all students in the sample completed a bachelor's degree within six years of their high school graduation" (Porter, 1990).

Two, attrition from college happens quite often during the first year. Eight years later, the National Center for Education Statistics, using data from the 1989-90 Beginning Postsecondary Student (BPS) survey, completed an examination of the persistence of college students during the freshman year and reported that: "Nearly 30 percent of 1989-90 beginning students left postsecondary education before the beginning of their second year" (Horn & Carroll, 1998).

Three, the traditional college student is anything but traditional anymore. In 2002, the American Council on Education (ACE), in its report on a ten-year longitudinal study of college enrollment using national databases concluded that:

Traditionally, four-year college students have enrolled full time immediately after graduating from high school; depended on their parents to take care of most, if not all, financial responsibilities; and worked part time or not at all. Today, only 40 percent of four-year college students fit this traditional mold. (Choy, 2002)

Four, college tuition increases as student financial aid shifts from grants to loans. The trends in college pricing, as reported by The College Board, suggest that college will remain expensive and out of reach to many of our young people. First, tuition continues to rise.

In the 1970s there was little, if any, real growth in college prices. In the early 1980s, however, tuition and fees began to grow much more rapidly than consumer prices. Over the ten-year period ending in 2002-2003, after adjusting for inflation, average tuition and fees at both public and private four-year colleges and universities rose 38 percent, much more slowly than over the preceding decade. Still, charges in both sectors have grown over the last two years at relatively high rates by historical standards. (The College Board, 2002)

Second, students attending college are more likely today to be taking out loans rather than receiving grants.

During the 1980s, the cost of attending college rose over three times as fast as median income, while student aid grew slowly. College costs continue to grow relative to the median family income, but student aid grew more rapidly than tuition and fees over the decade. However, much of the growth in aid has been in the form of loans, rather than grants. (The College Board, 2002)

To review, the national studies and College Board data tell us: that the drop out from college is worse than previously studied; that it is most pronounced during the freshman year; that the very composition of the college population has changed

dramatically during the course of the past twenty years; and, that the student who stays in college is likely to face increasing debt as he/she persists to graduation. These trends can only make the study of the persistence and retention problem all that more significant.

Five, the sources of college institutional funding are shifting from public and into private hands. Another notable trend in higher education centers on the institutional budget and the shifting of sources of institutional funds. The College Board reported in 2002 that, over the decades of the 1980s and 1990s: state appropriations to public universities and colleges declined from 45 percent to 36 percent; tuition at public institutions, as a percentage of total revenues, rose from 13 to 19 percent; and, tuition at private institutions, as a percentage of total revenues, rose from 35 to 43 percent (The College Board, 2002). Institutions of higher learning, particularly private colleges and universities, are relying increasingly on tuition dollars to meet operating expenses, maintain physical plants and academic programs, and pay faculty and staff, while the burden to pay for all this is shifting to the students who must contend with rising tuitions and lowering financial grants.

The College Board figures above are the average percentages. Some institutions with lower endowments rely even more heavily on tuition to operate. At the researcher's institution, for example, the amount of tuition and fees, as a percentage of total revenue for the 1998 – 1999 university budget is 78 percent (Office of the Provost, 1998), not inconsistent with many private universities.

Six, the economic and societal benefits of a college education are significant and growing. The College Board reports that the median income of a college graduate is 80 percent higher than that of a high school graduate and that lifetime income exceeds a

million dollars for the college graduate over the high school graduate (The College Board, 2002). This contrasts to a 49 percent earning differential for a male in 1979 (Tierney, 1998). It can be inferred that society benefits by having a citizenry better educated, less dependent upon public handouts, and more able to pay higher taxes from higher income to fund necessary public services.

These six trends, taken together, reveal some of the complexities associated with the phenomenon of persistence and retention in higher education. The challenge to institutional researchers and policy makers to better understand the persistence of students, particularly on the private campuses of America that are dependent upon tuition revenue to exist, is significant. The challenge to society to retain its best students in college to degree completion is equally important.

Some Historical Perspective

Ever since the days of Edgerton and Toops, two Ohio State University professors who, in 1929, published the first widely distributed retention study in higher education, there has been a proliferation of research devoted to the persistence of students in colleges and universities around the world. Studies have focused on a multitude of identifying factors that affect student persistence including: academic, environmental, pre-collegiate background, gender, race, family history, personal aspirations and motivations, financial considerations/constraints, personality, institutional characteristics, faculty interaction, student involvement, and specific institutional programs designed specifically for the retention of college students (Karp, 2002). The literature includes both qualitative and quantitative studies involving various research techniques utilizing data

generated by specifically designed survey instruments as well as from institutional and national databases.

In Edgerton and Toops' 1929 study, the researchers tracked 1,958 students in the freshmen entering class of 1923 throughout four years of college work in the six colleges of Ohio State. They analyzed descriptive statistics and created detailed 1920s state of the art and elaborate hand-made graphs to portray their published findings. The professors found that 68.6 % of those entering students completed the first year of their studies, 49.9 % finished the second year, 40.3 % the junior year, and "only 35.0 % of the original entrants...completed work during the Spring Quarter 1926-27, the normal graduation quarter" (Edgerton & Toops, 1929, p. 133).

Thus, our estimate is that we may ultimately expect about 35 percent ...to graduate...This estimate...points quite definitely to the conclusion that there are certainly a number of places where the University and the student are not properly adjusted to each other. (Edgerton & Toops, 1929, pp. 135 – 136)

In somewhat dated language, the conclusion of Edgerton and Toops' study puts out the challenge to policy makers and researchers to find ways to improve retention for the best students.

Some sort of a constructive program with the needs of the superior student in mind should be instituted. The work of one outstanding student cannot be equated to that of any number of inferior students. We have here the problem of equating the output of one motivated genius with that of numbers of inferior students. (Edgerton & Toops, 1929, p.139)

During the five decades immediately following the Edgerton & Toops study, little research on persistence in college made its way into the literature before Spady's retention model appeared in 1970. It was this model and the work of Tinto, who, in 1975, unveiled his retention model that prompted greater research interest in the subject matter.

In the early 1980s, the subject of college retention really took hold among the research community. A simple reference check on the Internet's Educational Resources Information Center (ERIC), a compilation of abstract journal articles and other research documents in education and related fields, reveals a total of only 48 articles archived under "academic persistence" before 1980 but an average of 140 literature entries each year thereafter. The rise of women and minorities on campuses across America, the maturing of the civil rights movement, the Higher Education Act of 1965, the effect of the GI Bill on college enrollment, the sharp increase in the cost of college education, and the development of retention models following the works of Tinto and Spady in the 1970s all may have contributed to increased awareness for more research in student persistence and institutional retention in higher education. But, despite the volumes of writings produced, there is little work that followed Edgerton and Toops' lead focusing on a cohort of students as they progress through a college or university program.

Three specific models of college student retention gained notoriety since the 1980s: the General Causal Model (Pascarella and Wolfe, 1985); the Longitudinal Model of Institutional Departure (Tinto, 1993); and the Integrated Model of Student Persistence (Cabrera, Nora, and Castañeda, 1993). These models identified a myriad of factors that influence student learning and the decision to persist or depart a university. Researchers have used these models, among others, to analyze groups of student samples. Although Edgerton and Toops used a single university's data for study, many researchers have relied on samples from large national databases, such as those compiled by the National Center for Education Statistics (NCES), to test these and other persistence theories.

The use of national databases over the use of institutional databases in persistence and retention research has its advocates. Braxton and Lien (2000), in studying the effects of academic integration on the retention question, preferred data from a variety of colleges and discounted what can be gained from an individual institution.

Multi-institutional appraisals provide robust empirical backing for the effect of academic integration on both subsequent institutional commitment and student departure decisions. In contrast, single-institutional tests render modest empirical support for both of these forms of influence of academic integration. (Braxton and Lien, 2000, p.22)

This study took an alternate approach in recognizing a need, perhaps even an imperative, for the single-institutional study particularly when administrators and policy makers have decisions to make concerning their unique campus environment that can affect their individually enrolled students. The national databases may be important at the governmental level, but the Boards of Trustees and the Presidents need data more specific to their needs.

Retention studies have centered on identifying specific characteristics of colleges that have enhanced retention. Identified characteristics include: higher admissions standards (Forest, 1967); private and religious affiliation (Trent and Ruyle, 1965); location of institution (State University of New York, Albany, 1989); clearly defined institutional mission (Huber, 1971); and, faculty personalities more closely matched with student personalities (Martin, 1997). Institutional studies may be better suited to study the persistence question at the individual level. It is the individual university decision and policy makers and the institutional researchers who must deal with the consequences of the individual student decision to leave prematurely, and who must address the moral imperative in the context of the institution's societal role. Why is there such an

imperative? The reason lies in the fact that the student persistence decision is becoming more and more critical both for the student and for society. Tierney (2000) made this observation.

Increasingly, the consequences of dropping out are quite severe. As manufacturing jobs move to the third world, workers in the United States need to rely on advanced skills often learned in postsecondary education. In 1979, for example, a male college student earned 49 percent more than a male with only a high school degree, and today that gap has grown to over 83 percent (Tierney 1998)... the consequences are more severe today than ever before for those who drop out. (Tierney, 2000, p.216)

Amidst the necessity to understand why students choose to stay in higher education or not, some of the studies have produced seemingly contradictory conclusions. For example, Herndon (1984) found that students who lived off campus were more likely to discontinue their studies than those who lived on campus. But Christoffel (1986), almost counter intuitively, had determined that students who lived off campus showed better retention because that choice was based on the need to improve ones chances of staying in school. In another series of studies, Smith (1976) reported that dropouts had personalities that were better able to cope with ambiguity. But, Brawer (1973) found that persisters were better able to cope with ambiguity. Several studies supported the contention that extra curricular activities in college positively impacted retention (Berson 1996, Boyd 1992, Benacci 1991). Yet, Villeda (1997) suggested the opposite.

One consistent finding with regard to college student persistence and institutional retention came from the research of Vincent Tinto.

Positive interaction with faculty members has a direct bearing on whether students persist to earn a degree... The more faculty members interact with and become engaged with students, the more likely the students are to stay in college. (Tinto, 1989)

Braxton (2000, p. 257) reinforced Tinto's conclusion. Terenzini, Pascarella, and Blimling (1999) illustrated the fundamental difficulty in determining the factors that do affect retention in college: "The impact of any given collegiate experience is smaller than the cumulative effect of multiple experiences, particularly when they are mutually supportive and reinforcing (p.617)." To state another way: the literature suggests that the analysis of college student persistence and institutional retention is a complex and difficult challenge.

Braxton, in evaluating Tinto's theory on persistence, summarized what researchers have found.

We are beginning to make substantial progress in our understanding of the roots of college student departure. Research testing Tinto's ... theory has yielded robust empirical support for four logically interconnected propositions. (Braxton, 2000, p.257)

These propositions could be categorized as follows. First, a student arrives on campus with a unique background, experience, and set of characteristics that affects an initial level of commitment to the college. Second, a subsequent commitment, developed from this initial commitment, is formed as a result of enrollment experiences. Third, this subsequent commitment is influenced further by the academic and social integration of the student into the institution. And fourth, the likelihood of persistence increases as this level of subsequent commitment increases. Bring in the properly motivated students. Ensure they have a meaningful and integrative experience while enrolled. And, they will stay. This notion lends support to the premise that the study of persistence makes sense in the context of some form of longitudinal methodology. But, there is still a big problem. "Our knowledge and understanding remain incomplete because social integration remains unexplained" (Braxton, 2000). Thus, the problem of both understanding and evaluating

student persistence in the context of institutional retention remains a challenge despite the many years of research.

As was noted, it is difficult to find Edgerton and Toops-like longitudinal cohort-based studies among the literature on student persistence, in part, because longitudinal studies are challenging to conduct. Bean (1990) offered one explanation:

On the one hand, longitudinal studies provide the best quantitative, descriptive, and analytical data for the study of attrition. On the other hand, the analyses can become very complex, requiring methodological specialists to conduct the study and communication specialists to present the findings in a meaningful way (a rare combination in a single individual)...Researchers will need to be skilled at describing findings in lay terms in order to make either cross-sectional or longitudinal analyses usable for most senior-level policy makers. (Bean, 1990, pp. 177-178)

With the advent of modern statistical techniques and software packages to aid in analysis, multiple factors can now be considered quite easily by anyone in higher education with access to computer software such as SPSS, and a solid methodology for gathering and recording pertinent retention data. The critical question centers on what data to collect and what methodologies to employ. In terms of quantitative techniques, more sophisticated options beyond the descriptive statistics used by Edgerton and Toops in their 1920s study are available for contemporary research and warrant consideration.

Statement of the Problem

As previously noted, both public and private universities have been confronting increasing operational costs with declining government tax support in the case of public institutions and declining tuition revenues in the case of private institutions. In the meantime, “Declines in state and federal funding as a percentage of total expenditures have shifted a greater share of the costs to students and families” (The College Board, 2002). In the midst of these economic realities, there has been increased pressure on

colleges and universities to raise the percentage of alumni giving, to enhance academic reputation, and to improve their financial position. Alumni and student satisfaction and retention can affect college rankings in national publications and these factors are statistically recorded and taken into consideration when school rankings are posted. Persistence in college has taken on a financial aspect not only in terms of its impact in school ranking and alumni support, but also in terms of its direct costs to the university, year in and year out. It costs money to recruit, admit, and enroll students to replace those who depart prematurely (Bean, 1990).

The decision to drop out of college also has taken its tolls on individual long-term earning power with spin-off societal consequences. In the ideal situation, every student who enrolls in a particular college or university would graduate on time. The student who persists does not have to be replaced prematurely; counts towards the institution's success rate; holds a seat in the classroom that, if left vacant, reduces the revenue stream and raises the overall burden of the institution's fixed costs; and graduates into a society increasingly in need of higher skilled workers.

With greater than expected drop out rates in higher education, the continued transferring of financial burden to students who stay and universities who retain them, and the demographic shifting of the college student population, the burden on college institutional researchers and policy formulators has never been so challenging.

What has been missing in the contemporary literature is a comprehensive methodology for conducting a longitudinal study and collecting and evaluating data pertaining to the factors that could affect the college student retention at a given institution. The study of large, national databases, although important in the context of

broader policy discussions, did not offer senior college administrators adequate glimpse into the specifics of their university. There remained a need to develop a methodology for the gathering and analysis of retention data to support a longitudinal study that could be conducted at the local level.

Purpose of the Study

The purpose of this study was to respond to the need articulated by developing a mathematical model to test the likelihood that students enrolled in a particular institution would persist from year-to-year to graduation. By developing a comprehensive list of factors, quantified and collected at the local level, modern statistical techniques could then be used to advance the studies of researchers like Edgerton and Toops and utilized to predict how an entry class of freshmen would persist in their studies and the extent to which they completed their degrees. By employing such a model, institutional researchers and policy administrators would be able to make inferential decisions at the local level to improve retention and reap the organizational, financial, and societal benefits higher college graduation rates promise.

The specific model developed for this study is applicable to the researcher's institution, a private Roman Catholic university in the southwest United States that benefited from initial work by Siefert (2002) who created a detailed mathematical model to examine student enrollment. Siefert used logit and probit analysis to predict the likelihood that an admitted student would enroll in the university, given a specific high school record, financial aid offered, and demographic considerations.

This study is longitudinal in nature and is concerned with the students who do enroll and their progress towards graduation. It examined a specific cohort of students,

the 1,030 freshmen who entered the university in the fall of 1998. It is a study that can be replicated at any university where the researcher has access to student data and computer statistical analysis. This study utilized the software capability of Statistical Product and Service Solutions (SPSS) 12.0 and employed hierarchical logistic regression analysis. Although this study has been constructed along the longitudinal cohort-based work of Edgerton and Toops, it was designed to demonstrate a model of general applicability as well as investigate the phenomena of a particular institution's record of retention.

Research Question

The purpose of this study is translated into the following research question. To what extent do: student demographics and background; academic preparation and achievement; institutional financial aid and personal financial factors; and the collegiate experience influence year-to-year persistence in higher education over time at a particular university and does the importance of these factors vary between class levels or among particular social, economic or ethnic backgrounds?

Significance of the Study

Bean (1990) reiterated the cost of poor retention to colleges and universities.

In a baccalaureate program, students who drop out during their first year represent the loss of three (or four) years of tuition and not one. It takes four freshmen who quit after one year to equal the income of one student who stays for four years. (p. 147)

Multiply this out for thousands of students attending our largest universities over three to four years and the tuition revenue loss can be quite significant. Include the costs to recruit replacement students (transfers), and the mandate to the institution to improve retention becomes even more financially significant.

There has been a growing notion in research that particulars matter; a recognition that context is important; an understanding that studies need to be tailored; a concern that the use of large databases might “average out” individual cases. Siefert (2002), concerned with these notions, examined a series of independent variables pertaining to enrollment decision-making, looked at each in terms of individual case sensitivity, and then took the average of each case to derive a prediction model. This work is in contrast to the preponderance of the studies that deals with average effects across many cases.

This study gathered a wide variety of data from a myriad of on-campus sources and, utilizing critically accepted quantitative techniques, examined predictors or the likelihood (odds) that any particular element may have on the overall decision of a student to remain in college. The advantage of being able to use a specific student population rather than having to take sample data eliminated the need to deal with issues of sample error and sample adequacy. It is one reason why the techniques employed in this study can be so useful to individual institutional researchers.

CHAPTER 2

Review of Literature

Introduction

The literature on the subject of persistence in higher education is voluminous. Researchers have conducted countless studies in which they: collected data from a variety of institutional and governmental sources; identified scores of variables to explain why students leave college; developed methodologies to predict student persistence behavior; and, formulated comprehensive models to explain it all. The literature is extensive because the problem is anything but trivial. There are as many reasons why students choose to leave a college or university as there are students who leave. It may be that the student is failing in the coursework; has decided the social setting is not conducive or what had been expected or advertised; believes that he/she can not afford any more debt; wants a new major not offered by the current institution; has a friend who attends elsewhere and just wants to be there as well; becomes involved in activities outside the institution that drives the student away; has not connected to anyone on campus, be they student or faculty; lacks the will to continue; sees no real value in pursuing the degree; was really in college because of parental and family pressure; and so forth.

Much of the question of persistence focuses on the student who chooses not to persist; the student who leaves the institution. What happens to this student is often problematic to the researcher. How, for example, can one track a student who has left one university, enrolled in another, drops from the second, remains away from higher education for years, decides to enroll in a third, and finally graduates twenty years after first matriculating at age eighteen? If the definition of persistence is the attainment of a

degree, this student has persisted. But, finding a method to track just this one student through the process, let alone the tens of thousands of entry students each year at the large public universities, offers great challenges for institutional researchers. It is no surprise then that researchers have developed a myriad of methodologies and identified countless factors relating to the causes for persistence, and have used them to develop a variety of models to help explain drop out behavior.

One way to examine the problem of persistence and retention is to study those students who remain at the institution rather than those who leave. Looking at the qualities of the persistors allows the researcher to make inferences about why they might be staying and, consequently, offer a glimpse about those qualities of the students who do not persist. That is how this dissertation approached the study of persistence and that is the focus of this literature review. The intention is to highlight the work that has been done studying those students who remain in school and to demonstrate the contribution this study makes to the overall body of knowledge.

This review of the literature consists of six components. First, understanding the terms used in the persistence literature serves to frame this study and to reiterate the ways in which researchers have approached the topic of higher education retention. Karp & Parker (2002) conducted a comprehensive literature review on the subject of persistence in college that covered three essential aspects: definitions of retention and attrition in various studies; retention rates, achievement of degrees, and time-to-degree; and, general factors related to the retention of students. This review offers insights into the lexicon. Second, methodologies used in retention studies may be sociologically based, or stem from psychological theory depending in large part on the backgrounds and points of view

of the researchers. Others may be more pragmatic and based on economic and business theories. Several methodologies are reviewed for their overall effectiveness in answering the fundamental research question – what characterizes the successfully retained student? Third, major models in the persistence literature are critiqued. Fourth, a thematic approach to the types of retention studies reported in the literature serves to illustrate the contribution this study makes to the already extensive body of knowledge on the persistence of students in higher education. Fifth, a critical review of selected persistence policy research follows. Finally, the contribution of this dissertation to the literature is discussed.

Understanding the Lexicon

First, a distinction is made between retention and persistence. Although often interchanged with persistence, retention, in general terms, can be described as the accomplishment of a defined objective while attrition is the failure to accomplish the objective. In the context of this study, the objective is persistence through college to graduation. In one sense, the students' ability to "progress towards" is the benchmark of success in persistence and is used by the NCAA's criteria for eligibility to play intercollegiate sports. But, Lenning, Sauer, and Beal (1980) dispute the concept of on-time graduation claiming it to be an inaccurate view of the meaning of retention. In the era where the traditional four-year college student is becoming less traditional, a student who graduates in five, six, or more years of continuous enrollment has persisted and been retained. Those students who take courses part-time or temporarily interrupt their studies also don't graduate according to the standard time line but, if they complete and eventually graduate, haven't they not persisted as well?

It is important then to define exactly what is meant by retention or persistence in order to be able to differentiate those who persist from those who don't. This study defined persistence as continuous or near continuous enrollment in the matriculating institution over a five year period. By restricting persistence in this manner, identification of individual student subjects was simplified. A check of institutional registrar lists confirmed easily the enrollment of any individual from one term to the next. But, try to determine if a student whose name does not appear on the term list has disenrolled permanently, reenrolled elsewhere, or just took a leave of absence. One can begin to visualize the dilemma an inaccurate definition of persistence can have on the research. On the other hand, the student who leaves and returns to complete within the five year period essentially remains on track with other students who may have elected double or engineering majors requiring five years of course work and, as such, is considered to have persisted. In summary, persistence is for students; retention is for institutions.

Second, if the definition of retention can be adapted to support a particular research design, retention rates themselves can serve many purposes. Astin (1975) studied undergraduate students in 358 colleges and universities and found the four-year retention rate to be 49.6%. He defined retained students quite narrowly, but probably appropriate for the times, to be those who received their bachelor's degree four years after starting college. Decades later, Karp & Parker (2002) reported, "more recent national studies reflect higher graduation rates, although the average time-to-degree seems to have increased from four to six years" (p.2). Tinto (1987), citing US Department of Education statistics, revealed that for 1986 first time college students, 57% of them would leave without a degree. But, this doesn't say how long the remaining 43%

of 1986 freshmen took to get their degrees. If some took more than, say ten years, could they be counted as persistors?

The definition of retention takes on significance when the source of the retention study is considered. For example, the US Department of Education (USDOE) 2000 as reported in Karp & Parker (2002, p.3) announced, “the six-year graduation rate for students entering four-year institutions in 1989-1990 was 60.4%”. Comparing this rate to the USDOE 1986 figure, the statistics revealed an apparent improvement in student persistence over three years. The American Association of State Colleges and Universities (AASCU) conducted its own study and found “an overall average six-year graduation rate ranging from 40.6 percent in 1993 to 42.7 percent in 1996” (Karp & Parker, 2002, p.3). So, now there is a study reporting a precipitous decline of nearly 20 % of the six-year graduation rate that would make educators in higher education pause. But, there is better news from the Consortium for Student Retention Data Exchange (CSRDE) that analyzed 344 colleges and universities and presented data that showed “the average six-year graduation rate for students who entered college in 1994 was 54.1%” (Karp & Parker, 2002, p.3).

Table 2-1 summarizes these four studies that used national or multi institutional databases to report highly different six year graduation rates.

Table 2-1
Six Year Graduation Rates from Selected Studies

<u>Study Conducted By</u>	<u>Entry Year</u>	<u>Six-Year Graduation Rate</u>
US DOE	1989	60.4%
AASCU	1993	40.6%
CSRDE	1994	54.1%
AASCU	1996	42.7%

One should be cautioned not to quote and compare these figures without knowing the types of institutions surveyed and the methodologies utilized in the analysis. This illustrates the point that how the researcher defines retention, from which data are obtained, and how studies are conducted, do matter.

There are many factors relating to the retention of students. Only the students and their experiences can limit the factors that influence their persistence. If a researcher can locate the data, it is likely to be used somewhere in some retention study. Nine broad categories of retention factors suggested in a comprehensive literature review of Karp & Parker (2002) are: academic; gender; race; aspirations and motivation; financial; personality; institutional characteristics; student involvement; and remedial instruction. Institutional policy can influence the effects on retention in each of these categories through a comprehensive review of admissions decisions, academic and social programs offered on campus, commitment to student welfare, and awarding of financial aid packages.

Policy makers no doubt are aware of what Tinto (1987, p.65) wrote is of paramount importance: “what happens following entry is, in most cases, more important to the process of student departure than what occurs prior to entry”. He built this from earlier work that recognized the importance of the university’s social system. “It is not surprising that a number of studies have found that social interaction with the college’s faculty is related to persistence in college” (Tinto, 1975, p.109). In a study that interviewed students on 90 campuses, Light (2001) found that the times faculty offered advice, challenges, and opportunities; they touched students in ways that would greatly

influence their desire to remain in college. According to Light, faculty influence on student persistence appeared to be significant.

What is apparent with all the factors surrounding retention is that the decision an individual student makes to persist or not to persist is a complex one. But what is also apparent is that “the impact of any given collegiate experience is smaller than the cumulative effect of multiple experiences, particularly when they are mutually supportive and reinforcing” (Terenzini, Pascarella, & Blimling, 1999, p.617). The choice of methodology used by the researcher is important to capture this cumulative effect as accurately as possible.

Research Methodologies in Persistence Studies

As previously noted, there are several definitions and interpretations for retention and plenty of statistics derived from significant large studies on retention rates. There are also many research methodologies used in studying student persistence in higher education. Here is an example of some data gathering methodologies.

Bean (1990) listed six approaches: autopsy studies; cross-section studies; longitudinal studies; qualitative studies; quantitative analytical approaches; and, program evaluation. So-called autopsy studies “pick at the carcass” to examine what happened. The student has already left the institution, so the researcher seeks to find out why. Cross-sectional studies view student populations in groups of represented samples, the data from which is taken at one time. Longitudinal studies apply a time series approach often catching the sample of students in specified snap shots over time. The same group of students is normally used but some longitudinal studies also utilize different groups of students over time. Qualitative studies, limited in sample size, are for discovery of rich

individual material. Quantitative studies, unlike those mentioned above that deal with data collection, are concerned primarily with data analysis. Program evaluation examines the results of some intervention usually by comparing a group that received the intervention with one that did not. For details on each, see Bean (1990, pp. 147-169). In the end, the approach Bean recommended depends on the researchers' time, purpose, and access to pertinent data. "When possible, use a combination of methodologies. Establish a data base and maintain it" (Bean, 1990, p.183).

These methodologies often rely on student surveys that must be carefully constructed and are not without their critics. Adelman (1998) is not shy in his criticism of this form of data collection. "It is my unabashed intention to persuade researchers to avoid student accounts of their academic backgrounds and achievements as if these accounts carried the Bubonic plague" (p.7). According to Adelman, the data students provide are often quite subjective and tend to hamper the work of the unbiased researcher. This study avoided the use of survey data, not out of fear of contracting an exotic disease, but rather because the methodology proposed was designed to take advantage of data on campus from specific departments universal to all institutions.

Astin detailed two types of data analysis for retention studies – descriptive and causal. "Descriptive analyses are concerned simply with describing the current state of affairs while causal analyses are designed to estimate the comparative effects of different environments on student outcomes" (Astin 1993, p. 127). For the researcher wants to use statistical techniques in a causal study, Astin recommends correlational and regression analysis as "especially well suited to causal studies because they permit the investigator to control simultaneously a large number of potentially biased input variables" (p. 127).

There is room for both techniques. The use of descriptive statistics provides overviews that present insight into who are the students of the sample or population, from where they came, what aspirations and experiences they brought, and how they have “organized” themselves and integrated into the institution. Causal analysis in turn allows for an inferential determination into why students make their persistence choices.

After reviewing general methodologies for data gathering and analysis, it is important next to examine some key models developed by researchers to explain the persistence phenomenon.

Retention Models in the Literature

Edgerton and Toops may have been the first to publish a retention study. Theirs was a longitudinal study using a descriptive statistics methodology from data recorded at a single institution. But it wasn't until Spady (1970) that the first theoretical persistence model gained notoriety. Spady's model was influenced by the suicide research of Durkheim (1961). A sociologist by education and training, Spady postulated that the decision to drop out of college was behavioral; that the student was withdrawing from a social system in a similar if less dramatic fashion to suicide. Spady's variables are “shared variables”; those that emphasize academic work with support from family, friends, and others in the institution. It opened the research door to the exploration of the persistence decision as more than just an academic choice.

Tinto's (1975) persistence model, known as the Student Integration Model in the literature, stemmed from Spady but was longitudinal in nature applying a variety of social and academic factors. Also a sociologist, the influence of Spady's suicide research was apparent in Tinto's contention that a student needs to drop out of his/her pre-collegiate

society, in essence commit suicide to it, in order to embrace the culture of the institution in which enrolled. The failure to make that break is a primal cause for dropping out.

Tinto's eight major causes or roots of persistence are grouped into three brackets: prior dispositions (the background the student brings to college); collegiate experiences (academic and social involvement in the campus community); and, external forces (outside employment, family, and other influences) that impinge upon the first two.

Tinto's variables are extensive and his model, refined over the years, is widely referenced in the literature.

Fishbein and Ajzen (1975) developed a psychological model for student persistence based on attitude and behavior. They define an attitude as "a person's favorable or unfavorable evaluation of an object" (p.12). In this context, the object is the institution of higher learning. This model links beliefs with attitudes, intentions, and behavior. Over time, one's beliefs influences one's attitude (in this instance, the favorable or unfavorable evaluation of the institution and one's place in that institution) which in turn leads to the intention to persist or not and ultimately to the behavior itself as manifested in the persistence decision. Bentler and Speckart (1979) enhanced this model by adding the element of past behavior as an influencer of future behavior. Although not nearly as quoted as Tinto, Fishbein and Ajzen's contribution to the literature is significant in that it advanced the notion that the study of persistence can be addressed in psychological as well as sociological terms thus bringing both disciplines into the persistence research field.

Bean (1980, 1983) developed a compatible model to Tinto's without the influence of suicide research. Commonly known in the literature as the Model of Student

Departure, Bean viewed the persistence question as analogous to turnover in the work environment and was influenced by the psychological modeling of Fishbein and Ajzen (1975). The decision to persist in college is a result of a cyclical behavioral process. Beliefs influence attitudes that guides intentions and results in specific behavior. Bean introduced the environmental variables, external to the institution that nevertheless can influence a student's decision to stay or dropout. He is also credited with modeling for institutional fit whereby a student might fit in some capacity but not in others. The classic example is the high achieving loner student who may fit academically but not socially yet still feels he/she has achieved an institutional fit. This student who persists has developed the necessary coping behavior. It is this coping behavioral theory that places emphasis on stress reduction. With reduced stress, students are more likely to stay enrolled in college (Lazarus, 1966).

Bean and Metzner (1985) collaborated on a retention model for the non-traditional student where environmental and background factors were more important than institutional factors for the students who spend little time on campus outside of class. In this model, a student's family and friends are more important factors than a college's faculty, programs, or facilities in the decision to persist. Even though specific research may focus more on the so-called traditional student, listing individual students, as living on or off campus, would help to capture Bean and Metzner's contention that the time a student spends on campus is significant in the persistence decision.

Additional persistence models, Bandura (1986) for example, have been based on self-efficacy theory that suggests past experience and observation as critical for an individual to acquire a perception of ability to do a task or to deal with a particular

situation. Under this theory, it is the personal recognition of competency that engenders self-confidence leading to a demonstration of higher aspirations, performance, and persistence to graduation. In another model using self-efficacy theory, Solberg et al (1993) studied social and academic measures and found a positive relationship with college persistence among Hispanic students. The theory provides insight into the motivational elements of academic and social integration. Solberg et al (1993) suggested that the integration process requires a certain behavioral and attitudinal energy that stems from self-efficacy. And this energy can supercede skill levels allowing the student to attain that level of integration more conducive to a positive persistence decision. Self-efficacy theory is gaining growing interest among researchers in the persistence field. The challenge to data collection in this area is formidable.

Weiner (1986) adopted attribution theory in a causal model of persistence using what is called the locus of control (Rotter, 1966). Weiner suggested: "a locus of control indicates an individual's ability to provide an internal or external causal perspective for past outcomes and experiences" (Bean and Eaton, 2000, p.54). For example, an internal locus of control allows a student to believe he/she can influence a performance outcome in a given academic course by studying harder to achieve a higher grade. In this instance, the student feels more in control and is likely to put out more study effort to achieve a better grade. An external locus of control, on the other hand, deflects grade performance to problems with a difficult subject matter, a boring and ineffective instructor, or an inadequate textbook. In this case, the student believes that his/her amount of study effort is somewhat irrelevant, so why bother. Thus, according to attribution theory, if a student feels more in control of an outcome, he/she is more likely to do what is necessary to

obtain that outcome. Follow-on studies to Weiner's model have found that the internal locus has a strong positive correlation, along with other emotional factors, with academic success (Van Overwalle, Mervielde and De Schuyser, 1995).

Tinto (1987) expanded his earlier Student Integration Model to include environmental variables and student intentions. This model adds the work of Van Gennep's (1960) rites of passage where a student must first undergo separation from family and high school, then engage in transition at college, finally to be incorporated into the collegiate culture. This model has undergone recent criticism from researchers who espouse that cultural suicide is not what retains minority students and in fact can lead to serious institutional "misfitting" when these students feel compelled to shed their cultural norms in order to blend in to the university norms of the majority persuasion. The researcher needs to exert caution when modeling the effects of any cultural change on the decision of a student to stay in college. Other critics of Tinto's model claim that not all the variables needed to understand departure behavior are included (Cabrera, Stampen, and Hansen, 1990).

It is Tinto's 1993 longitudinal model of institutional departure, a refinement of his previous work that is one of the most studied pieces of research in the field of higher education (Baird, 2000). In this highly comprehensive model, Tinto incorporated pre-entry attributes with goals and commitments and institutional experiences into academic and social integrations from which follow-on goals and commitments are formed. Combined with external commitments, these academic and social integrations lead to the persistence decision. Despite its robustness, some researchers believe that Tinto's model is too diverse for empirical study.

Such diversity undoubtedly reflects the fact that the model is often tested in secondary analyses of data sets that were developed for other purposes. Thus the researchers often looked for items that might in some way be related to Tinto's concepts rather than constructing items and scales designed to measure the constructs carefully. The result, however, is a rather confusing empirical and theoretical understanding of the meaning of the variables in the model. (Baird, 2000, pp. 62-63)

Psychologist critics contend that Tinto's view of perceived social integration as a behavior measure runs counter to Spady's (1970) psychological measure. To these critics, the distinction is important because it suggests that the students' social integration into the institutions is influenced more by subjective interpretations rather than behavioral norms (Hurtado and Carter, 1997).

Many of the variables in Tinto's model can be seen to operate intrapsychically. Goal and institutional commitments are personal statements of intent; social and academic integration can be viewed as the psychological consequence of interactions with the institutions' systems. (Baird, 2000)

As noted later in this literature review, however, a student's level of academic and social integration can sometimes run counter-intuitive to the persistence decision.

Undoubtedly, psychological constructs will receive increasing attention in the literature on persistence in higher education. But, as the academic debate on the efficacy of existing models in student retention continues among researchers, new models to explain persistence will likely emerge.

A Thematic Breakdown of Persistence Studies in the Literature

This section of the literature review examines and critiques specific types of retention studies that have become popular beginning in the 1990's. What becomes evident is that the preponderance of persistence studies deals with freshmen sampling and use of national databases. This gives researchers rich opportunity to examine the effects

of a variety of sociological and psychological factors and their significance on retention in the first year of college, where the literature suggests the strongest influences to drop out occur. The literature sheds little light on what occurs during the upper class years.

Studies on the Effects of Financial Aid on Retention

Intuitively, the price or tuition paid for college has an influence on the desirability or availability of the degree. Basic economic theory tells us that the demand for a commodity, in this case enrollment in a specific institution, is a function of the tuition price, the income or affordability of the enrollee, and the enrollee's tastes and preferences (Siefert, 2002). As the enrollee's tastes and preferences towards a particular institution strengthen, given a set tuition and income level, desire to enroll will increase. This assumes, of course, that the perceived value of attendance is in accord with the ability to pay the tuition as well as its overall cost. If the perceived value were to diminish without a comparable reduction in cost to the student, interest is likely to wane. In other words, the individual enrollee is a consumer who is likely to behave like a consumer where the cost of education matters.

Fuller, Manski, and Wise (1982) divided the econometric literature on the decision to enroll into two branches.

One branch estimates equations explaining institutional, statewide, or national enrollments as a function of characteristics of the population of potential enrollees and of the set of existing schools...The second branch estimates a model explaining the enrollment decision of an individual student as his revealed preference among the available schooling and work alternatives. (Fuller, Manski, and Wise, 1982, p. 477)

Fuller, Manski, and Wise refined the work of second branch researchers in their 1982 study on the effects of tuition costs and financial aid using a conditional logit model. Sample data came from national databases of college bound high school seniors. The

econometric methodology was rigorous and the analysis was detailed. The study concluded that financial aid could be an important determinant of college attendance. However, the methodology did not support any conclusions for the persistence of those students likely to enroll under this model.

Somers has written extensively on the subject of financial aid and retention. In her writings, she sites the works of St. John who studied the effects of tuition and financial aid from year-to-year. "Using data from the early 1980's, (St. John) found that in persistence decisions students are more responsive to increases in aid (grants, loans, and work study) than increases in tuition" (Somers, 1996). St. John used national databases for his sampling.

Somers (1996) conducted a single institution study on the effects of financial aid and tuition cost over the first year of studies and used logistic regression analysis in the methodology. In it, she "describes the development and testing of a socioeconomic model that allows any institution to study student persistence using existing data sources" (p.94). Somers used student data collected from existing computer files in admissions, financial aid and registrar offices on campus. Interestingly, Somers discovered a strong negative correlation between financial aid and persistence explained by a high attrition rate for large scholarship recipients. The money awarded was perhaps not as important as the fit between the institution and the enrollee. The effects of partial scholarships throughout a collegiate career could not be ascertained since data were collected up to the first semester of the sophomore year only.

Cofer and Somers (2000) reviewed national databases from 1987 to 1992 during a time when financial aid policy shifted college aid more toward the middle class students.

The researchers studied the effects of debt load and these policy changes in financial aid on the student persistence decision, and considered both financial and non-financial variables at both public and private institutions in a broad study with considerable generalizability. The research focus was exclusively within-year progression from the fall to the spring semesters. Logistic regressions were performed for both the public and the private sectors. One conclusion is of particular interest. "The amount of debt held by private college students and their families had a significant and negative impact on within-year persistence...the long term effect of short-term borrowing decreased the likelihood of continued enrollment" (Cofer and Somers, 2000, p.6).

A five year longitudinal financial aid study of a sample cohort of 6,711 full-time students at Arizona State University was conducted by DuBrock (2000). Data analysis combined descriptive and inferential statistics. Logistic regression techniques were employed.

Logistic regression is a viable statistical technique for studying a phenomenon such as the influential factors of persistence as it aptly handles a dichotomous dependent variable with multiple explanatory variables that are continuous and categorical. (pp. 7-8)

The independent variables in this study were categorized into four classifications: entering demographics; pre-college attributes; college experience; and financial aid (p. 6). Four year-to-year persistence models were constructed and examined the population of students: receiving financial aid versus those not receiving financial aid; receiving financial aid in \$1,000 increments; accumulating debt in \$1,000 increments; and, accumulating a debt in subsidized or unsubsidized loans. The study found a positive correlation of financial aid on persistence "although only in the second-to-third year when aided students were more than twice as likely to return" (p.1) that was inconsistent

with the findings of Somers (1996). DuBrock found the following variables to be significant: age, gender, ethnicity, need, high school GPA (one of the strongest predictors for persistence in the study), first year enrollment course hours, working on campus, and first year college GPA (p.20). DuBrock suggested for future study that the effects of grants, scholarships, loans and work-study dollars (types of financial aid) be examined. Since this study was conducted at a public university with tax supported tuition rates, would the same results hold true for a private tuition-budgeted institution likely to have a greater variation in what each student would be paying to attend?

Such a study was conducted at Iona College in New Rochelle, New York, a private Catholic liberal arts institution by Braunstein, McGrath, and Pescatrice (2000). The researchers conducted a persistence analysis only of the population of freshmen students sequenced in two alternate academic years to capture potential differences in cohort composition as a result of the college recruitment policy changes that occurred between the years. Logistic regression was used with the dichotomous dependent variable defined as the freshman cohort student enrolling or not enrolling in the sophomore year. The study utilized financial aid and income variables as suggested by St. John (1992) to include levels of family income and financial aid types (grants, loans, and work-study). “Wealthy students”, students who reported family income exceeding \$85,000 or who did not apply for financial aid, were used as a control group for analysis. Interestingly, the researchers reported:

Essentially, none of the measures of financial aid had any significant impact on student persistence at this institution...This is somewhat surprising given that financial aid was found to be a significant factor affecting enrollment decisions of the accepted applicants of this institution. (Braunstein, McGrath, and Pescatrice, 2000, pp. 200-201)

The study did not consider what happened to these students as they progressed from year-to-year at the college. Nor did the study investigate the potential effects of changes in the financial aid policies of the institution such as criteria for financial aid retention from year-to-year or changes in actual dollar amount in grants, loans or amount of work-study offered.

The Arizona State University and Iona College studies suggest a need for a more comprehensive longitudinal approach across all grades and terms in college and to include as diverse a set of financial aid data as possible. The study of data from a private institution, where students are likely to be paying a “wider variety of tuitions” than in a public university where tuition is relatively constant, although different among in-state and out-of-state students, could help researchers unravel this seemingly contradictory set of findings.

Retention Studies of College Freshmen

A significant set of studies in higher education retention is conducted on college freshmen. Since the 1990’s alone, researchers have focused on first year students in a variety of contexts. Longitudinal studies involving college freshmen are of particular interest for this dissertation. Several key studies are discussed.

Cabrera, Castañeda, Nora, and Hengstler (1992) and Cabrera, Nora, & Castañeda (1993) used more than 2,400 freshmen at a single institution in a longitudinal study over the first year in college to compare Tinto’s Student Integration Model with Bean’s Model of Student Departure to test two alternative models proposed by the researchers. Data were collected into the beginning of the sophomore year only. Predictably, “the results

indicated that a more comprehensive understanding of the persistence process can be achieved when combining the two major theories of college persistence” (1992, p. 160).

Hull-Toye (1995) developed a causal model adapted from Tinto and Pascarella to identify student persistence based upon degree aspirations. The researcher used a sample of 1,473 students from 261 institutions responding to a national survey.

This study was limited to Caucasian, traditional-aged, full-time, single students in four-year colleges and universities because the cell size among variables of race, age, full-time/part-time status, family responsibilities, and institutional type were too extreme to allow for statistical analyses. (Hull-Toye, 1995, p. 13)

This use of narrow archival data precludes meaningful analysis here.

House (1996) “investigated the efficacy of noncognitive variables and academic background as a function of student ethnic group for the prediction of college grade performance and persistence” (p 1). He used sample data of freshmen from a single institution, but followed-up with five dependent measures of academic performance (cumulative GPA after one, two, and four years in college) and attrition (enrollment status after two and four years of college). This study employed a combination of quantitative techniques: computation of correlation coefficients to investigate relationships among the predictor variables; ordinary least squares multiple regressions to examine the relative contributions of each predictor variable on cumulative GPA; and stepwise logistic regression to determine the relative order of the predictor variables (pp. 9-10). However, the use of freshmen sample data only may have limited the generalizability of the results obtained.

Pascarella and Terenzini (1977) studied the informal interaction of students and faculty beyond the classroom to determine its possible effects on persistence. Both Tinto

and Spady placed emphasis on the informal interaction of students and faculty in positively influencing the persistence decision. “Interaction with faculty not only increases social integration and therefore institutional commitment but also increases the individual’s academic integration” (Tinto, 1975). Pascarella and Terenzini collected a computerized random sample of 1,008 students from the total population of incoming freshmen in the Fall of 1975 and sent them a preenrollment questionnaire of which 766 provided usable responses. A follow-on instrument was sent the next semester to these 766 students of which 536 usable responses were received. But, because of missing data elements from many of these respondents, the actual sample size was boiled down to 344 freshmen or about 1 in 7 students in the population. How truly representative was this sample of the student population was unclear. Multiple regression analysis was used to control for the influence of key variables (sex, aptitude, and personality characteristics) on the frequency of student/faculty informal contact. The study concluded that faculty “contacts focusing on intellectual or course related matters clearly contributed most to the discrimination between persisters and voluntary leavers” (p. 550) at least for the freshmen year.

Sadler, Cohen, and Kockesen (1997) conducted a study to predict “at risk” students at NYU. “Our sample included data for the Fall 1994 and Fall 1995 entering freshmen cohorts (N=2209)” (p.7). The researchers used logistic regression to analyze the effects various factors have on the dichotomous dependent variable of retention. They portrayed three models that looked at variables available through admissions, financial aid, registrar, and bursar offices on campus defining the students prior to entry, at the end of three weeks of classes (the census data), and at the end of the freshman year. Data

were included for both students who persisted and those who attrited by the beginning of the sophomore year.

Although Sadler, Cohen, and Kockesen's longitudinal study did not follow the students past the first year, the interesting aspect of this work from a methodological perspective was the researchers' rationale for choosing different cutoff points to classify the logit results and the display of ranges of logit predictions as the cutoff points were manipulated. For example: at the classic logit cutoff of .5 (estimated probabilities of retention less than .5 indicates an attrite while probabilities equal or great than .5 indicates a persist), the NYU model at the end of freshman year correctly predicted 99% of the persistors while only correctly predicting 14.3 % of the attritors. At a cut off point of .85 (estimated probabilities of retention less than .85 indicates an attrite while probabilities equal or great than .85 indicates a persist), the NYU model at the end of freshman year correctly predicted 82% of the persistors while now correctly predicting 51.8 % of the attritors (Sadler, Cohen, and Kockesen, 1997, p. 15). This is a fact of logistic regression employed against component groups (persistors and attritors) that are not balanced in terms of their relative sizes. In the NYU study, persistors in the cohort outnumbered attritors more than 7 to 1. "Classification is sensitive to the relative sizes of the two component groups and will always favor classification into the larger group" (Hosmer and Lemeshow, 1989, p. 147).

The Zhang and RiCharde (1998) study sampled 462 freshmen from a public university to test the hypothesis of the effects on persistence of certain cognitive, affective, and psychomotor variables. "Logistic regression identified self-efficacy and physical fitness as positive predictors of freshmen retention, while judgment and empathy

were negatively associated with persistence” (Abstract). The logistic regression in this study generated a prediction model for freshmen retention only.

Perhaps, of more interest to the examination of year-to-year persistence is the Nichols, Orehovec, and Ingold (1998) study that also used a logit model as a prediction tool. The researchers had two strategies in mind: “to transform the original admission philosophy from recruiting a first-year class to recruiting college graduates” and to identify and evaluate “variables from the logit model that were useful in identifying ‘at risk’ students” (p. 35). This study employed the use of logit “cut off” values of .68 and .70 to model beginning and mid-semester first year students respectively.

It is important to mention that choosing the ‘cut off’ value is an intuitive decision that includes the evaluation of the implications of false positives (predicting persisters as ‘high risk’) and false negatives (predicting non-persisters as ‘not at risk’). (Nichols, Orehovec, and Ingold, 1998, p.30)

Despite the sophistication of the methodology and the intuitive selection of logit cut-off values, the restricted sampling to first semester freshmen students may have limited the generalizability of the findings.

Some studies use single-school data to examine the effects of specific programs on retention. In one study, Staehr, Martin, and Byrne (2000) evaluated an intervention program for freshmen women enrolled in a computing degree in an Australian university. The researchers used a mixed quantitative and qualitative methodology to conclude that the program increased retention rates. In another study, Baker and Pomerantz (2000) examined learning community programs in a metropolitan commuter institution and concluded these programs enhanced student performance and created slightly higher retention rates. Surveys, focus groups, and statistical comparison with a control group formed the methods of assessment for this study. In a third research piece, Nauta and

Kahn (2000) administered questionnaires to incoming freshmen, follow-up surveys to them at second semester, and obtained academic data at the beginning of sophomore year to evaluate the social-cognitive model as a predictor of retention. In this study, hierarchical logistic regression techniques were used to evaluate the data despite the authors' concerns of "low response rate; non-random missing data; a predominance of Caucasian and female respondents" (p.6). State-of-the-art techniques cannot fully compensate for inadequate sampling.

Strauss and Volkwein (2001) used multi-institutional data to examine the effects of academic and social integration towards institutional commitment. They concluded that two-year schools offer stronger academic integration while four-year schools offer stronger social integration over their counterparts' institutions. The researchers implied that two-year colleges were more likely to be commuter colleges where little social integration takes place. On the other hand, four-year colleges, where many reside on campus, offer their students a greater opportunity for social integration. Despite all this, Strauss and Volkwein admitted that "the differential findings for two-year versus four-year institutions may have more theoretical than practical significance" (p.17).

First semester and first year college students were sampled at a single institution to determine the effects of both credit load and course difficulty on GPA and persistence in a study by Szafran (2001). This research combined the work of the "course difficulty scholars" who hypothesized the role course difficulty plays on student retention with those of the "credit load scholars" who hypothesized the effects credit load in college has on persistence. A systematic random sample of 487 students represented a freshmen entry cohort of 2,047. The researchers combined the credit hours of both academic and

developmental courses to determine course loading at the end of the first and the second semesters while acknowledging that “students register for slightly easier courses during the second semester” (p.42) for a variety of reasons. One conclusion of this study that “students in more difficult courses are less likely to return for a second year” (p. 43) may not be very helpful to admissions and policy makers trying to minimize attrition.

Retention Studies of College Upper Classmen

Some researchers focused on longitudinal studies that went beyond the freshman year. They did so likely because the literature clearly suggests that attrition is not just a first year phenomenon.

Gohn, Swartz, and Donnelly (2001) recognized that “most campuses lose as many students through attrition from the second year to graduation as are lost from first to second year” (p. 272). The persistence decision for sophomores may be just as critical as for freshmen. Richmond (1985) put it succinctly

Generally, the components of sophomore slump include doubts regarding the choice of career, dissatisfaction with personal relationships and a heightened awareness of and concern for the financial aspects of one's college education, such as tuition costs. (Richmond, 1985)

They also recognized that most of the research literature on the persistence problem focuses on freshmen. Thus, Gohn, Swartz, and Donnelly built a model on four key components affecting retention at the sophomore level: academic; financial; emotional and personal support; and, commitment and aspirations. They conducted a mixed methodology study. The qualitative piece consisted of 11 interviewed students representing the overall group of second year students. The quantitative piece encompassed the population of enrolled sophomores and compared retention and graduation rates of the researchers' university to that of peer institutions and national

data. Qualitative approaches were used to analyze data and interview notes. Neither descriptive nor inferential statistical techniques were considered in the study.

Blecher, Michael, and Hagedorn (2002) addressed the problem of “system persistence”, the retention of a student within the college system not necessarily at the institution of commencement. The researchers used a national data base to follow a cohort of college students over five years and concluded that the student who transfers out of the first college of attendance is less likely to complete the bachelor’s degree while student satisfaction would appear to be significant in the transfer decision but not in any direct sense to persistence towards the degree (p. 28). “Of the background and demographic variables in the model, socioeconomic status, age, and academic ability had significant total affects on five-year system persistence” (abstract). Cost of education and financial aid factors were not considered in the fifteen variables of this study.

Glass and Harrington (2002) conducted a single institution study of transfer students and “native” students and compared GPAs for random samples of 50 students for each group. The researchers wanted to know if transfer students, as compared to sophomore native students, performed better to graduation. After overcoming the transfer shock, transfer students were found at the time of graduation to have the same or better grades than those of the native students. The study also concluded that, once a student completes the junior year, he/she is likely to graduate regardless of his/her transfer or native status. However, the researchers suggested, “It may be helpful to survey students who drop out during their junior year to see what factors contributed to such a move” (p.427).

Retention Studies of Two-Year College Students

Although this dissertation focused on a four-year university comprised mostly of traditional students, studies on retention have not been limited to this area of research. Interest in the persistence decision in two-year colleges is strong in part because it is the two-year college route that often makes attaining a college degree affordable to a vast number of lower to middle income students. It is important, then, to take a look at a few studies that have addressed persistence at the community colleges.

Voorhees (1987) defined persistence as “re-entry in either the spring or fall semesters” in a given year to account for the typical community college enrollment patterns. If a student failed to reenroll in either semester, he was classified as a non-persister and coded “0”. A persister was coded “1” thus making the dependent variable dichotomous and allowing the use of logistic regression for inferential analysis. In this study, it was not possible to differentiate between the nonpersister who voluntarily left the college, either to dropout or enroll in a four-year institution, and the nonpersister who involuntarily dropped out through academic failure or disqualification. The study did find that “satisfaction is relatively unimportant in community college persistence decisions” (p.127). The ease of admission and the relatively low tuition does little to encourage institutional commitment and helps to explain that the only variables of significance in this study were: “sex, purpose for enrolling, and intent to return” (p. 126).

Somers et al. (1998) added to this side of the persistence research with a qualitative piece of twelve focus groups of 282 students at two-year and technical colleges in Arkansas. In this work, financial aid and/or the cost of attending was an overriding factor in both the decision to enroll and to persist.

Hoyt (2000) tracked four community college freshmen cohorts over five years to determine how many were still enrolled in a single institution. A student was assigned to a cohort the first term during which the first college course was taken. Students transferring in any credits were removed from cohort status. Hoyt's use of logistic regression is consistent with other studies. He grouped his dependent variables under four headings: demographic; goal commitment; academic; and, financial support. "The college generally lost 30 to 35% of its students from fall to spring and nearly 60% of its students by the following fall" (p.61). Some of these students returned later. Some went on to other community colleges or four-year schools. The nature of community college enrollment makes it difficult to determine "system' persistence" rates. Nevertheless, Hoyt concluded that first term academic performance was the strongest factor relating to persistence with financial aid second. Even in a relatively low tuition environment, financial aid loomed as significant.

Andreu (2002) offered a listing of variables applicable for community college retention studies. Noteworthy of the variables presented are those involving financial aid. Andreu's financial aid variables are quite comprehensive and include: first term financial aid; Title IV disbursements (the total of the Pell, federal Supplemental Educational Opportunity Grant [SEOG], and federal work study funds awarded); specific state programs; loan programs (Stafford, unsubsidized, and Plus); other sources of financial aid (institutional and private sourced); financial aid by term; and, total financial aid awarded during entire enrollment. Studies using these sorts of financial aid variables can be accomplished when institutions maintain meticulous records and open these records to researchers. Privacy considerations are not trivial and must be taken into account.

Retention Studies of Minority Students

A final thematic portrayal in this literature review concerns studies conducted specifically for minority students. Ybarra (2000) used ethnographic techniques in a qualitative study of two Latina students in conversation about classroom communications with Anglo-mainstream instructors. Reyes (2000) interviewed seven Alaskan Native college students in a qualitative study on what it takes to be successful at the University of Alaska. And Ness (2002) selected thirteen American Indian students attending a tribal college in another qualitative work. In all three, rich data were obtained through these qualitative efforts. There appears to be room for quantitative studies devoted to minority student retention.

Policy Research in Retention

In Chapter 1, two reasons for scholarly interest in persistence were advanced. The first referred to the surprising high rates of attrition given all the investment upfront by parents, teachers, counselors, and students. This is of crucial importance to enrollment managers and admissions directors tasked to recruit students who will best fit the institution and who must “make the class” in institutions increasingly dependent on tuition revenue to make budget. The second comes from the likes of the Tinto (1993) model and others that relate the academic and social elements of the college community so closely to the persistence decision. It is this second reason for studying retention that is often of such interest to top policy makers in higher education and the focus of policy research studies in the literature. A few pertinent studies are addressed next.

A relatively early study with potential policy implications as part of the research design, Molnar (1993), examined the impact of mission effectiveness at a private

Catholic university in the southeast. Molnar wanted to know if the way in which the institution executed its mission had an affect on student retention. Molnar assembled a series of independent variables from admissions and student academic records and a survey of freshmen, and used logistic regression techniques to predict their impact on the persistence decision, the dichotomous dependent variable. It was the use of the survey mechanism that this research was able to gather data reflecting student perceptions on the implementation and effectiveness of the institutional mission throughout the campus. Using Likert scale responses on the survey, students communicated their level of academic and social integration at the institution. For example: the level of socialization was determined by the reported satisfaction “with the opportunities to make friends of the opposite sex”; the level of teaching quality was determined by the response to “indicate your level of satisfaction with the quality of teaching”; and, the level of university success in communicating its life philosophy was determined by reported agreement with the statement “[University] has helped me articulate more clearly a philosophy of life” (Molnar, p. 15). From the freshmen survey responses (response rates of 54% and 39% in a follow-up, no N reported) and the recorded data from admissions and registrar offices, the study concluded, “The impact of institutional effectiveness on the academic mission has only an indirect effect on retention” (p. 19). This study suggested that the way in which an institution executes its mission is less important in the persistence decision than the result of individual academic outcomes, and that retention need not be the primary motivation for institutional effectiveness.

As in most of the freshmen studies, Molnar does not capture the maturing student, who, in this instance, may see the impact of mission effectiveness as an evolutionary

process over years in residence. Thus, the research hypothesis “There is evidence that student perception of an institution’s effectiveness does improve retention” (p. 5) may not have been tested adequately. To rely on the results of this study for policy decisions may not be in the best interest of the university. A longer-range longitudinal study could be more appropriate to address this research question.

Another policy related research piece comes from Berger (2001) who concluded that “colleges and universities are organizations and, as such, the patterns of organizational behavior within them have important consequences for the retention of undergraduate students” (p.19). Berger looked at the works of Meyer (1970), Kamens (1971, 1974), Clark et al. (1972), and others predating Tinto’s 1974 model on persistence to synthesize the pattern of findings of these sources that suggest the institution’s retention rate is associated with its social charter (Meyer, 1970) and image and environmental potency (Clark et al. 1972).

The Molnar and Berger studies illustrate another type of work in the literature on persistence that incorporates theory and research to suggest and influence policy decisions at the institutions wanting to improve retention. In the Molnar case, an individual study was conducted. Berger, on the other hand, synthesized the findings of others to make his recommendations. Molnar didn’t use data from upper classmen. Berger generalized from studies of decades past. Neither approach would offer specific benefit to the institutional researcher desiring to know what is really happening with retention on his/her specific campus. On the other hand, this dissertation provides the means by which the institutional researcher is able to analyze the data across an entire

class of students and witness the results on retention with predicted changes to any data collected.

Conclusion: The Place for This Study in the Literature

There may not be a more widely researched topic in higher education than that of persistence. So, what could this dissertation contribute to such a prolific body of knowledge? A summary of the major conclusions of the literature review will be helpful.

There are many studies that use data from freshmen and first semester sophomores. There are very few studies that supply data from a cohort of students from matriculation to graduation. If the persistence decision is indeed a longitudinal concern, and students can opt out any time along the journey of higher education, the study of persistence should include data along the entire continuum. Unfortunately, many researchers may not be able to get access to such data and thus are forced to make inferences from the first year's experience only.

Many researchers utilize large databases in their studies. These databases are touted as comprehensive and generalizable to any institution. Individual data from an individual university is more meaningful to the institutional researcher. Population studies are more meaningful than sample studies in quantitative research because they eliminate the error consideration in the inferential analysis. Population studies are not practical using the national databases. An institutional cohort study affords the most accurate appraisal of the persistence decisions being made at the local level.

There are many models that have been developed to attempt to explain the persistence decision. There continue to be discussions among researchers that it is the sociological, the psychological, the financial, or the organizational variables that are most

significant. Intuitively, all these factors matter in the individual decision to remain in college. Yet, the research also suggests that, in any given study, the level of significance of any given variable will be different. Because the decision to remain in college or to dropout of college is so complicated, research alone will never likely provide any definitive answer. Yet, researchers persist in the study of persistence because so much is at stake for the individual, for the institution, and for society at large.

Logistic regression techniques have been demonstrated to be the quantitative methodology of choice in the persistence literature because the logit is so adaptable to modeling the dichotomous dependent variable of the yes/no decision “to persist or not to persist”.

This dissertation individualized the process of persistence analysis by using logistic regression to examine a population cohort of students that have persisted and graduated; that have exhibited levels of academic preparedness and academic performance in college; that have specific demographic and background characteristics; that have attained levels of social integration; that have participated in institutional life; and, that have pre-entry dispositions and external experiences over which the institution may have no control. With all of the individuality these aspects portend, only a study at a specific institution evaluating a specific cohort of students would be meaningful to a particular institutional researcher and to particular university policy makers. It is to these individuals that this individual research study was designed. This is the specific area of contribution to the literature of this current work.

CHAPTER 3

Methodology

Introduction

This study was built on the work of Siefert (2002), Braunstein, McGrath, & Pescatrice (2000), Fuller, Manski, & Wise (1982), and others who used Logit and Probit analysis to model the effects of financial aid, personal backgrounds, and collegiate experiences on the student enrollment decision process in higher education. The study developed a model that examined the effects of a variety of factors, readily available to faculty, administrators, and staffs at universities and colleges to determine how each factor influenced the decision of individual students to return to campus and pursue their studies year after year to graduation.

The research question posed and answered in this study is:

To what extent do: student demographics and background; academic preparation and achievement; institutional financial aid and personal financial factors; and the collegiate experience influence year-to-year persistence in higher education at a particular university and does the importance of these factors vary as students progress through their studies to graduation?

One goal of this study was to introduce a methodology that can be employed to examine the persistence of a cohort of students from matriculation to graduation and to analyze data gathered from a specific cohort of students. Hierarchical logistic regression analysis was employed as the appropriate research methodology to examine the dichotomous dependent variable of persistence in a longitudinal study extended over five years.

Rationale for the Study

Despite the proliferation of research written on the subject of retention in college, there had been no noteworthy longitudinal study focused on a specific cohort of students at a private four-year school that examines various persistence factors and the degree to which they influence individual decisions to stay in college year after year to graduation. This study fills that void in the literature.

The rationale for this study was derived from the work of Spady (1970), Tinto (1975, 1987, and 1993), Bean (1980, 1983), Cabrera, Nora, and Castañeda (1993), Pascarella (1985) and others who had developed integrated, longitudinal, and causal models of student persistence. Each of these models contains a series of defining variables grouped into general categories such as: pre-entry attributed; matriculation goals/commitments; institutional experiences; integration within the college; goals/commitments after integration; and outcome (the decision to persist), (Tinto, 1993, p.114). Each study describes the relationships among the sets of factors and how they relate to the persistence decision.

Persistence models are sound, theoretical approaches that, nevertheless, create challenges for the researcher. How, for instance, does the researcher determine what data to gather that addresses goals/commitments at entry? Does the researcher conduct an entry survey or rely on data taken from the application for admissions and financial aid? What kind of financial data should be collected? Does the researcher focus on net cost of attendance or try to develop a logical mechanism to compare similar net costs among dissimilar financial situations? And how does the researcher replicate the student – faculty interaction Tinto (1993) considers critical to retention success?

These are but a few questions that raise practical challenges to institutional researchers that can be difficult to overcome. In this study, the university examined operates a freshman “preceptorial” program wherein every first semester student is assigned to an intimate seminar class under the guidance and instruction of a volunteer tenured professor whose job is to function as the student’s initial mentor and academic advisor. The preceptor also acts as a confidant for student social and other issues as appropriate. The program is designed to facilitate the academic and social integration of the student into campus life. Because all students are assigned to a preceptorial, the expected variance of first year student interaction with faculty would likely be quite small. Hence, methodology that might be employed to capture student/faculty interaction becomes less significant and was not adopted for this particular study.

If persistence is going to be able to be evaluated effectively on a given college campus, there has to be some data gathering and analysis techniques that can readily be employed. This study provided one approach to the collecting of data from existing campus sources, integrated the data into a master database, and utilized appropriate quantitative techniques to examine the state of retention on the campus. Motivation came in part from Braxton’s observation that, after decades of research, much has been learned about the problem of persistence in higher education while more work needs to be done.

The seventy-five year history of research on the problem of college student departure belies the current state of knowledge and understanding of this phenomenon. We are beginning to make substantial progress in our understanding of the roots of college student departure. (Braxton, 2000, p. 257)

This study benefited from the researchers who developed the retention models and identified key variables for analysis.

*The Basic Model**General*

This study was concerned with year-to-year persistence. Ideally, college admissions committees would like to be able to select students who will enter and complete their studies on time. These committees look to admit the student who will enroll in freshmen year, decide to return for the sophomore year, the junior year, the senior year, and eventually graduate. The student who makes these successive choices optimizes the university's management of its enrollment. There would be no need to recruit and enroll a replacement for this student. The full tuition equivalent (FTE) represented by this successful student has been retained throughout the cycle of enrollment. The university saves money by not having to recruit a replacement student. Institutional statistics are enhanced by higher retention. College rankings are positively affected by greater persistence among the student population. Tuition dollars, which drive the budgets of most private and many public universities, are more guaranteed when there is less student turnover.

Given the choice to collect information on students retained or on students who depart, unless the institutional researcher is prepared to administer detailed exit interviews and track down students at other universities or in the work place or elsewhere after departing, it is less problematic to seek information about those students who return each year. It is more straightforward to collect information on the students that stay rather than attempt to find out what happens to the students that leave. This was the rationale why this study concerned itself only with the returning students.

As already illustrated, the decision to persist is a function of a complex series of factors that can be quantified into categories of variables, some denoting environmental, behavioral, background, and intention characteristics of an individual. In many studies, large national or regional databases are utilized to ascertain the effects any of these variables may have on the decision to remain in college and to generalize across all colleges the role each factor plays in persistence. But for an institutional researcher wanting to examine what is really happening on campus, the use of these generic databases serves to offer a glimpse at the general when the specific is what may be preferred. This study examined a specific group of students and their specific decisions to return to college semester-by-semester. In so doing, this study affords the institutional researcher a guide for the collection and analysis of data unique to students on a particular campus.

Data Sources

This study tracked a cohort population of 1,030 students, the total class of undergraduates who enrolled in a small to mid-size private liberal arts Catholic university in the Southwest United States in the fall of 1998 through to the spring of 2003. Except for the engineering students who enrolled in a five-year joint BA/BS degree program, and some students seeking the BA with teaching credentials for primary or secondary education, four years is the normal interval of study from matriculation to graduation at the institution under study. A five-year cohort population study captured all of students who remain on track for a normal progression through the university. Of the 1,030 students who entered in the fall of 1998, 5 graduated in three years, 18 graduated in three

and a half years, 591 graduated in four years, 69 graduated in four and a half years, and 51 graduated in five years for a five year graduation rate of 71.3 per cent.

Data were collected from offices on campus that dealt with students directly: admissions, financial aid, registrar, and housing. Each of these offices compiled many factors for each student that, when studied together, could tell the institutional researcher much about the cohort to be examined and even more about the characteristics of the students who decide to return to college each term.

Selection of the Model Variables

Appendix A, Table A-1 lists and defines the persistence variables used in this study. The dependent variables were a series of dichotomous phenomena – the student makes a conscious choice each semester (the institution studied is on a semester schedule) to continue in school to graduation, or not.

The independent variables were loosely organized according to Tinto's eight major causes or roots of persistence as defined in three predominant categories and listed in Table A-2. The choice of Tinto's categories was merely a convenience to organize the independent variables, was in deference to his importance in the study of retention in higher education, and provided one demonstration of data collection for the institutional researcher. It was not the intention of this work to add to a voluminous list of studies designed to test Tinto's theory. These independent variables were assembled from the various databases on the campus and together formed a portfolio for each student. Each portfolio represented an individual case that could be examined as a single entity, in a grouped setting, or for the entire campus community. Rather than have to deal with samples from the large national databases, the database constructed served to study the

entire population of students where the likelihood of persistence of any similar cohort could be predicted from the actual data of the case institution.

The Financial Variables – Net Price and Pain Index

Much of the focus of this retention study centered on financial considerations, the concepts of Net Price and Pain Index, in part, because the institution examined is both private and heavily tuition dependent for its operating budget, but also because “finance-related factors (student aid, tuition, and other costs, including living) explained about half of the total variance in the persistence process” (Paulsen & St John, 1997). The inclusion of Net Price and Pain Index type financial variables was consistent with the views of St. John, Cabrera, Nora, and Asker (2000) who concluded that “including variables related to actual family resources, tuition, and student aid awards is necessary in comprehensive persistence models” (p.42).

Net Price considered the actual cost of education. It was defined as the difference between tuition plus fees and the amount of grants plus on campus work study credit earned. It represented the direct cost to the student some of which may require loan payback after graduation. Work study credit was included to model the effects of on-campus work commitment as it relates to reducing the cost of education.

Pain Index considered the effects of the relative cost of education. It took into account the financial need of each student as calculated using the standard federal methodology based on family income as reported through the Free Application for Federal Student Aid (FAFSA), required information for all students seeking financial aid for college. The Pain Index represented the difference between what the federal government determined to be the financial need and the amount of grants and work study

credit made available to the student. In the one extreme, a person with no federal financial need, coming from a background of means and receiving a merit scholarship, could have a substantial negative Pain Index. In the other extreme, a person with maximum financial need and receiving no grants or work study credit could have a significant positive Pain Index equivalent to the entire cost of the education.

By considering both Net Price and Pain Index, the models used in this research accounted for both the price the students and their families actually paid for the education and the financial pain they felt in paying that price. Cumulative Net Price and Pain Index variables allowed for the examination of their long term effects throughout enrollment.

Decision Rules for Missing Data Elements

Although much of the data collected for this study resided in four offices on campus, some was not yet computerized, required hand gathering, and proved difficult to record. The likelihood of encountering missing data elements for a population over one thousand was anticipated and decision rules for incomplete observations were developed. Because of the persistence, perhaps luck, of the researcher, few missing data elements were uncovered. In the interest of generalizability, a missing data protocol was developed.

Pre-Enrollment / Admissions Office Variables

The SAT was recorded individually as verbal and math scores. Students who took the ACT in lieu of the SAT (31 in the population) had their combined scores converted to SAT type scores according to the standard conversion table used in admissions. The ACT English and Reading scores were averaged and converted to an "SAT equivalent" verbal score, and the ACT Math and Science Reasoning scores were averaged and converted to an "SAT equivalent" math score. The addition of these two equivalent scores became the

SAT equivalent score. Since these were averages, numbers such as 631 or 538 (scores not associated with SAT's even numbered results) can be found as recorded scores.

Ethnicity is an optional question on the admissions application. "Other" is one category for ethnicity. Students who either did not record an ethnicity or listed ethnicity as "other" were classified as "other". Parent's education was collected from application files. Legacy, or the past family association with the university as a student/alumnus, was also collected. Neither of these variables can be readily predicted if not recorded or available through other on campus sources. If efforts to consult other sources could not determine parent's education or legacy, the data elements remained blank and no college education or legacy was assumed. This is a reasonable approach because, if the individual student didn't bother to record any of these conditions as existing, the assumption that they may carry minimal weight in any persistence decision can be argued.

Registrar Variables

Completed units, GPA, and major each semester, were available for all students in this study and were recorded.

Housing Variables

No evidence of assignment to campus housing was recorded as a student being in a commuter status.

Financial Aid Variables

No evidence of financial aid, merit scholarships, or grants was interpreted as financial aid, merit scholarships, or grants not awarded. If there was no evidence of any request for financial aid, it was assumed that the student was not dependent upon it for matriculation and retention in college.

Statistical Analysis – The Case for Logistic Regression

“Logistic regression is a variation of ordinary regression useful when the observed outcome is restricted to two values, which usually represent the occurrence or non-occurrence of some outcome” (Brooks, 2001, p.5). Logit allows the researcher to determine the likelihood of an individual in the enrolled population to remain enrolled each term and eventually to graduate in five years. It can be used as a predictor of persistence. The researcher will be able to determine the likelihood a student with certain defined pre-entry dispositions, external influences, and internal college experiences will remain at the university.

Siefert (2002) utilized both logit and probit analysis in her study on the effects of financial aid in the decision to accept an offer of admission and enroll in the same private university of this study. “Logit and probit models yield very similar estimates of the probability of events... The main difference between them is in the tails of the distribution” (p.52). This study followed that lead in recognizing the efficacious use of this analytical approach but chose to employ the logit only in the regression, the more commonly found technique in the literature.

Galloway (2004) illustrated what we gather from the use of logistic regression. He described the “three separate predictions that would emerge from the logistic regression model – the logit, the odds of (the event occurring), and the predicted probability (of the event occurring)”. In the case of this persistence study, with the logit calculation from the regression analysis, the odds of a student persisting from year-to- year and to graduation in the final year in college is the antilog of the individual logit. “The final step is then calculate the predicted probability associated with the different values of the independent

variable from the odds of (retention)” (Galloway, 2004, p.11). In this study, the demographics, pre-college and college experiences, and individual financial factors for each student comprised the independent variables in the logistic regressions and contributed to the determination of the odds of continued enrollment to graduation.

Quantitative Research Design and Data Analysis Methods

Descriptive Analysis

Descriptive statistics are important to better understand the population being investigated. The use of descriptive statistics in this study aided in describing the status of the student population cohort at enrollment for each academic term and at graduation. The statistics served as a composite picture of the students who persisted from matriculation to graduation and were coupled with inferential statistical procedures to more fully analyze the population of the students.

Separate statistical analysis was conducted for all enrolled students in the cohort each term of enrollment. This was done so that the effects of the individual variables could be examined over time for each student in the initial cohort who returned to college in the sophomore, junior, and senior years, and completed the degree requirements to graduate. A few examples illustrate the efficacy of this approach. The effects of a generous financial aid package, for instance, may be more significant for a freshman about to embark on an expensive venture into higher education than for a senior who has already spent much of what is to be spent on his/her education. It may also make sense to suppose that high school GPA and SAT/ACT test scores diminish in significance over time. By examining a series of independent variables semester-by-semester, these and other hypotheses can be explored. The appropriate statistical technique used when

dealing with dichotomous dependent variables, to persist or not to persist in this instance, is logistic regression.

Examination of the descriptive statistics was an important component of this study. The means and standard deviations of the independent variables were presented and discussed for the population to give the institutional researcher an appreciation of the uniqueness of the student cohort under examination.

Inferential Analysis

A hierarchical analysis of logistic regression models comprised the inferential component. The research design of this study consisted of a compilation of 103 logistic regression models computed through SPSS 12.0. Each of the models analyzed the effects on the student cohort of the demographics and pre-college experiences, the college experiences, and financial factors on the persistence decision made each semester in a variety of contexts using Tinto's model strictly as a loose organizer for the independent variables. As stated previously, this study was conducted neither to validate nor to refute Tinto's model.

Models 1 – 30: The Individual Factors Models.

Each of the ten dependent variables (enrollment in semesters two through ten and degree attainment) was analyzed as to its influence from three basic categories (demographics / pre-college experiences, college experiences, and financial factors) associated with the categories of causes or roots of persistence as defined in the Tinto model. This afforded the opportunity to evaluate the significance of each variable each semester and the role demographics and pre-college experiences, college experiences,

and financial factors by themselves contributed to continued favorable enrollment decisions.

Models 31 - 60: The Multiple Factors Models.

Each of the ten dependent variables was analyzed as to its influence from combinations of grouped major causes or roots. These were more complete models and allowed for examination of the effects of combined background and college experiences and financial factors towards continuation in enrollment.

Models 61 – 70: The Full Models.

These were the full models with all independent variables included as appropriate for each of the ten dependent variable situations. These provided for the examination of the totality of effects and the opportunity to observe potential interactive effects.

Models 71 – 103: The Full Models By Financial Need Categories.

These models provided an example of one additional way to analyze the population by dividing the students into no financial need, low financial need, and high financial need categories. The no financial need student was the student who did not apply for financial aid or whose aid package was determined to be less than \$1.

Distinction between what constitutes low and high federal need was chosen to be \$12,000 (adjusted to 1998 figures) per semester as argued by Siefert (2002). The specifications for each of the models can be found in Appendix A, Table A-3.

Tests of Statistical Significance

In logistic regression, the goodness of fit or prediction of model fit is measured by computing the difference between the deviance of the model with no predictors (D_{null}), a measure of the worst model possible compared to the perfect model, and the deviance of

the model with k predictors (D_k), a measure of the model with these k predictors compared to the perfect model. The G (goodness of fit) statistic is $D_{null} - D_k$, a “measure of the goodness of contribution from the predictor set” (Cohen, Cohen, West, & Aiken, 2003, p. 505) and uses the χ^2 distribution with k degrees of freedom. A pseudo R^2 is calculated using these deviances and can be formulated as: $R_L^2 = (D_{null} - D_k) / D_{null}$. The range of values runs from zero and one.

SPSS provides two pseudo R^2 indices, the Cox and Snell (range of zero to .75) and the Nagelkerke that “corrects the Cox and Snell index by dividing the Cox and Snell index by the maximum possible value it can attain for a given proportion of cases” (Cohen, Cohen, West, & Aiken, 2003, p. 503). As such, the Nagelkerke pseudo R^2 will always reflect higher than the Cox and Snell which is more closely aligned to R_L^2 . This study reported both pseudo R^2 indices and the “-2 log likelihood” (-2LL) which is a measure of the success of the model in predicting dichotomous outcomes. The lower the value for -2LL, the greater is the predictive effect of the included variables over the null model of no predictors. Both pseudo R^2 s and -2LL were reported in this study.

An additional goodness of fit for each model, the Hosmer and Lemeshow test, is reported by SPSS and used in this study. This index of fit examines the S-shaped curve of the logistics regression to measure the level of agreement between the predicted outcomes and the observed outcomes. It tests the null hypothesis that the model is good. “A good model is indicated by a high p value...If the p value is less than 0.05 then the model does not adequately fit the data” (Brace, Kemp, & Snelgar, 2003, p.274). The statistic used is the Pearson χ^2 .

The Wald statistic was used to test the impact of an individual variable in the prediction of the dichotomous outcome, enrolling in a follow-on semester or obtaining a degree, in each model. The Wald statistic, reported by SPSS, is “the ratio of square of the estimate of the regression coefficient B_j to the square of the estimate of its standard error, SE_{B_j} ” (Cohen, Cohen, West, & Aiken, 2003, p. 507), or $B_j^2 / SE^2 B_j$. It tests the null hypothesis of being a case using χ^2 with 1 degree of freedom. Threshold for reporting a predictor variable as significant in each model is $p \leq .05$ for the Wald statistic.

Limitations

An obvious first limitation was the challenge to generalize the results of this study that used a specific institutional database. This study, however, was about process and it is the process that has broad applicability.

A second limitation centered on the choice of the factors or independent variables available and used for the study. With several well-known theories on persistence in the body of knowledge, whose variables does one choose? To accept one set of variables is to limit another's. This study compiled as many variables as could be found on campus and generally categorized them according to one widely studied model developed by Tinto. The exclusion of factors cited in other retention models of note is an acknowledged limitation of this study necessitated by the simple requirement to set its boundaries. The exclusion of other factors forms additional basis for future studies in this arena.

A third limitation, and perhaps more significant than the others, came from the very model of retention that was used in this study – Tinto's Model of Persistence. As noted above, Tinto suggested that it is the individual student/faculty interaction that may be the most significant reason for a student deciding to stay in college. The challenge to

quantify that relationship is daunting. Does the researcher survey the students directly? Can one extract data from end of course critics? Should there be a qualitative analysis conducted from detailed interviews over the period of attendance? Because of the necessity to set boundaries on the focus of this study, and due to the somewhat uniqueness of the university's preceptorial program previously discussed that tends to level out the variability of faculty/student interaction at least in the freshman year, the effect on persistence of the student/faculty relationship in a longitudinal study is left for other research. See Pascarella & Terenzini (2001) for a methodology that addressed this examination.

A fourth limitation stemmed from logistic regression itself. Logistic regression is very effective in dealing with dichotomous dependent variables and examining the direct effects of independent variables in predicting the probability for the dichotomous event, in this instance, the decision to continue in college from semester to semester. It provides a quantitative way to predict whether or not a student exhibiting specific "factors" will persist.

Logistic regression analysis does not suggest that an indicator (such as gender) "causes" high or low probability of event occurrence. Logistic regression, like all regression analyses, is based on correlations or relationships between variables, which in many cases are indirect. A relationship does not imply cause. (Brooks, 2001)

Thus, it would not be appropriate to interpret indirect effects of the independent variables from this analysis. For example: suppose the data on students who persist report that those living on campus tend to show a higher average number of units taken each semester than those who commute. It would be incorrect to suggest that this means that students in residence are more likely to enroll in more units because they live close to

class and therefore may find taking a greater course load more convenient. A further limitation of logistic regression made itself apparent in the course of this study, that of the problem of complete separation. Cohen, Cohen, West, and Aiken described this occurrence when the maximum likelihood estimation in logistic regression is employed. "A caution with maximum likelihood estimation is that estimates of the coefficients will not exist if there is *complete separation* on a predictor or set of predictors between the group coded 1 and the group coded 0 (2003, p.498)." This occurrence was significant and precluded the running of 8 of the 103 logistic regression models in this study.

A fifth limitation was the availability and form of the data, particularly in the financial aid and residency area. As noted in the literature review, the type of data extracted from the respective financial aid offices may have limited the 2000 studies of DuBrock at Arizona State University and Braunstein, McGrath, and Pescatrice at Iona College. This dissertation faced a similar limitation and needed the full cooperation of the financial aid resources to gather a comprehensive set of data. Housing office records were maintained only on a yearly basis, not on a semester basis, on which other data were extracted. Thus, this study was unable to ascertain if a mid-year change in residency status (a student chose to move off campus or return to the campus residence halls) took place. Semester-by-semester records for all variables would benefit future studies.

A final limitation was the data themselves and the way they were collected. Perhaps most problematic was the effects of transfer credits. Because the case institution recorded all transfer credits at the end of each transcript, this study was unable to determine when these credits were earned. Hence, predictive significance of lump sum transfer credits on any given enrollment decision would have to be viewed with care.

CHAPTER 4

Results

Introduction

This chapter records the findings of the study. Before they can be presented and interpreted, more must be written on the data gathering itself, important to validate the interpretive analysis. In this study, there were ten dependent variables, one for each reenrollment decision over the five years and one for completion of the degree, and one hundred and twelve independent variables for each of the 1,030 members of the population. Each data element was collected and recorded personally by the researcher; as such, the accuracy of data rests solely with the researcher.

Dependent Variables

The ten dependent variables are listed and defined in Appendix A. The data were obtained from transcripts on file at the registrar's office of the case university and were assigned individual case numbers to maintain student anonymity.

The Enrollment Variables

ENROLL1F was assigned as the variable to designate the totality of cases in the study. ENROLL1S, 2F, 2S, 3F, 3S, 4F, 4S, 5F, and 5S represented enrollment in specific semesters ("F" for fall and "S" for spring). If no courses were listed on the transcript for a specific semester, this was interpreted as a decision not to enroll for that term and a "0" was assigned. If one or more courses were listed, completed or not, this was interpreted as a decision to enroll for that term and a "1" was assigned. Intersession and Summer Sessions were not considered in ascertaining enrollment since these academic terms are optional for purposes of continuous enrollment at the case institution.

The Degree Variable

If the transcript reported graduation during Year 3, Year 4 or Year 5, the student was recorded as having graduated with degree and a “1” was assigned to the variable DEGREE. Otherwise, no degree, no graduation was recorded and a “0” was assigned. In a few instances in which students dropped out and returned semesters later, referred to in the literature as “stop outs”, and were recorded as enrolled at the end of the study time period, the student was reported not to have graduated even if evidence of graduation was discovered years later. This is consistent with the design of this study to address the persistence of continuous or near continuous students expected to complete college in four or five years. Two of the students who achieved degrees after four years, reenrolled in fall of the fifth year as graduate students. They were removed from the study after degree completion because this study deals only with an undergraduate population.

Independent Variables –Twenty-Four Demographic and Pre-College Experiences

The twenty-four demographic and pre-college experiences variables are listed and defined in Appendix A. The data were obtained from admissions applications records of the university in this study and common Internet sources (for mileage calculations).

The General Demographic Variables

GENDER was recorded male/female from application files and coded “1” for male and “0” for female.

LEGACY was self-reported in the application file. A “1” was assigned if the student reported any prior family enrollment at the university, and a “0” was assigned if no such prior family enrollment was reported.

MILES was the distance calculation between the student's home of record and the university in this study. Two independent Internet data sources were used for this calculation. For students whose home of record was within the United States, a zip code distance calculation was employed – the calculated mileage between the university's zip code and that of the home of record address and rounded to the nearest mile. The program to calculate this distance was found on the Internet website "melissadata.com" at: <http://lookup.melissadata.com/Lookups/zipdistance.asp>. For the foreign students, those who report addresses of record outside the United States, the mileage was the calculation between the city in which the university is located and the city of the student's home of record. A program found on the Internet website "geobytes.com" at: <http://www.geobytes.com/CityDistanceTool.htm?loadpage> was used to calculate this distance. The miles variable was divided by 100 to better facilitate regression analysis.

The High School Performance Variables

RATE was a number assigned by the admissions office to represent a composite of applicant high school GPA, SAT/ACT scores, leadership, service, and talent. Rate ranges from 0 (lowest) to 9 (highest). Students who were rated "9" received the \$8,800 Trustees' Scholarship in financial merit aid per year. Students rated "8" received the \$7,700 President's Scholarship in financial merit aid per year. Students rated "7" received the \$6,000 Dean's Scholarship in financial merit aid per year. These three levels of merit scholarships were awarded without regard to financial need or application for financial aid. Students rated "6" or lower did not receive merit scholarship monies but could have qualified for higher levels of need-based aid with higher ratings.

GPAHS was the high school grade point average for all four years, calculated by admissions counselors at the university from official high school transcripts submitted.

SATVERB and SATMATH were recorded from admissions files. Students who took the ACT in lieu of the SAT had equivalent SAT scored recorded as described in the methodology section.

LDRSHIP, SERVICE and TALENT were collected from registrar files and reflected admission's evaluations of applicant high school leadership, service, and talent respectively. Students were assigned scores from "1" (least) to "5" (most) for each category based on reported high school experiences. Students who received a "4" or a "5" were given boosts for admissions consideration. A "3" was considered a neutral score, an expected level of experience. These three independent variables summarized individual extracurricular achievements prior to college enrollment.

TRANSFER recorded the total number of semester units transferred into the student's university academic record from college work accomplished outside the university. Students who earned quarter units had these units adjusted to semester units using the standard conversion of: 1 quarter unit = $\frac{2}{3}$ semester unit. In this study, TRANSFER was grouped with high school performance variables. Because transfer data also included academic credits earned at other institutions while students were enrolled in the case university or brought back to the university after a stop out period, it could be argued that TRANSFER is also a college experience variable. However, since these courses were not taken at the case university, they weren't experiences derived directly from enrollment in the case university. Rather, they were experiences brought into the university in a manner similar to high school and demographic factors.

AP was the total number of college units transferred into the student's university academic record as a result of successfully passing advanced placement and international baccalaureate examinations in high school.

ATHHS was collected from admissions files of self-reported, or admissions counselor noted, high school athletic participation or college athletic recruitment activity. Some students might not have reported such activity even though they participated, an indication, perhaps, of its lesser importance in enrollment and persistence decisions.

The Parental Education Variables

The DADNC, DADAA, DADBA, DADPG, MOMNC, MOMAA, MOMBA, and MOMPg variables were reported by each student on the admission's application and recorded from the individual files held by the Registrar. A "1" was recorded if the record reported the achievement of the respective level of education for each parent. Otherwise, a "0" was recorded. It is acknowledged that student self-reporting could under or over identify parents' academic achievements. The lack of reporting on the part of the student was assumed to mean: the college experience of the parent was truly unknown; the college experience of the parent was none and felt better left unreported; or, the college experience of the parent was of little interest to the student. In this study, non-reported education was listed as "no college". There was little that could be done to verify accuracy of this self-reporting and no way in which instances of over reporting could be verified – an admitted limitation in data collection accuracy.

The Ethnicity Variables

The ETHNC, ETHNB, and ETHNO variables were self-reported on the individual student application and recorded as a "1" if the student reported himself as of that

ethnicity and a “0” if left blank. A student who did not report identification with any specific ethnic group was recorded as “1” for ETHNO (ethnicity, other). A lack of reporting of ethnicity could have been a simple oversight on the application form; a lack of interest in such self-identification; or, association with the majority ethnicity that is felt not necessary to report. Unsure of the reason for no response, in this study, those cases were grouped under ETHNO. Original data recorded more than three categories of ethnicity variables. But, due to problems of data separation in the running of the logistic regression models, larger grouping of ethnicities were required. The use of additional ethnicity categories will allow for further research of the persistence behavior of specific ethnicity groups within the population of this study.

Independent Variables –Thirty-One College Experiences

The thirty-one college experiences variables are listed and defined in Appendix A. These variables were collected from case institution admissions files and transcripts.

The College Academic Variables

MAJORBIS (business related majors), MAJORLIB (liberal arts related majors), and MAJOROTH (all other academic majors) were recorded from individual transcripts and assigned a “1” to the appropriate category of final major declared by the student. A student was recorded to have had only one major - the earliest major declared that resulted in a degree. For the student who changed majors while enrolled, the final major was recorded whether or not a degree was achieved. In all other instances, a “0” was recorded. Original data recorded more than three categories of majors. But, due to problems of data separation in the running of the logistic regression models, larger grouping of majors were required.

DECLARED reported the semester during which the student submitted declaration of final major to the university. It was defined as a number from 1 to 10 with “1” being the first term of enrollment (Fall Year 1) and “10” being the tenth term of enrollment (Spring Year 5). In this study, the terms of enrollment were defined as: June 1 through December 31, and January 1 through May 31.

UNITS1F – UNITS5S (semester units completed per designated term) were recorded from the transcripts. These were cumulative completed units at the time of reenrollment decision. Fall units were totaled in December as the student departed for the Christmas holiday period and included units achieved the past summer and fall. Spring units were totaled in May as the student departed for summer vacation and included units achieved the past Intersession (three weeks in January) and spring. The students who enrolled in Intersession courses had likely made their decision to reenroll the following spring. Recording the total units at the end of the fall semester is appropriate to represent student accomplishment at the time of this likely persistence decision. Likewise, the students who enrolled in summer courses had likely made their decision to reenroll the next fall. Recording the total units at the end of the spring semester is appropriate to represent student accomplishment at the time of this likely persistence decision.

GPA1F – GPA5S (college grade point average) was recorded from the individual transcripts and were cumulative over terms. Each GPA was recorded at the end of the fall semester to include performance in the fall semester and prior summer, and at the end of the spring semester to include performance the spring semester and prior Intersession – both recording GPA achieved at the times of the likely persistence decisions.

The Residence Variables

The RES1, RES2, RES3, RES4, RES5, and RESTOT variables were collected from the residence life department but available only on an annual basis. If the residence record showed a student had been assigned to a room on campus, the variable was recorded as a “1”. Otherwise, a “0” was recorded signifying the student did not live on campus that year. Since residence data for this study was available only on an annual basis compared to other variables that were recorded by semester, it is acknowledged that some students who may have been assigned to a room could have vacated campus before making any persistence decision later that academic year. This variable differentiated those students who accepted rooms on campus at the beginning of the academic year and thus served as an indicator of predetermined individual feeling towards campus living more than the effects of campus living on the persistence decision. This limitation in data gathering can be minimized for future studies by recording semester-by-semester residence data at the end of each term to better determine if on campus living is significant at the time the persistence decision is likely to be made. It is noted that the university in this study required all out of town students to reside on campus the first year and guaranteed all students on campus rooms throughout all years of enrollment if desired. RESTOT (number of years in which residency on campus was recorded) was used in the models for which DEGREE was the dependent variable to show the potential influence of total campus living on the decision to graduate.

The Extracurricular Variable

Original data gathering included variables for recruited scholarship college athletes, college choral singers (Choral Scholars) on scholarship, NROTC scholarship

students, and resident assistants receiving room and board for their service. These extracurricular activities were identifiable from admissions files or from financial aid records showing actual recruitment or financial award. A “1” was recorded for any of the categories fulfilled. Otherwise, a “0” was recorded. But, due to problems of data separation in the running of the logistic regression models, insufficient numbers of college athletes, resident assistants, NROTC students, and Choral Scholars from semester to semester, necessitated that they be grouped under a single variable called EXTRA. Qualitative research techniques, not a part of this study, could be appropriate to examine the effects of individual extracurricular activities on the persistence question.

Independent Variables - Fifty-Seven Financial Factors

Net Price and Pain Index variables were used to model the effects financial factors had on the persistence decision. The Net Price was defined as the sum of tuition and fees minus the total grant aid from institutional, government, and private sources. The Net Price represented the “out of pocket” cost of the education. The Pain Index was defined as the calculated federal need (from FAFSA input) minus the total grant aid from institutional, government, and private sources. The “pain” of attending college was the difference, between what the federal formula calculated to be the portion of tuition and fees that exceeded what the family/student should be paying, to the amount of “free” (not requiring payback) funds offered to make up this difference. Although the Net Price assumed a value greater than or equal to zero, the Pain Index could be positive or negative. A negative Pain Index represented the case of a student requiring no federal need but receiving scholarship monies perhaps as an incentive to enroll.

These variables were the most challenging to determine and collect for this study and were obtained from paper copy records of student financial aid from the university archive vault. The individual sums of money represented the final tuition and fees expected to have been paid (in the Net Price figures) and the final financial pain expected to have been incurred (in the Pain Index figures) among all iterations of awards for that semester. Students who reported changes to their or their parents' financial status triggered a recalculation of financial need and a subsequent reconsideration of financial aid. Students who withdrew from school showed no tuition and fees for that semester. These variables represented the amount of Net Price and Pain Index most recently assumed, not projected. Although it is reasonable to suggest that the promise of a financial aid award is compared against the estimate of cost before making a persistence decision, there were no data to make that analysis beyond the initial enrollment award studied by Siefert (2002) because subsequent annual financial aid award letters sent to students were not available. Future research should consider such letters to better predict when financial factors might actually influence the persistence decision.

Historical financial aid records reported costs actually billed, awards actually awarded, and grants actually granted after all changes and iterations had been received and adjusted. An important assumption was made that there was a "decision" Net Price and a "decision" Pain Index that was generally known to the student and/or family at the time the decision to return the following semester was made. These "decision" financial variables were recorded in this study as Decision Net Price and Decision Pain Index, the known quantities of actual Net Price to be expected and actual Pain Index to be endured at the time the persistence decision was likely to have been made. This assumption was

critical because there was no way to show from the financial aid records kept what the student and/or family knew about their awards and when they knew it. This may be an unconventional method of viewing financial aid apart from the more traditional consideration that relies on the “Here’s what we are offering you, will you stay?” approach. This new method suggests that there may be significance in the effects of cumulative costs and debt on the decision to continue in college and thus worth a more rigorous examination. The use of cumulative financial variables may allow for this broader evaluation.

All financial aid figures were recomputed from actual dollar amounts to 1998 base year dollars according to the figures recorded by the US Department of Labor, Bureau of Labor Statistics, consumer price index (CPI) for all urban consumers, not seasonally adjusted, US city average for all items in the “basket”. The Internet webpage used was: <http://data.bls.gov/cgi-bin/surveymost> from website: www.bls.gov. The CPI used the base period 1982 to 1984 = 100. Table 4-1 lists the adjustment figures recorded from the BLS website.

Table 4-1

Bureau of Labor Statistics CPI Corrections for Base Year 1998

Year	Enrollment Period	CPI Calculation
1998	ENROLL1F	163.0
1999	ENROLL1S and ENROLL2F	163.0 / 166.6
2000	ENROLL2S and ENROLL3F	163.0 / 172.2
2001	ENROLL3S and ENROLL4F	163.0 / 177.1
2002	ENROLL4S and ENROLL5F	163.0 / 179.9
2003	ENROLL5S	163.0 / 184.0

Adjusted financial factor variables were recorded in thousands of US dollars for ease of analysis in logistic regression.

The Cumulative Pain Index Variables

CUMPI1F, CUMPI1S, CUMPI2F, CUMPI2S, CUMPI3F, CUMPI3S, CUMPI4F, CUMPI4S, and CUMPI5F were the cumulative values for all financial pain endured over the course of enrollment and provided for the examination of the effects of the totality of the financial burden incurred before the decision to return to college was made. In this study, the cumulative Pain Index up to the semester most recently completed was entered into the individual models. For example, for models examining the decision to enroll in Fall Year 3, the Cumulative Pain Index for Spring Year 2 was entered.

The Decision Pain Index Variables

DECPI1S, DECPI2F, DECPI2S, DECPI3F, DECPI3S, DECPI4F, DECPI4S, DECPI5F, and DECPI5S were the Pain Index values for each semester from financial aid calculations. In this study, the decision Pain Index was that of the semester into which enrollment was being considered. For example, for models examining the decision to enroll in Fall Year 3, the Decision Pain Index for Fall Year 3 was entered.

The Total Cumulative Pain Index Variable

The cumulative total of the Pain Indices for all enrollment semesters, CUMPI TOT, was used in the models in which DEGREE was the dependent variable. Thus, the totality of the Pain Index was considered in the decision to persist to degree.

The Decision Net Price Variables

DECNP1S, DECNP2F, DECNP2S, DECNP3F, DECNP3S, DECNP4F, DECNP4S, DECNP5F, and DECNP5S were the Net Price values for each semester in the final iteration from financial aid calculations. The decision Net Price was that of the

semester into which enrollment was being considered. For example, for models examining the decision to enroll in Fall Year 3, the Decision Net Price for Fall Year 3 was entered.

The Total Cumulative Net Price Variable

The cumulative total of the Net Prices for all enrollment semesters, CUMNPTOT, was used in the models in which DEGREE was the dependent variable. The totality of the Net Price was considered in the overall decision to persist to degree. The semester cumulative Net Price was not included in the models because a significant number of the population reported no financial need and thus would have the same Net Price each term.

The Financial Need Variables

The financial need variables were: NOFN1S, LOFN1S, HIFN1S, NOFN2F, LOFN2F, HIFN2F, NOFN2S, LOFN2S, HIFN2S, NOFN3F, LOFN3F, HIFN3F, NOFN3S, LOFN3S, HIFN3S, NOFN4F, LOFN4F, HIFN4F, NOFN4S, LOFN4S, HIFN4S, NOFN5F, LOFN5F, HIFN5F, NOFN5S, LOFN5S, and HIFN5S. To illustrate one way financial factors could be grouped for examination, this study classified the student population into three financial need areas, no financial need, low financial need, and high financial need. No financial need was defined as zero to \$1 US dollar. The cut off between low and high need was \$12,000 US dollars consistent with Seifert's 2002 study. "The cut off of \$12,000 between low and high need...is approximately half of the required costs of attending the university" (Seifert, 2002, p. 74).

The Total Financial Need Variable

The final financial factor variable, FNSEMTOT, was used in the models in which DEGREE was the dependent variable. The total number of semesters in which a student

consistently remained classified in a single financial need category was considered in the overall decision to persist to degree.

Description of the Data

Continuity of Study

This study expanded upon the work of Siefert (2002) who used data from the same university to evaluate the effects of a variety of factors on the decision to accept an offer of admission. One of the enrolling years of that study formed the population of students for this longitudinal study of their persistence to graduation once they accepted the admissions offer. In Siefert's work (p. 61), there were 3,285 students admitted for this class. Of these 1,031 enrolled. This equated to an admissions yield of 31.4%.

Table 4-2 provides a comparison of demographic data collected by Siefert and by this study pertaining to the entry class used in both dissertations. It was discovered after the Siefert study that one enrolled student decided to leave the university before beginning classes thus dropping the population in this work to 1,030. Religion was not recorded for this work in part because Siefert found this variable not to have been significant in the decision to enroll (2002, p. 83). Unlike demographic factors which remain unchanged over the course of enrollment, one's religion can and often does change in college. Although this may be less likely to occur in a religiously affiliated institution, its use as a predictor in year to year persistence could be questioned unless students are asked to declare their religion with each enrollment. This had not been done at the case university. Nevertheless, Table 4-2 reveals an overwhelming population of students of Christian religious background (88.1%) and of Caucasian race (70.0%).

What has become increasingly more typical in higher education enrollment, women comprised the majority of this student population (59.7%). In Siefert, pre-enrollment campus visit information was not available for all classes examined but was available for the population in this study. These visits were not considered in this persistence research since they pertained only to the initial enrollment decision. The comparison between the two studies enhances the argument for internal validity.

Table 4-2

Comparison of Enrolled Demographics: Siefert 2002 and Marra 2006

	<u>Siefert (2002)</u>	<u>Marra (2006)</u>
Enrolled:	1031	1,030
Male:	40.3%	40.3%
Visited Campus before Enrolling:	52.5%	Did not record.
Legacy:	16.1%	16.1%
Reported Ethnicity:		
Asian, Pacific Islander	4.8%	4.8%
African American	2.2%	2.2%
Caucasian	69.9%	70.0%
Filipino	1.6%	1.6%
Hispanic	14.5%	14.6%
Native American	1.9%	1.9%
Other/Unknown	4.9%	5.0%
Reported Religion:		Did not record.
Catholic	55.2%	
Protestant	32.9%	
Jewish	2.2%	
Other/Unknown	9.7%	
International	1.7%	1.4% (home of record)
Mean SAT	1139	1141
Mean High School GPA	3.66	3.66
Mean Application Rating (0 - 9)	5.48	5.48

Discussion of the Population Demographic Independent Variables

The 1,030 students examined in this study could be described in many ways. From the researcher's perspective, each assumed an increasingly complex identity as

more individual data were collected. To preserve confidentiality and to conform to expected practice of human subject research, each student was identified in the data base as a “case” from “1” to “1030”. Each “case” had to make a decision to enroll or not each term. There were several unique populations – those students who initially enrolled, those students who enrolled each semester through five years, and those students who graduated with degree in years three, four or five. Table 4-3 reports the population breakdown for each enrollment period and the periods of graduation.

Table 4-3
Enrollment and Graduation Population Breakdown

<u>Population of Students</u>	<u>No. (N)</u>	<u>% IE*</u>	<u>Men (M)</u>	<u>% (M)</u>	<u>Women (W)</u>	<u>% (W)</u>
Initial Enrolled (IE)	1030	100.0	415	40.3	615	59.7
Enrolled Spring Year 1	1004	97.5	399	39.7	605	60.3
Enrolled Fall Year 2	888	86.2	360	40.5	528	59.5
Enrolled Spring Year 2	849	82.4	343	40.4	506	59.6
Enrolled Fall Year 3	767	74.5	307	40.0	460	60.0
Enrolled Spring Year 3	765	74.3	310	40.5	455	59.5
Graduated Spring Year 3	5	<0.01	3	60.0	2	40.0
Enrolled Fall Year 4	772	75.0	307	39.8	465	60.2
Graduated Fall Year 4	18	0.02	5	27.8	13	72.2
Enrolled Spring Year 4	752	73.0	299	39.8	453	60.2
Graduated Spring Year 4	588	57.1	214	36.4	374	63.6
Graduated Summer Year 4	3	<0.01	3	100.0	0	0.0
Enrolled Fall Year 5	157	15.2	86	54.8	71	45.2
Graduated Fall Year 5	69	6.7	42	60.9	27	39.1
Enrolled Spring Year 5	80	7.8	40	50.0	40	50.0
Graduated Spring Year 5	51	0.05	26	51.0	25	49.0

* IE = Initial Enrollment (N = 1030).

Some general observations from Table 4-3 are apparent among this population of students. One, there was nearly a 14% drop in enrollment from the first to the second year compared to a total loss of 27% over four years. This is consistent with much of the literature that reports a significant drop-off in initial enrollment over the freshman year

(Tinto, 1993; Horn & Carroll, 1998). Two, there was evidence of relative class stability within each academic year with the majority of decisions not to persist taking place over the summer months. Three, there was a net gain of seven students in the beginning of year four, evidence that stop-out behavior existed in the population. Appendix C shows twenty-one students not reenrolling, five students graduating, and thirty-three stop out students returning. Four, women outnumbered men throughout the semesters until the fifth year where the number of enrolled men surpassed the number of enrolled women. There may be reason for this occurrence but it is not evident from Table 4-3. Five, more than 70% of the original student cohort graduated from the university after five years. Although this graduation rate may exceed comfortably the national average of 51% in six years (Tinto, 2002), still an uncomfortable 30% of those students who accepted admission did not graduate in five years. And, six, 53.5% of the men and 63.3% of the women from the original student cohort graduated in four years while 70.6% of the men and 71.7% of the women from the original student cohort graduated in five years, an indication that women tended to progress quicker though the curriculum than men but both women and men tended to have nearly equivalent rates for five year graduation. Of the eighteen Fall Year 4 graduates, thirteen were women.

Tables 4-4 and 4-5 report the educational background of the fathers and the mothers respectively of the population initially enrolled and continually enrolled throughout the five years (ten terms) of the study. Fifteen and one half percent of the fathers of the incoming class (term enrolled 1) were reported to have had doctorate or professional degrees while only 1.8% of the mothers were listed for these degrees. But, the percentage of mothers with master's degrees exceeded that of the dads by 1.4%.

Although the mothers with no reported degree surpassed that of the dads by 1.7%, the percentage of moms with college background to the baccalaureate level was in excess of the dads by more than 10%. Also, 23.5% of the dads in the initial enrollment had graduate degrees while 24.4% of the population after year 4 and 21.4% in the tenth term (year 5) held these degrees. These six categories of educational background were compressed into four (no college, one to two years college, three- four years college, and post graduate work) because of data separation issues encountered in the running of the logistic regression models.

Table 4-4
*College Background of the Fathers of the Student Population**

<u>Term Enrolled :</u>	<u>1F</u>	<u>1S</u>	<u>2F</u>	<u>2S</u>	<u>3F</u>	<u>3S</u>	<u>4F</u>	<u>4S</u>	<u>5F</u>	<u>5S</u>
No College	23.8	23.3	22.5	21.6	21.9	22.0	21.5	21.4	29.3	26.3
1 – 2 Years	8.7	8.9	9.2	9.2	9.5	9.5	9.6	9.7	10.8	13.8
3 – 4 Years	44.1	44.0	44.4	44.6	44.1	43.9	43.8	43.8	36.3	37.5
Masters	8.0	8.0	7.5	7.8	8.3	8.2	8.2	8.4	7.0	8.8
Doctorate	2.0	1.9	1.8	1.9	1.6	1.2	1.6	1.5	1.3	1.3
Professional	13.5	13.3	13.9	14.3	13.8	14.4	14.6	14.5	14.6	11.3

*Figures are in percentages that may not sum to 100% due to rounding.

Table 4-5
*College Background of the Mothers of the Student Population**

<u>Term Enrolled :</u>	<u>1F</u>	<u>1S</u>	<u>2F</u>	<u>2S</u>	<u>3F</u>	<u>3S</u>	<u>4F</u>	<u>4S</u>	<u>5F</u>	<u>5S</u>
No College	25.5	25.4	25.1	25.0	25.6	25.4	24.4	24.7	31.2	28.8
1 – 2 Years	17.4	17.1	17.0	17.0	17.3	17.5	17.6	17.7	19.7	22.5
3 – 4 Years	46.0	46.1	46.7	47.1	46.4	46.3	46.9	46.5	40.8	42.5
Masters	9.4	9.6	9.3	9.1	8.7	8.9	9.1	9.3	5.7	2.5
Doctorate	0.3	0.2	0.2	0.2	0.3	0.3	0.1	0.1	0.0	0.0
Professional	1.5	1.5	1.5	1.5	1.6	1.6	1.8	1.5	1.9	2.5

*Figures are in percentages that may not sum to 100% due to rounding.

In the case of the moms' education, 11.2% were reported to have graduate degrees in the initial student enrollment. This compared to a relatively constant 10.9% at

the fourth year but with a 5.0% at the fifth year, a considerable decrease when compared with the dads. These six categories of educational background were compressed into four (no college, one to two years college, three- four years college, and post graduate work) because of data separation issues encountered in the running of the logistic regressions.

The ethnic breakdown of the student population is depicted in Table 4-6.

Enrollment in this institution was decidedly Caucasian but with a sizable Hispanic population no doubt due to its proximity to the US southern border. Note the increasing percentage of enrolled Hispanic students from a fourth semester low, 113 students representing 13.3% of the fourth semester enrolled population, to the end of the fifth year, 20 students representing 25% of the tenth semester enrolled population. These seven categories of ethnicity were compressed into three (Caucasian, Hispanic origin, and other) because of data separation issues encountered in the running of the logistic regressions. Original data were retained for future research on the persistence decision of specific ethnic groups.

Table 4-6
Ethnicity Percentages of the Student Population

<u>Term Enrolled :</u>	<u>1F</u>	<u>1S</u>	<u>2F</u>	<u>2S</u>	<u>3F</u>	<u>3S</u>	<u>4F</u>	<u>4S</u>	<u>5F</u>	<u>5S</u>
Asian/Islander*	4.8	4.9	5.1	5.1	5.3	5.0	5.2	5.3	3.8	3.8
Black#	2.2	2.3	2.0	2.0	2.1	2.1	1.8	1.9	2.5	2.5
Caucasian	70.0	70.1	70.9	71.5	70.1	70.2	70.7	70.5	61.8	56.3
Filipino	1.6	1.6	1.8	1.8	1.6	1.7	1.6	1.6	3.8	5.0
Hispanic+	14.6	14.2	13.6	13.3	14.3	14.5	14.4	14.6	21.0	25.0
Native^	1.9	2.0	1.4	1.4	1.4	1.4	1.4	1.3	0.6	1.3
Other	5.0	4.9	5.2	4.9	5.1	5.1	4.9	4.8	6.4	6.3

* Figures include Asian, Asian American, and Pacific Islander.

Figures include African American, Black African, and Haitian.

+ Figures include Hispanic, Chicano, Latin American, and Puerto Rican.

^ Figures include Native American and Eskimo.

Table 4-7 lists demographic compositions of the initial enrolled, the graduating classes after years four and five, and the entire population of persisters to degree.

Table 4-7

Demographics of Initial and Graduation Populations Year 4 and Year 5

	<u>Initial</u>	<u>% (N)</u>	<u>Yr 4</u>	<u>% (611)</u>	<u>Yr 5</u>	<u>% (123)</u>	<u>Grads</u>	<u>% Initial</u>
<u>Population (N)</u>	1030	100.0	611	100.0	123	100.0	734	71.3
Male	415	40.3	222	36.3	71	57.7	293	70.6
Female	615	59.7	389	63.2	52	42.3	441	71.7
Legacy students	166	16.1	103	16.7	27	22.0	130	78.3
Intl students	14	1.4	8	1.3	1	0.8	9	64.3

Dad's Education (seven reported deceased dads for N [1030 – 7] = 1023)

	<u>Initial</u>	<u>% (N)</u>	<u>Yr 4</u>	<u>% (606)</u>	<u>Yr 5</u>	<u>% (122)</u>	<u>Grads</u>	<u>% Initial</u>
<u>Population (N)</u>	1023	100.0	606	100.0	122	100.0	728	71.2
No College	243	23.8	120	19.6	33	26.8	153	63.0
1 – 2 years	89	8.7	58	9.5	13	10.6	72	80.9
3 – 4 years	451	44.1	277	45.4	46	37.4	325	72.1
Masters	82	8.0	51	8.3	9	7.3	60	73.2
Doctorate	20	2.0	10	1.6	1	0.8	11	55.0
Professional	138	13.5	90	14.8	20	16.3	111	80.4

Mom's Education (one reported deceased mom for N [1030 – 1] = 1029)

	<u>Initial</u>	<u>% (N)</u>	<u>Yr 4</u>	<u>% (611)</u>	<u>Yr 5</u>	<u>% (122)</u>	<u>Grads</u>	<u>% Initial</u>
<u>Population (N)</u>	1029	100.0	611	100.0	122	100.0	733	71.2
No College	262	25.5	141	23.1	36	29.5	178	67.9
1 – 2 years	179	17.4	105	17.2	25	20.5	132	73.7
3 – 4 years	473	46.0	294	48.1	51	41.8	346	73.2
Masters	97	9.4	60	9.8	10	8.2	70	72.2
Doctorate	3	0.3	1	0.2	0	0.0	1	33.3
Professional	15	1.5	10	1.6	0	0.0	10	66.7

<u>Ethnicity</u>	<u>Initial</u>	<u>% (N)</u>	<u>Yr 4</u>	<u>% (611)</u>	<u>Yr 5</u>	<u>% (123)</u>	<u>Grads</u>	<u>% Initial</u>
<u>Population (N)</u>	1030	100.0	611	100.0	123	100.0	734	71.3
Asian, Pac Islander	49	4.8	32	5.2	6	4.9	38	77.6
African American	23	2.2	10	1.6	4	3.3	14	60.9
Caucasian	721	70.0	447	73.2	79	64.3	526	73.0
Filipino	16	1.6	6	1.0	4	3.3	10	62.5
Hispanic	150	14.6	78	12.7	21	17.1	99	66.0
Native American	20	1.9	10	1.6	1	0.8	11	55.0
Other/Unknown	51	5.0	28	4.6	8	6.5	36	70.6

As noted in Table 4-7, women graduated at a higher rate than men and the overall population. Students of legacy graduated at the highest rate while international students graduated at the lowest rate among the categories listed. In terms of the educational background of the dads, interestingly, the highest graduation percentage was among those students whose dad had one to two years of college, closely followed by those whose dad had a professional degree, while the lowest was among those students whose dad had a doctoral degree. Note that there were only twenty students in the later category. In terms of the educational background of the moms, the highest graduation percentage occurred among students whose moms had one to four years of college or a master's degree, while like the situation with the dads, the lowest was among those students whose mom had a doctoral degree. There were few, only three, such students in this later category.

Concerning ethnic background, Asian and Pacific Islanders graduated at the highest rate while Native Americans graduated at the lowest rate. Neither ethnic group was well-represented although there were opportunities on campus for all minority groups through the multi-cultural student organizations. The vast majority of Caucasian students graduated at a rate slightly better than the total population.

Because so many students in the study university were of Caucasian background, even significant gains in persistence among minority groups would not greatly improve overall retention rates at this institution. Nevertheless, as more effort is made toward minority recruitment, it is important for policy makers to examine thoughtfully those groups that fell below the overall university averages. Again it is noted that in the running of the logistic regression models, the delineation of ethnicity and parents' educational background listed in Table 4-7 could not be accomplished. The category for international

students also had to be eliminated from the modeling for similar reasons. This demonstrates a shortcoming of strictly utilizing quantitative techniques to examine these research questions and suggests that mixed methodologies could provide meaningful and useful information in a subsequent study of this student population.

Table 4-7 shows that seven students reported deceased dads and one student reported a deceased mom. Details on these students were not shown but are available for future research consideration. All four men and three of the four women graduated; one of the seven fatherless students reported a mom with no degree; five reported a mom with three to four years of college; and, one a mom having a professional degree. The male student, whose mom was deceased, reported a dad with no college and graduated in year five. The female student who did not graduate reported a mom with three to four years of college. Seven students identified themselves as Caucasian; the eighth as “other”. The one legacy student graduated in year four. None were international students.

Siefert (2002) postulated that distance from home of record to the university would influence the decision to enroll and used mileage radii from the university along with in and out of state criteria to model this significant factor. In this work, mileage from home of record to the university was calculated, for each student through a zip code to zip code program for domestic addresses and from city of record to city in which the university was located for international addresses. These calculations were used in this study to examine the significance original distances from the institution may have in the persistence decision even if this distance might have changed over the course of enrollment. Table 4-8 reports the mileage from the original home of record to the case university for the semester enrollment and graduation populations.

Table 4-8
*Mileage from Home of Record to the University**

<u>Population</u>	<u>Mean</u>	<u>Median</u>
Initial Enrollment	636.24	318.00
Enrolled second semester	640.33	328.00
Enrolled third semester	605.11	312.50
Enrolled fourth semester	600.76	311.00
Enrolled fifth semester	587.31	308.00
Enrolled sixth semester	582.92	306.00
Enrolled seventh semester	576.74	307.00
Enrolled eighth semester	576.34	305.50
Enrolled ninth semester	611.26	109.00
Enrolled tenth semester	604.59	114.00
Graduated Year 4	572.74	312.00
Graduated Year 5	599.65	238.00

*The mode in each population is 17 miles.

Discussion of the Population Pre-College Independent Variables

The population of students could further be defined through admissions related data and semester courses completed. Table 4-9 compares data from the initial enrolled population with that of the graduated class in years four and five respectively. Similar data collected for all terms of enrollment were included in the regression analyses.

Table 4-9
Admissions Profiles for Initial Enrollment and Graduation Populations

<u>Variable</u>	<u>Initial Population</u>		<u>Year 4 Graduates</u>		<u>Year 5 Graduates</u>	
	<u>Mean</u>	<u>Median</u>	<u>Mean</u>	<u>Median</u>	<u>Mean</u>	<u>Median</u>
Profile (max. = 3600)	2748	2755	2775	2770	2666	2673
Rate (0-9)	5.48	6.00	5.72	6.00	4.65	5.00
GPA HS (4.0 scale)	3.66	3.68	3.71	3.73	3.54	3.54
SAT Verbal	563	560	567	570	544	540
SAT Math	578	580	584	590	571	570
Leadership (1-5)	3.02	3.00	3.05	3.00	2.96	3.00
Service (1-5)	3.02	3.00	3.08	3.00	2.89	3.00
Talent (1-5)	3.35	3.00	3.33	3.00	3.44	3.00
Transfer (credit)	6.06	3.00	7.55	6.00	7.38	5.00
AP (credit)	2.04	0.00	2.41	0.00	1.63	0.00

Note the values for the profile score. The maximum profile score of 3600 is obtained according to the following formula established by the university's admissions office: $(4.00 \text{ HS GPA} \times 400) + (1600 \text{ SAT score}) + (100 \text{ Leadership Points}) + (50 \text{ Service Points}) + (100 \text{ Talent Points}) + (150 \text{ Miscellaneous Points})$. Leadership, service, and talent points could be negative as well as positive depending upon the level of respective accomplishment reported in the application for admission. Miscellaneous points, for first generation college for example, were positive only and may not have been included for every applicant.

Inserting the means for GPA and SAT scores from Table 4-9 for the initial population of students into the admissions formula, an average profile score of the averages, less leadership, service, and talent, was obtained. $(3.66 \text{ HSGPA} \times 400) + (563 \text{ SAT Verbal} + 578 \text{ SAT Math}) = 2605$. This was 143 points less than the mean profile of 2748 in the table indicating that, on average, 143 extra points were assigned to the enrolled student in the application evaluation for subjective determinations of leadership, service, and talent. In other words, the initial enrollment population had, on average, demonstrated a certain level of leadership, service, talent, and other attributes sought by the university. Also, note the higher profile mean and median for the year four graduating students. Mean talent scores were slightly higher in all populations perhaps because talent for recruited NCAA Division 1 athletes was "maxed out" by convention in the admissions process, deference to the value-added from these students, and was part of the overall data collected. The profile score was eliminated from the variables entered into the logistic regression models because these data were captured by the RATE variable,

the “0” – “9” numbers into which the profile scores were compressed, and other pre-college variables that were listed separately in analysis.

Discussion of the College Independent Variables

The college variables in this retention study concerned the category of major declared and the number of units accumulated over time, and the grade point averages earned throughout enrollment. The totals and percentages of the majors were divided into five categories and summarized in Table 4-10. Business majors comprised more than a third of all declared majors in this liberal arts institution and 37% of the fourth year graduating students. Not surprisingly, liberal arts majors formed the largest set for both initial enrollment and four-year graduates.

Table 4-10

Declared Majors of Enrollment and Graduation Populations

<u>Population of Students</u>	<u>Business</u>		<u>Education</u>		<u>Engineering</u>		<u>Liberal Arts</u>		<u>Sci/Math</u>	
	<u>No.</u>	<u>%</u>	<u>No.</u>	<u>%</u>	<u>No.</u>	<u>%</u>	<u>No.</u>	<u>%</u>	<u>No.</u>	<u>%</u>
Initial Enrolled (IE)	300	35.9	44	5.3	24	2.9	393	47.1	74	8.9
Enrolled Spring Year 1	299	29.8	44	4.4	24	2.4	390	38.8	73	7.3
Enrolled Fall Year 2	298	33.6	43	4.8	22	2.5	386	43.5	70	7.9
Enrolled Spring Year 2	296	34.9	42	4.9	22	2.6	381	44.9	71	8.4
Enrolled Fall Year 3	272	35.5	40	5.2	21	2.7	363	47.3	66	8.6
Enrolled Spring Year 3	278	36.3	41	5.4	21	2.7	356	46.5	65	8.5
Enrolled Fall Year 4	284	36.8	43	5.6	21	2.7	356	46.1	66	8.5
Enrolled Spring Year 4	272	36.2	42	5.6	21	2.8	350	46.5	65	8.6
Enrolled Fall Year 5	52	33.1	7	4.5	19	12.1	69	43.9	9	5.7
Enrolled Spring Year 5	19	23.8	6	7.5	13	16.3	39	48.8	3	3.8
Graduated Year 4	226	37.0	36	5.9	2	0.3	290	47.5	56	9.2
Graduated Year 5	46	37.4	6	4.9	18	14.6	48	39.0	5	4.1

Table 4-11 summarizes when, over the course of enrollment, the decision of the final academic major was made. This table shows that the mean time to declare the final major for both the initial enrolled population and those who earn their degrees after four

and five years occurred during the sophomore or second year (semesters three and four).

A decision on a final major past the second year could impact the student's ability to have completed all upper division courses required of the major by the fourth or fifth year.

Table 4-11

Semester of Major Declaration of Initial and Graduation Populations

<u>Variable</u>	<u>Initial Population</u>		<u>Year 4 Graduates</u>		<u>Year 5 Graduates</u>	
	<u>Mean</u>	<u>Median</u>	<u>Mean</u>	<u>Median</u>	<u>Mean</u>	<u>Median</u>
Declared (semester)	3.49	4.00	4.14	4.00	4.83	5.00

Table 4-12 delineates the accumulation of academic credits in semester hours for the population of students who continued to enroll to graduation. Advanced placement and transfer units were not included in the units' count, only units earned at the case institution. For simplicity of presentation, only the mean and the median of the initial enrolled population and those who graduated in four or five years are displayed. All enrolled populations were considered in the regression analysis portion of this study.

Table 4-12

Cumulative Semester Units for Initial and Graduation Populations

<u>Enrollment</u>	<u>Initial Population</u>		<u>Year 4 Graduates</u>		<u>Year 5 Graduates</u>	
	<u>Mean</u>	<u>Median</u>	<u>Mean</u>	<u>Median</u>	<u>Mean</u>	<u>Median</u>
Fall Year 1	13.99	15.00	14.62	15.00	13.55	14.00
Spring Year 1	27.37	28.00	28.71	29.00	27.15	27.50
Fall Year 2	39.75	42.00	43.59	44.00	40.85	42.00
Spring Year 2	51.45	56.50	58.35	59.00	53.11	55.00
Fall Year 3	62.96	70.00	73.53	74.50	65.91	68.00
Spring Year 3	73.93	84.50	88.54	89.50	79.02	80.00
Fall Year 4	85.76	99.50	104.74	105.50	93.36	94.00
Spring Year 4	96.67	114.00	119.43	121.00	107.96	110.00
Fall Year 5	98.93	116.00	119.43	121.00	123.21	122.00
Spring Year 5	104.07	117.00	119.43	121.00	128.60	125.00

The case university required the earning of a minimum of 124 semester units to grant a bachelors degree. If a student was admitted with no AP or transfer credits, and did not plan to enroll in any special sessions (January Intersession or Summer Sessions), he/she would have had to complete 15 units per semester with 4 units remaining to be taken – 1 with a required lab science, and 3 units elsewhere in a one course semester overload. Reviewing the cumulative semester units in Table 4-12, it becomes apparent that the initial population means were below the 15 units per term. The Year 4 Graduates numbers, not surprisingly, were considerably closer to idealized semester units. As expected, the values for Spring Year 5 were greater than the 124 minimum in part due to the additional graduation requirements of the engineering students enrolled in four and a half to five year joint degree programs.

Next are the cumulative grade point averages of the population of students over the semesters of enrollment along with their annual status of residency on campus. In the interest of simplicity of presentation, Table 4-13 records data for the initial population and those who graduated in years four and five.

Table 4-13

Cumulative Grade Point Averages for Initial and Graduation Populations

<u>Enrollment</u>	<u>Initial Population</u>		<u>Year 4 Graduates</u>		<u>Year 5 Graduates</u>	
	<u>Mean</u>	<u>Median</u>	<u>Mean</u>	<u>Median</u>	<u>Mean</u>	<u>Median</u>
Fall Year 1	2.91	3.00	3.06	3.13	2.78	2.83
Spring Year 1	2.93	2.97	3.09	3.12	2.78	2.74
Fall Year 2	2.96	3.00	3.13	3.17	2.82	2.78
Spring Year 2	2.97	3.04	3.15	3.19	2.84	2.84
Fall Year 3	2.99	3.06	3.18	3.22	2.86	2.84
Spring Year 3	3.00	3.07	3.19	3.22	2.86	2.83
Fall Year 4	3.02	3.08	3.21	3.23	2.90	2.85
Spring Year 4	3.03	3.08	3.22	3.24	2.92	2.88
Fall Year 5	3.03	3.09	3.22	3.24	2.94	2.91
Spring Year 5	3.03	3.09	3.22	3.24	2.95	2.93

Note in Table 4-13 the rise in the cumulative GPA after the first year for the three populations depicted. The highest cumulative GPA was enjoyed by the four year graduates, the presumably the “traditional” students who remained on track from start to finish, while the lowest cumulative GPA was recorded for the five year graduates. Caution should be exercised in not over-speculating why this may be the case for the five year students. Here, it is merely an observation of the descriptive data.

Another category of college experience variables dealt with the residency status of the student. Data were recorded per annum rather than per term. This is a limitation created by record keeping. Although it is postulated that some students enrolled for the entire academic year could have changed residency mid-year (moved off campus or returned to campus), university penalties imposed on the mid-year termination of residence halls contracts likely would have helped to reduce the number of instances of off campus moves between the fall and spring terms.

Residency can be a complicated experience for the college student. In the city in which the case institution is located, there are many attractive off-campus apartments available in communities catering to college students from several universities in the region. The incentive to join these communities can be strong especially in an attractive urban environment featuring a myriad of recreational and entertainment options. Although this local setting is not unique to the case university, it should be taken into account when considering the significance of any move off campus. The lure of exciting off-campus living can take students away from the dormitories despite the best efforts of residence directors and assistants and may not necessarily indicate dissatisfaction with the institution. Informal discussions with many students at the institution in this study

suggested that interest in the university remained high despite the move to live off campus. The case university required all freshmen to live on campus unless they lived with their families and commuted from home. Table 4-14 lists residency status.

Table 4-14

*Campus Residency of Enrolled and Graduation Populations**

<u>Enrollment Population</u>	<u>Year 1</u>		<u>Year 2</u>		<u>Year 3</u>		<u>Year 4</u>		<u>Year 5</u>	
	<u>No.</u>	<u>%</u>	<u>No.</u>	<u>%</u>	<u>No.</u>	<u>%</u>	<u>No.</u>	<u>%</u>	<u>No.</u>	<u>%</u>
Fall Year 1 N = 1030	937	91.0	610	68.7	189	24.6	99	12.8	14	1.4
Spring Year 1 N = 1004	914	91.0	610	60.8	187	18.6	97	9.7	12	1.2
Fall Year 2 N = 888	804	90.5	602	67.8	186	20.9	97	10.9	12	1.4
Spring Year 2 N = 849	767	90.3	573	67.5	186	21.9	96	11.3	12	1.4
Fall Year 3 N = 767	690	90.0	525	68.4	187	24.4	96	12.5	13	1.7
Spring Year 3 N = 765	690	91.3	520	68.0	181	23.7	97	12.7	14	1.8
Fall Year 4 N = 772	698	90.4	524	67.9	176	22.8	99	12.8	14	1.8
Spring Year 4 N = 752	677	90.0	508	67.6	175	23.3	99	13.2	14	1.9
Fall Year 5 N = 157	130	82.8	80	51.0	26	16.6	19	12.1	14	8.9
Spring Year 5 N = 80	63	78.8	37	46.3	19	23.8	13	16.3	11	13.8
Grad Year 4 N = 611	563	92.1	443	72.5	153	25.0	79	12.9	0	0.0
Grad Year 5 N = 123	103	83.7	64	52.0	21	17.1	16	13.0	10	8.1

* Percentages refer to the percentage of students recorded as living on campus to those enrolled in that specific term. For example: There are 752 students enrolled in the Spring of year four. The 14 students living on campus in year five out of that spring year four population represent 1.9% of these 752 fall year four enrollees from the initial student population.

The college experience extracurricular activities was consolidated into one variable called EXTRA identified from five areas of extra curricular activities gathered

from the institutional records. Except for the high school athlete, these variables represented distinctive areas of commitment (time and talent) from the student, and financial remuneration (scholarships, grants, and/or stipends) from the university. Students identified by these characteristics were listed in Table 4-15 without regard to participation in any given semester. The low numbers in individual categories precluded the use of these different extracurricular variables in logistic regression analysis; hence the combined EXTRA variable was created. Knowing other campus organizations and activities that might reveal areas of significant influence on persistence could benefit institutional decision makers when deciding budget and resource allocations.

Table 4-15

*Extracurricular Activities for Enrollment and Graduation Populations**

<u>Enrollment Population</u>	<u>High School Athlete</u>		<u>College Athlete</u>		<u>Choral Scholar</u>		<u>NROTC Midshipmen</u>		<u>Resident Assistant</u>	
	<u>No.</u>	<u>%</u>	<u>No.</u>	<u>%</u>	<u>No.</u>	<u>%</u>	<u>No.</u>	<u>%</u>	<u>No.</u>	<u>%</u>
Total Population	217	21.1	40	3.9	2	0.2	26	2.5	23	2.2
Spring Year 1	212	21.1	39	3.9	2	0.2	26	2.6	23	2.3
Fall Year 2	182	20.5	39	4.4	2	0.2	26	2.9	23	2.6
Spring Year 2	168	19.8	39	4.6	2	0.2	25	2.9	23	2.7
Fall Year 3	159	20.7	40	5.2	2	0.2	26	3.4	23	3.0
Spring Year 3	158	20.7	40	5.2	2	0.3	26	3.4	22	2.9
Fall Year 4	159	20.6	38	4.9	2	0.3	26	3.4	22	2.8
Spring Year 4	155	20.6	38	5.1	2	0.3	24	3.2	22	2.9
Fall Year 5	34	21.7	10	6.4	1	0.6	3	1.9	1	0.6
Spring Year 5	20	25.0	8	10.0	1	1.3	2	2.5	1	1.3
Graduate Year 4	123	20.1	30	4.9	1	0.2	23	3.8	21	3.4
Graduate Year 5	24	19.5	7	5.7	1	0.8	3	2.4	1	0.8

* High School Athlete is included with college extra curricular activities for comparison purposes since it is the only extra curricular activity common to both high school and college available for this study. Participation in junior NROTC programs in high school, if available, could have been included as comparison to NROTC participation in college.

In Table 4-15, all but three college athletes, all choral scholars, all NROTC midshipmen, and all but one resident assistant graduated in five years while only 147 of

the 217 high school athletes or 67.7% graduated in five years. It was the college athletes, the choral scholars, the NROTC midshipmen, and the resident assistants who committed extensively to university life and received varied levels of financial aid compensation for that commitment. High school athletes, as a group, developed no specific commitment, although many may have participated in intramural sports with no specific compensation for having been athletes before initial enrollment. The high school athletes who had participated in college sports were listed under the college athlete category as well.

Discussion of the Financial Factors Independent Variables

The final set of variables dealt with financial aid, the real cost of tuition, and the amount of financial effort a student and/or his family was providing. Cumulative Pain Index, Decision Net Price and Decision Pain Index figures for the respective semester enrollees, proximate to the persistence decision are listed in Tables 4-16 through 4-18.

From Table 4-16, a negative Cumulative Pain Index was recorded in each of the enrollment periods for the no-need students. This is depicted again in Table 4-18 for the Decision Pain Index. On average, students of no-need facing the decision to reenroll were not experiencing any financial pain for the cost of tuition. Some actually received more money than what federal calculations determined to be the family/student need to meet tuition costs. These students received merit scholarships and/or grants without demonstrating financial need. Hence the Pain Index was negative. This had an important institutional policy consideration discussed in Chapter 5. Many decisions to award merit scholarships were made, not to benefit individual students, but as incentives to get the better students to enroll and thus enhance university profile statistics important for elevating ranking. Merit scholarships were also offered to reward students who

performed well in high school as well as to encourage the next class of applicants to perform equally as well.

Table 4-16

*Cumulative Pain Index Proximate to Next Semester Enrollment Decision**

<u>Enrollment</u>	<u>N</u>	<u>Mean</u>	<u>Median</u>
Enroll1f	1030	\$766	\$0
No Fed Need 1s	483	(\$1,804)	\$0
Lo Fed Need 1s	399	\$2,512	\$2,358
Hi Fed Need 1s	148	\$4,448	\$3,831
Enroll1s	1004	\$1,479	\$0
No Fed Need 2f	599	(\$1,530)	\$0
Lo Fed Need 2f	264	\$5,298	\$4,740
Hi Fed Need 2f	141	\$7,115	\$6,670
Enroll2f	888	\$2,429	\$0
No Fed Need 2s	495	(\$3,376)	\$0
Lo Fed Need 2s	269	\$8,503	\$8,656
Hi Fed Need 2s	124	\$12,425	\$12,145
Enroll2s	849	\$3,376	\$0
No Fed Need 3f	520	(\$2,662)	\$0
Lo Fed Need 3f	211	\$11,693	\$11,434
Hi Fed Need 3f	118	\$15,113	\$14,164
Enroll3f	767	\$3,443	\$0
No Fed Need 3s	441	(\$6,111)	\$0
Lo Fed Need 3s	227	\$14,594	\$14,334
Hi Fed Need 3s	99	\$20,436	\$18,623
Enroll3s & Grad3s=0	760	\$3,836	\$0
No Fed Need 4f	431	(\$7,109)	\$0
Lo Fed Need 4f	204	\$14,880	\$16,980
Hi Fed Need 4f	125	\$23,549	\$22,019
Enroll4f & Grad4f=0	754	\$4,267	\$0
No Fed Need 4s	431	(\$9,142)	\$0
Lo Fed Need 4s	209	\$18,384	\$18,203
Hi Fed Need 4s	114	\$29,084	\$26,263
Enroll4s & Grad4s/4ss=0	161	\$10,584	\$5,771
No Fed Need 5f	93	(\$1,058)	\$0
Lo Fed Need 5f	48	\$21,691	\$21,283
Hi Fed Need 5f	20	\$38,058	\$37,641
Enroll5f & Grad5f=0	88	\$14,530	\$9,940
No Fed Need 5s	46	(\$2,731)	\$0
Lo Fed Need 5s	20	\$21,382	\$20,084
Hi Fed Need 5s	22	\$44,392	\$48,304

*Figures in Fall Year 1 Dollars.

•Multiple modes exist. The smallest value is shown.

Looking at the Net Price for the high-need students, Table 4-17 shows that considerable success had been made to drive down the Decision Net Price to under

\$1,000 per semester at least until the fifth year where a noticeable increase was realized. By the fifth year, however, less than two dozen high-need, and perhaps high motivated, students remained enrolled to make the decision to continue.

Table 4-17

*Decision Net Price Proximate to Next Semester Enrollment Decision**

<u>Enrollment</u>	<u>N</u>	<u>Mean</u>	<u>Median</u>
Enroll1f	1030	\$4,012	\$4,342
No Fed Need 1s	483	\$6,343	\$8,108
Lo Fed Need 1s	399	\$2,858	\$2,996
Hi Fed Need 1s	148	(\$485)	(\$1,221)
Enroll1s	1004	\$5,911	\$8,374
No Fed Need 2f	599	\$7,935	\$8,749
Lo Fed Need 2f	264	\$4,219	\$4,329
Hi Fed Need 2f	141	\$482	\$85
Enroll2f	888	\$5,387	\$5,625
No Fed Need 2s	495	\$7,547	\$8,465
Lo Fed Need 2s	269	\$3,716	\$3,951
Hi Fed Need 2s	124	\$390	\$73
Enroll2s	849	\$5,490	\$6,213
No Fed Need 3f	520	\$7,220	\$9,053
Lo Fed Need 3f	211	\$4,000	\$4,178
Hi Fed Need 3f	227	\$533	\$428
Enroll3f	767	\$4,943	\$5,259
No Fed Need 3s	441	\$6,686	\$8,803
Lo Fed Need 3s	227	\$3,555	\$3,614
Hi Fed Need 3s	99	\$360	\$36
Enroll3s & Grad3s=0	760	\$5,492	\$6,239
No Fed Need 4f	431	\$7,323	\$9,415
Lo Fed Need 4f	204	\$4,408	\$4,951
Hi Fed Need 4f	125	\$945	\$424
Enroll4f & Grad4f=0	754	\$5,415	\$6,131
No Fed Need 4s	431	\$7,230	\$9,268
Lo Fed Need 4s	209	\$4,189	\$4,647
Hi Fed Need 4s	114	\$802	\$402
Enroll4s & Grad4s/4ss=0	161	\$4,476	\$4,476
No Fed Need 5f	93	\$5,770	\$5,165
Lo Fed Need 5f	48	\$3,096	\$2,368
Hi Fed Need 5f	20	\$1,769	\$2,315
Enroll5f & Grad5f=0	88	\$6,283	\$6,379
No Fed Need 5s	46	\$8,066	\$7,424
Lo Fed Need 5s	20	\$5,453	\$6,171
Hi Fed Need 5s	22	\$3,311	\$2,628

*Figures in Fall Year 1 Dollars.

The Cumulative Pain Index and Decision Pain Indices for the high-need students told a different story. High-need students, who completed four years, incurred roughly a

mean of \$29,000 of cumulative financial pain while five-year students approached a \$45,000 mean. The low-need students averaged roughly \$18,000 and \$21,000 respectively of cumulative financial pain while the no-need students averaged negative financial pain throughout. No-need students paid more each term as shown in Table 4-17 but on average showed negative semester financial pain as shown in Table 4-18.

Table 4-18

*Decision Pain Index Proximate to Next Semester Enrollment Decision**

<u>Enrollment</u>	<u>N</u>	<u>Mean</u>	<u>Median</u>
Enroll1f	1030	\$750	\$0
No Fed Need 1s	483	(\$1,765)	\$0
Lo Fed Need 1s	399	\$2,457	\$2,307
Hi Fed Need 1s	148	\$4,352	\$3,748
Enroll1s	1004	\$1,050	\$0
No Fed Need 2f	599	(\$814)	\$0
Lo Fed Need 2f	264	\$3,076	\$2,890
Hi Fed Need 2f	141	\$5,177	\$4,586
Enroll2f	888	\$1,132	\$0
No Fed Need 2s	495	(\$901)	\$0
Lo Fed Need 2s	269	\$3,049	\$2,854
Hi Fed Need 2s	124	\$5,088	\$4,474
Enroll2s	849	\$282	\$0
No Fed Need 3f	520	(\$1,823)	\$0
Lo Fed Need 3f	211	\$2,858	\$2,560
Hi Fed Need 3f	118	\$4,951	\$4,341
Enroll3f	767	\$304	\$0
No Fed Need 3s	441	(\$2,105)	\$0
Lo Fed Need 3s	227	\$2,963	\$2,561
Hi Fed Need 3s	99	\$4,938	\$4,708
Enroll3s & Grad3s=0	760	\$465	\$0
No Fed Need 4f	431	(\$2,070)	\$0
Lo Fed Need 4f	204	\$2,884	\$2,627
Hi Fed Need 4f	125	\$5,257	\$4,464
Enroll4f & Grad4f=0	754	\$455	\$0
No Fed Need 4s	431	(\$2,038)	\$0
Lo Fed Need 4s	209	\$3,008	\$2,639
Hi Fed Need 4s	114	\$5,199	\$4,397
Enroll4s & Grad4s/4ss=0	161	\$1,400	\$0
No Fed Need 5f	93	(\$218)	\$0
Lo Fed Need 5f	48	\$2,089	\$2,033
Hi Fed Need 5f	20	\$7,265	\$7,375
Enroll5f & Grad5f=0	88	\$2,393	\$0
No Fed Need 5s	46	(\$214)	\$0
Lo Fed Need 5s	20	\$3,066	\$3,440
Hi Fed Need 5s	22	\$7,233	\$7,279

*Figures in Fall Year 1 Dollars.

Table 4-19 offers an aggregate comparison of cumulative Pain Index and Net Price for the entire initial enrollment (N=1,030) and those who achieved degree (N=734). Since the cumulative figures were the calculations of semester Pain Index and Net Price in this study, accumulation occurred after enrollment had been determined. If a student did not enroll in a given semester, stopped out, and returned in a follow-on semester, the cumulative Pain Index and Net Price figures “resumed” where they left off. When a student left the university never to return, the cumulative figures were carried over from semester to semester without increment. Hence, the Cumulative Pain Index and Cumulative Net Price figures for Spring Year 5 represented the total for each student regardless of number of terms enrolled. Table 4-19 shows a slightly lower mean of cumulative financial pain for those who graduated despite the higher level of Net Price incurred. This suggests that the Cumulative Pain Index and the Cumulative Net Price may be significant in predicting graduation.

Table 4-19

*Selected Cumulative Pain Index and Net Price Comparisons**

	<u>Final Cumulative Pain Index</u>	<u>Final Cumulative Net Price</u>
Initial Enrollment (N=1030)		
Mean	\$4,952	\$34,246
Median	\$0	\$33,610
Degree Completion (N=734)		
Mean	\$4,117	\$40,470
Median	\$0	\$42,471

*Figures in Fall Year 1 Dollars.

Observations of the descriptive statistics formed only part of the story of the persistence decisions that were made by this student population. Examination of the logistic regression results added more to the story.

Regression Results

The Analyst and the Practitioner – Different Perspectives

Data gathered for this study took years to collect. Their examination can take equally long. There is much to glean from the logistic regression model constructions and results detailed in Appendices A and B. Appendix C graphs the flow of the 1,030 students through the five years. Individual case numbers, not included in the appendices, allowed for examination of those who stopped out and returned as well as those who continued to degree. This study focused on what can be learned from the macro data.

Two sorts of the model results were supplied in Appendix B. The first, by model design, allows the analyst to study the influences of progressive models as they may predict the persistence decision. Initial independent variables pertaining to demographic and pre-college experiences were used as predictors for semester reenrollment and degree award. Then, college experiences were considered. Finally, the financial factors were taken into account. These groupings of ten models were then paired among the three predictor elements ending with the full models in which all predictor factors were included. The full models were then divided among the three need categories (no, low, and high) for each of the enrollment periods. This construct facilitates consideration of the influence of individual and combined predictors by category. Institutional researchers and professors may find this organization helpful in considering, for example, the significance of cumulative college units and GPA without the influence of the financial factors, Net Price and Pain Index, and then, with the influence of these variables.

An alternate approach considers the role of boards of trustees and college administrators in developing policies to improve retention, the practitioners. These

officials may benefit by examining the models as to how they might predict the persistence decision in a given semester. The practitioners' sort of the model results spreadsheet allows for the examination of the degree models and then those of each enrollment period. If, for example, a dean of students is interested in the first two years of college, the practitioners' sort may provide clearer insight into what predictors may be most critical in that fourth semester when returning to the junior year is being decided.

This study examined the logistic regressions from the practitioner perspective because the success or failure of retention measures most often rests with higher administration. According to Peter T. Ewell, a vice president of the National Center for Higher Education Management Systems (NCHEMS), it is the boards of trustees, the presidents and chancellors, the provosts and deans who must understand their students and take action if success is going to be realized.

To some extent, it's about programs and policies, but ultimately, culture – creating a long-term culture of student success – is what really matters. It's about the chief executive and the chief academic officer deciding to focus on this as something they can do something about and being relentless about it. (Ewell, 2005, p.14)

General Interpretation of the Logistic Regression Model

Cohen, Cohen, West, & Aiken (2003) offered a comprehensive theoretical study of logistic regression, how it is done, how to interpret results, and how it is compared to ordinary least squares (OLS) regression techniques. Brace, Kemp & Snelgar (2003) provided a broader operational view of logistic regression results. Both sources are commended for their contribution to the understanding and limitations of logistic regression. SPSS software used for this study calculates the log odds that a particular dichotomous outcome, the dependent reenrollment and degree variables, will occur given

various predictors, the independent variables. The -2 log likelihood (-2LL) offers a measure of success of overall model fit as a result of an iterative process of approximation that measures the change in -2LL from the no variable model containing only an intercept to that of the model with k independent variables as predictors. A solution is determined when a minimum threshold of -2LL change decrease is met, at .010 percent change for this study. In instances when “*complete separation* on a predictor or set of predictors between the group coded 1 and the group coded 0” (Cohen, Cohen, West, & Aiken, 2003, p.498) cannot be realized, maximum likelihood estimation fails and a logistic regression solution cannot be found. This occurred extensively in the model building phase of this research since there were several instances within the study population where students who made the same persistence choice were of the same ethnicity, parental education background, or possessed other identifiers in common. Appendix B reports those models where insufficient data separations precluded solution. Each successfully run model had to be built, variable by variable, to ensure conditions would allow for iterative solution. Model 19 achieved solution after only 5 iterations while Model 47 took the longest, 155 iterations, before solution was possible. In both models, the -2LL statistic, was among the lowest of the models, indicative of a reasonably good fit for the data. The number of iterations to solution, therefore, is not a measure of model success and has not been included in the model results in Appendix B.

The cut point calculations for each model are provided in Appendix D. This study dealt with a population of students, not a sample. Thus, the precise number of enrolled and reenrolled students was known and the cut points could be calculated to reflect this reality. The cut point, where on the logistic regression curve the dichotomous decision

will result in a case or a non-case, is important in determining the level of Type I and Type II errors. If sensitivity (an enrolling student predicted to enroll) is more important than specificity (a non enrolling student predicted not to enroll), then the cut point selected should represent as close to reality as can be determined. This study used cut points to optimize model sensitivity as shown in Appendix B. The disadvantage of this decision is that model specificity was sacrificed. Both sensitivity and specificity cannot be maximized together. To improve one will necessarily degrade the other. The standard cut point of .50 is often used when historical outcome data of the dichotomous choice is either unreliable or not available. See Cohen, Cohen, West, & Aiken (2003, p. 516) for a discussion on the accuracy of logistic regression in predicting case identification.

Two pseudo R^2 s are reported in SPSS, the Cox and Snell and the Nagelkerke. They are not the same as the R^2 in OLS regression but do provide some degree of comparison between the log likelihood of the intercept only model and that of the k predictors. Both are reported in Appendix B and can be interpreted as a general range of percentage of variance attributable to the model. See Brace, Kemp & Snelgar (2003, pp. 269-276) for further explanation.

The Hosmer and Lemeshow statistic test is reported in SPSS and recorded in Appendix B for each model. The Pearson χ^2 and the p value were also recorded.

This test gives a measure of the agreement between the observed outcomes and the predicted outcomes. This statistic is a test of the null hypothesis that the model is good, hence a good model is indicated by a high p value (as recorded under 'H&L Sig' column in Appendix B). If the p value is less than 0.05 then the model does not adequately fit the data. (Brace, Kemp & Snelgar (2003, p. 274)

The effect the individual predictor variable may have on the enrollment decision is determined by the sign (negative or positive) of its coefficient in the model. In the

models results of Appendix B, variables with negative coefficients were recorded in red; positive coefficients in blue. All things being equal, a “red” variable indicated that for every unit increase in its value, there would be a decrease in enrollment. A “blue” variable indicated a predictor that, all things being equal, would result in an increase in enrollment. Since “magnitudes of the coefficients cannot be interpreted directly in logit...models” Siefert (2002, p. 78), they were not included in the results appendix. However, predictor variables can be judged to be significant in the enrollment decision. Significance is determined with the Wald statistic $p \leq .05$ and those independent variables were shaded in green in Appendix B.

There were three reasons for the omission of independent variable in the models. One, the model called only for specific factors (demographic/pre-college, college experiences, financial) to be included. Variables not associated with the respective factor were excluded. Two, the variable was omitted from the same set of dummy variables. One of the Dad’s education, Mom’s education, major, ethnicity, and financial need variables was removed from each model. And, three, the variable was omitted when data separation issues precluded iterative solution as previously described.

Methodology of Evaluation of the Models

Prelude.

From the practitioners’ perspective, the models were grouped by enrollment period. Evaluation of each grouping of models was presented next, first with the degree models, those for whom the dichotomous dependent variable was degree or none degree in five years or less, followed by the models for each enrollment period, semester by semester, until the end of the fifth year. There were two reasons for adopting this

convention. One, by displaying the degree models first, evaluators could observe the totality of predictor effects over the life of each student at the institution. Second, by next examining the individual enrollment periods, patterns of changes in significance of certain predictors could be recognized. If interventions are to be considered by university policy makers, the timing of such interventions will be important. These semester models could offer clues not generally recognizable in the degree models.

Evaluation of the Degree Models.

Thirteen models (10, 20, 30, 40, 50, 60, 70, and 98-103) held the variable DEGREE as the dependent variable to which a series of independent variables were added as predictors of student attainment of a degree. Logistic regressions were run with the independent variables and results listed in Appendix B. Models 10, 20, 30, 40, 50, 60, and 70 were run for initial enrollment cases, ($N = 1,030$). Models 98 – 100 were run for specific financial need groups (those who remained consistently in either the no, low, or high need categories) over five years. Models 101 – 103 were run similar to Models 98 – 100 except over four years. These last six models were developed as an example of one way institutional data gathered in this study could be grouped for analysis. The following are noteworthy observations.

TRANSFER was a significant positive influence variable ($p \leq .05$) for predicting degree completion in all initial enrollment models in which it was included and in the five-year no-need enrollment model 98. In the four-year no-need enrollment Model 101, its influence on degree completion was also positive with $p = .20$ but not significant. Insufficient data separation precluded inclusion of this variable in the low and high need models, both years four and five. All else being equal, the student with transfer units

applied to the institution's transcript was more likely to graduate than the student without such units.

MILES was predominantly a negative influencer for persistence to degree with the exception of the no and low need students in the case of four years (Models 101 and 102). For this student population, all else being equal, the student was more likely to graduate when he/she had come from homes closer to the institution's home city. Location from campus was negatively significant on the probability of degree completion in the model in which demographic and pre-college factors were considered alone (Model 10, $p = .01$) and when financial factors were added (Model 50, $p = .01$).

LEGACY was positively significant in Model 98 ($p = .03$) for no-need students in the five-year situation. All else equal, students with family background at the university were more likely to graduate than students without that family connection. Except in Model 103 (four-year high-need case), LEGACY was a consistent positive predictor of degree completion. Alumni connections to the university seemed to matter.

There were a few other variables that appeared significant in selected degree models, such as AP, DADNC, and SATVERB, among the demographic and pre-college factors but these were not consistent throughout all the degree models. There seems to have been little predictor activity among the high school performance variables (RATE, GPAHS, SATVERB, SATMATH, LDRSHIP, SERVICE, TALENT, and ATHHS), all important admissions considerations, suggesting that these pre-college experiences played a less significant role to other factors. A person's gender also seemed not to matter in this population's decision to complete the college degree.

Looking at the college experience factors in the degree models, a slightly different story emerged. Among these factors, cumulative college units and GPA all reflected significant positive influence on degree completion. This may be intuitive that, all things being equal, the likelihood of degree achievement is going to increase with higher UNITS and GPA. But it also demonstrated the “reasonableness” of the logistic regression results.

Regarding the college majors, relative to all others, business majors (MAJORBIS) and liberal arts majors (MAJORLIB) were more likely to achieve the degree. In one instance (Model 40), MAJORLIB was a positively significant predictor ($p = .05$). Also intuitively obvious and borne out by the regression results, DECLARED, the semester during which final major declaration is made, was a negative predictor. All else equal, the earlier the declaration of the final major, the more likely was the student to graduate.

The three key financial factor variables in the degree models were of particular interest in part because of their counter-intuitive results. The models showed that, all else being equal, the higher the cumulative Net Price (CUMNP) the more likely would the student persist to degree. Yet, the higher the cumulative Pain Index (CUMPI), the less likely would be that persistence. And, in three of the degree models, the effects were significant. This seemed to suggest that the institution could increase Net Price and graduation rates would improve! Somers (1996) noted the studies of St John in the early 1980's “that in persistence decisions students are more responsive to increases in aid (grants, loans, and work study) than in increases in tuition”. Perhaps, this is what we are seeing here; perhaps not. It would not be wise to be premature in interpreting these degree models in this manner without further exploration.

Among the seven initial enrollment degree models, Model 70, the full variable model seemed to have the best fit for the data. In Model 70, only the TRANSFER, UNITS, and GPA variables were significant predictors of degree completion. All others displayed positive or negative influences, but none showed significance to the decision process. In general, then, these degree models were insufficient by themselves in assisting policy decision at the institution. Researchers needed more and the individual semester enrollment models offered detail to expand the story.

Evaluation of the First Year Models.

Models 1, 11, 21, 31, 41, 51, 61, 71, 72, and 73 used ENROLL1S as the dependent variable to examine the predictors for the second semester enrollment decision. In this semester, certain variables emerged as predictors for the continued enrollment decision. GENDER was of negative influence meaning that, all else equal, women were less likely to enroll than men. Recall, men was coded as “1” in this variable. In Models 41 and 61, the gender predictor was significant ($p = .05$ and $.04$ respectively). This phenomenon was not apparent when viewing the degree models only. Why women might be more likely to leave the institution after only one semester is a question that could be addressed in follow on qualitative case study research if desired.

Model 61, the full variable model, told us that the admissions rate (RATE) was also of negative influence in that, again all things equal, students with a higher admissions rate, a higher qualified applicant, were more likely to leave the university. Counter-intuitive perhaps, or perhaps the better qualified students simply found better institutions willing to take them a semester late. SERVICE was a significant positive predictor ($p = .03$) in Model 61, the only pre-college variable to be so categorized.

Perhaps, students with a background in service projects and volunteer work in high school were more involved in the early stages of college and thus became more attached to and comfortable in the new environment – a good reason, the literature suggests, for retention.

The college experience variables the first semester told a story quite different than they did in the degree models. Here, business and liberal arts majors compared to all others, either already declared or eventually to declare, didn't show much desire to leave early. In every model in which they were inserted, MAJORBIS and MAJORLIB were positively significant (all p values $\leq .05$). This was not evident when viewing the degree models only. And, in further contrast to the degree models, these first semester models revealed the significant negative influence of GPA and the significant positive influence of UNITS. Students with more units yet lower first semester GPAs were more likely to enroll than their counterparts. Thus these models might suggest that the good students with higher admissions rates, fewer units completed the first term, and higher first semester GPAs were more likely to leave. If this were true, the institution could have experienced a loss of some good students and potential alums in this first year.

The financial factors, all things being equal, revealed that the no-need students were likely to stay enrolled. But, the higher the decision Net Price, the more likely would be the decision to leave. In these models the decision Pain Index was removed because of redundancy with Net Price, so its influence would be similar to Net Price. On the other hand, the cumulative Pain Index (here just the one semester) was a positive predictor and significant in Model 51 ($p = .05$). Lower Net Price might have encouraged enrollment at this stage of the college experience, but the financial pain had yet to take any toll.

The analysis of the ENROLL1S models when compared to that of the DEGREE models might suggest that there were two different populations being studied. In fact, only 26 of the 1030 initially enrolled students left the university after the first semester. But the stories were indeed different and continued to remain so as the semester by semester analysis unfolded.

Evaluation of the Second Year Models.

These models are: 2-3, 12-13, 22-23, 32-33, 42-43, 52-53, 62-63, and 74-79. In the full models for second year enrollment (Models 62 and 63), we saw the beginnings of the ethnicity variables as having an effect on enrollment prediction. Hispanic ethnicity had become a significant negative predictor ($p = .03$) in Model 62 but not significant ($p = .37$) although still negative in Model 63. The variable was also significant negative ($p = .05$) in the case of the no-need student (Model 74). All things being equal, the Hispanic student was less likely to reenroll in fall of year two than his/her counterparts. Interestingly, the Hispanic student in the no-need category was also less likely to reenroll in the third semester compared to students of other ethnicities. Looking at Model 75 for the low-need students enrolling in Fall Year 2, Hispanic ethnicity was of positive predictive influence although not significant ($p = .49$). In all but one of these two year models, Hispanic ethnicity turned out to be a negative predictor of reenrollment whereas Caucasian ethnicity was a positive, although not significant, predictor in all instances except the low-need case for the spring semester (Model 78).

In this second year, parental education appeared as a significant predictor in more than one instance. In the ENROLL2F models, DADNC was of positive influence and significant in Model 32 ($p = .05$). In the ENROLL2S models, the same variable was a

negative predictor throughout and significant in Models 3 ($p = .01$), 43 ($p = .01$), and 63 ($p = .01$). This was consistent with the DEGREE models in which dad's no college was both a negatively and a positively significant predictor.

Since Models 62 and 63 were the full models and among the better fitting, they deserve closer scrutiny. Looking at all the predictor variables that were significant, model 62 suggested that Caucasian male students of a legacy and high school service background who were later declarers of business or liberal arts majors, in which the cumulative Pain Index and Decision Net Price were both of significant concern (lower is better), were the most likely to reenroll in the third semester. In Model 63, it was the late declaring male students with more cumulative units and higher GPAs than their counterparts for whom Decision Net Price was a concern while Decision Pain Index was not were those more likely to reenroll in the fourth semester. There is recognized danger in over- simplifying these results but, clearly, a pattern seemed to develop that tended to favor male students of majority background with fewer financial worries staying enrolled. This observation was not apparent when reviewing the degree models only.

Model 76 could not be run because of data separation issues in logistic regression analysis. It was noted that of the 141 reported high need students considering the reenrollment decision for fall second year, all of them chose to return. But as shown in Chapter 5, this perfect reenrollment did not translate into perfect degree achievement. Model 76 revealed a weakness in the use of strictly quantitative techniques to evaluate so complicated an issue as student persistence. Insights can be gained from quantitative evaluations. But, follow up qualitative studies might suggest why this full reenrollment did not translate into full degree attainment.

Evaluation of the Third Year Models.

Third year models are: 4-5, 14-15, 24-25, 34-35, 44-45, 54-55, 64-65, and 80-85.

In these models, new activity was detected in the appearance of TRANSFER as a significant negative predictor of reenrollment in both semesters of the third year. In the full model (Model 64), the variable was highly significant ($p < .01$) and it was the only demographic and pre-college factor that was significant. In Model 65, it was also highly significant, $p < .01$. Transfer units typically are courses that can apply to nearly any university to meet basic college general education or lower division major requirements. Taken by itself, this suggested that the more units transferred into the institution, the more likely would be the decision not to reenroll. That is, for this population of students, fewer of these transfer courses taken outside the university actually may have increased the likelihood of reenrollment. This may seem counterintuitive until one considers that in the state in which this study was conducted, the highly acclaimed public university systems almost exclusively accept transfer students at the beginning of the junior year and only after completing a comprehensive lower division general education sequence. This is not always the case with private universities often free to take exceptional second year students. So, if the student wanted to transfer to a public university, he/she needed good grades and lots of required lower division courses that could have been taken anywhere, completed after two years. Note in Model 64, cumulative college units, which do not include the transfer units, was a significant positive predictor ($p = .01$). The more cumulative units the student actually earned at the originally enrolled institution, the more likely the student would stay there.

Fifth semester enrollment was influenced by Net Price and Pain Index as in the third and fourth semesters. Consistently significant negative predictors were recorded for both Cumulative Pain Index and Decision Pain Index suggesting that enrollment decisions were still being negatively affected by these financial factors.

In Model 83, DECLARED took on negative predictor significance ($p < .01$) that was only noted in Model 98, the degree model for the total no-need student. In the case of the no-need student the earlier the declaration of major, the more likely would be the reenrollment in the sixth semester. TRANSFER was of negative significance ($p < .01$) consistent with the findings for the fifth semester decision.

The residence variable became significant for the first time in Model 80 where RES2 had a positive effect ($p = .04$). Living on campus finally seemed to have a positive impact on retention although the total years of residency on campus did appear to be significantly positive in Model 98 (initial enrollment to degree, no-need cases).

Models 82 and 85 could not be run because of data separation issues in logistic regression analysis. In both these high financial need populations, all but one student in the fall semester returned both semesters.

Evaluation of the Fourth Year Models.

Fourth year models are: 6-7, 16-17, 26-27, 36-37, 46-47, 56-57, 66-67, and 86-91. By the time the student arrived at the fourth year, pre-college factors were long behind them. Nevertheless, these models showed that there were still some of these factors that were significant in the retention decision. In the full model (Model 66), MILES was negatively significant ($p = .01$) suggesting that distance between home and campus, as it did in some of the ENROLL2F models, all things being equal, mattered.

The closer one's home was to the university the more likely would be the reenrollment in the seventh semester. For eight semester enrollment models, MILES was consistently a negative predictor although not significant. SATVERB showed up as a significant negative predictor in two models, Model 66 ($p = .02$) with all predictors added and Model 36 ($p = .02$) with the demographic/ pre-college and college factor predictors only added. TRANSFER was a significant positive predictor in all ENROLL4F models and positive but not significant in ENROLL4S models. DADAA was negatively significant in Model 7 ($p = .03$), and also in Model 47 ($p = .01$) and in the full Model 67 ($p = .03$).

In the college experiences factors, UNITS and GPA were strong positive predictors in nearly every ENROLL4F model for persistence as might be expected. But by the spring of the fourth year, these variables were no longer significant suggesting that individual "persistence decision rules" might be changing in the latter years. The variable RES3 was now negatively significant for the first time in the population and in three models: Model 56 ($p = .01$); Model 66 ($p < .01$); and Model 86 ($p = .04$). This was clearly an area for the housing administrators to investigate since it suggested that residence during the third year of campus life, all else being equal, was a significant predictor for non retention of seniors especially students of no-need (Model 86).

In the financial factors variables, the sign of the Decision Net Price predictor from the predominant negative to positive in the ENROLL4F models suggested what might be called an anesthesia effect. Those students, who had persisted to this point, and their families, seemed willing to return, all other consideration being equal, regardless of the Net Price. In fact, an increase in Net Price seemed not to dissuade at all. The Decision Pain Index also changed direction, once a positive predictor was now negative and in fact

significantly negative in the full Model 66 ($p = .03$). Although the persisting student might be willing to pay a higher Net Price, he/she might also been feeling some effects of a long term financial burden. The negative values for the Cumulative Pain Index appeared consistent with this notion. In the ENROLL4S models, the DECPI and DECPN variable signs reverted to the earlier semesters indicating the more traditional expectation for these effects that a lower Net Price was more likely to result in enrollment.

Models 88 and 91 could not be run because of data separation issues in logistic regression analysis. In these models of the high financial need students, all but one student chose to reenroll, consistent with previous semester results. As with Model 76 in the three-year category, success of reenrollment did not guarantee success in degree attainment. This suggested that even high-need students receiving high amounts of financial aid may need more than a low Pain Index to complete the curriculum to degree.

Over the four years of enrollment modeling, the Decision Net Price for the most part was seen to be a predominantly negative predictor except as noted for the seventh semester. This is intuitive and an expected finding. At the same time, the Decision Pain Index had been a predominantly positive predictor except in that seventh semester reversal. This was a puzzling and counterintuitive finding without considering the financial demographics of the study population. Recall from Tables 4-16 and 4-18 that at this institution, the no financial need students consistently averaged a negative Pain Index both for the decision semester and cumulatively. They were getting financial aid, most likely in the form of merit scholarships, when they didn't need it. This may be flattering and can encourage continued enrollment. For the no-need students who may have a positive Pain Index, it didn't seem to matter. These families seemed to be willing to pay

when they felt they had a good product being offered to them. Table 4-20 shows that these no-need students in the majority.

Table 4-20

Percentage of No Financial Need Students Each Semester

<u>Enrollment Decision</u>	<u>Previous N</u>	<u>No Need Students</u>	<u>Percent No Need</u>
Spring Year 1	1030	483	46.9
Fall Year 2	1004	599	59.7
Spring Year 2	888	495	55.7
Fall Year 3	849	520	61.2
Spring Year 3	767	441	57.5
Fall Year 4	760	431	56.7
Spring Year 4	754	431	57.2
Fall Year 5	161	93	57.8
Spring Year 5	88	46	52.3

In the first year of enrollment of this student population, over \$2.65 million were awarded in the form of merit scholarships to entice top students to attend the university. With such a high percentage of no-need students enrolled, this could help explain why financial pain appeared to have a positive impact on reenrollment. At this institution, it seemed that more financial pain could be and was tolerated in the student population.

Evaluation of the Fifth Year Models.

The fifth year models 8-9, 18-19, 28-29, 38-39, 48-49, 58-59, 68-69, and 92-97 evaluated a population of students lowered by the large number of graduated students after four years. The successful fifth-year students were likely to be the engineering and double major candidates who needed the extra units to complete their programs of study. As such, evaluation of the fifth year models was done in this context.

Appendix C shows that, except for the Fall of Year 2 when 117 students chose not to reenroll, and the fall of Year 3 when 92 students chose not to reenroll, the number of

students who chose not to enroll in most semesters was quite low. This was summarized in Table 4-21.

Table 4-21
Number of Students Choosing Not to Reenroll

<u>Semester</u>	<u>Eligible to Return</u>	<u>Not Returning</u>	<u>Percentage Not Returning</u>
Spring Year 1	1030	26	2.5%
Fall Year 2	1004	117	11.7%
Spring Year 2	888	45	5.1%
Fall Year 3	849	92	10.8%
Spring Year 3	767	34	4.4%
Fall Year 4	760	21	2.8%
Spring Year 4	754	9	1.2%
Fall Year 5	161	13	8.1%
Spring Year 5	88	10	11.4%

The key observation was the percentage of students who chose not to reenroll. From Table 4-21, the percentages increased significantly in year five over year four and approached the large percentage drop after the first year. There would be a greater percentage of cases to non cases in these fifth year models over the fourth year models. But the low overall number of cases, particularly in the final semester, resulted in greater instances of data separation issues arising. The results in Appendix B showed the many independent variables that had to be removed from the models to get them to iterate a logistic regression solution. Important predictors could be lost in the process. Models 93, 94, and 97 could not be run because of data separation issues in logistic regression analysis. In these models of low financial need students (Model 93) and high financial need students (Models 94 and 97), every student chose to reenroll. Throughout this study, the high-need students in particular had demonstrated a great propensity to persist, a noteworthy achievement for the institution.

Ninth semester models showed that men ($\text{GENDER} = 1$) were more likely to reenroll (Model 38, $p = .03$ and Model 68, $p = .04$). This could be simply because engineering students, who needed the extra semester/year to complete the required double degree at this institution, were mostly male. SATMATH in Model 8 ($p = .05$) was positively significant and seemed to fit with the expectation that engineering students were likely to have performed better on the math portion of the SAT. RATE was negatively significant as shown in Model 68 ($p = .05$) suggesting that there might have been students in the fifth year who were less prepared for college according to the institution's evaluation of admissions criteria. Cumulative GPA was significantly positive in these models, also an intuitive observation for students persisting after four years.

The financial factor variables showed significant positive influence for both the Decision Pain Index and the Decision Net Price. That is to say that by this point the students in this study were no longer influenced by the immediate financial factors when it came to their reenrollment decisions. These students were close to completing and, for the most part, seemed to be willing to make final tuition payments regardless of the costs. Price and pain sensitivity had evaporated. But some might still be influenced negatively by the cumulative financial pain they had incurred as evidenced by the predominantly negative signs of the CUMPI variable although not showing any significant effect.

In the tenth semester models, TALENT appeared for the first and only time as a significant positive predictor in Model 9 ($p = .05$). SATVERB reappeared in Model 39 as a significant negative predictor ($p = .03$). No other variables in any of the models were significant which might suggest that students who returned that tenth semester were not influenced by any of the predictors for persistence addressed in this study. It might be

illuminating in future research to determine how many enrolled students in this tenth semester returned for a sixth year or beyond eventually to graduate.

An Analytical Look at the Financial Need Models

A significant component of this study, and indeed of the data collection efforts, centered on the financial factors. Hence, special financial need models were developed. Models 98 – 100 were examinations of five years of enrollment, the entire data set used in this study, and had been added to the series of models addressing the population of students according to their financial need category. Models 101 – 103 were run to examine four years of data. Since these latter models showed no significant predictors for persistence, they were eliminated from further discussion and are not included in the summary of findings.

No-Need Student Models.

The no-need student models were: 71, 74, 77, 80, 83, 86, 89, 92, 95, and 98. In these ten models, eighteen significantly positive predictors of continued enrollment among the no-need students were observed. They were: GENDER (male) and LEGACY in two instances, SATMATH in one model, TRANSFER in three models, DADNC in one instance, MAJORBIS in one model, DECLARED in three models, residence in two, GPA in one, CUMPI in a single model, and CUMNP in one model. Twelve negative significant predictors were observed. They were: MILES in one model, SATVERB once, TRANSFER two times, ETHNH in one instance, DECLARED in two models, residence in one, CUMPI in three instances, and DECNP once. In the degree Model 98, one of the strongest in terms of significant predictors, LEGACY ($p = .03$), TRANSFER ($p < .01$), DADNC ($p = .03$), RESTOT ($p < .01$), GPA5S ($p < .01$), and CUMNP5S ($p < .01$) were

all positively significant for the no-need students. Significantly negative predictors in this model were: SATVERB ($p < .01$), DECLARED ($p < .01$), and CUMPI5S ($p < .01$).

Low-Need Student Models.

The low-need student models were: 72, 75, 78, 81, 84, 87, 93, 96, and 99. In these eleven models, SATVERB once, LDRSHIP in a single instance, CUMPI and DECNP each in one model were significant negative predictors. Six positively significant predictors were: DECLARED twice, UNITS in two models, GPA once, and DECPI in one instance. Model 93 failed to iterate to solution for reasons previously described.

High-Need Student Models.

The high-need student models were: 73, 76, 79, 82, 85, 88, 94, 97, and 100. Of these nine high-need student models, only Models 73 and 79 could be run for reasons previously described. There were no significant predictors in these two models. The success of retention of the high-need students at this institution may be a reason for this finding. In the one model in which the financial factors could be included, Model 79 for the spring of the second year enrollment decision, positive influence was seen for CUMPI and DECNP while negative influence was noted for DECPI. All things being equal, this suggested that a lower immediately recognized financial pain may be more important in electing to enroll than the accumulation of financial pain or the expected Net Price for the semester. Since the variables were not significant, care must be taken not to suggest beyond what the model results support.

Model 104 - A Special Model for Hispanic Students

Table 4-22 details the enrollment of Hispanic students semester by semester. The table shows that a higher percentage of Hispanic students in general seemed to take five

years to graduate when they did complete. Yet the overall graduation rate of Hispanic students was only 66% as compared to the general population graduation rate of 71.3%.

Table 4-22
Hispanic Student Enrollment and Graduation

<u>Semester</u>	<u>Hispanic (N)</u>	<u>Population (N)</u>	<u>Hispanic %</u>
Fall Year 1	150	1030	14.6
Spring Year 1	143	1004	14.2
Fall Year 2	121	888	13.6
Spring Year 2	113	849	13.3
Fall Year 3	110	767	14.3
Spring Year 3	111	765	14.5
Fall Year 4	111	772	14.4
Spring Year 4	110	752	14.6
Grad Year 4	78	614	12.7
Fall Year 5	33	157	21.0
Spring Year 5	20	80	25.0
Grad Year 5	21	120	17.5
Degree	99	734	13.5

A full logistic regression model was run for the population of Hispanic students (N=150) revealing no significant predictors despite a -2LL of 37.02 and pseudo R² values of .65 (Cox and Snell) and .89 (Nagelkerke) reported. Although none were significant, Model 104 results revealed glimpses of factors that showed a negative effect. These potential negative predictors were: LEGACY, MILES, GPAHS, SATMATH, LDRSHIP; SERVICE; TALENT; DADAA; DADPG; and, DECLARED. The strongest positive predictor for the Hispanic students was MAJORLIB ($p = .10$). These data points may be helpful for institutional researchers in developing new methodologies to better predict what was transpiring in the reenrollment decision making of the Hispanic population on campus. Quantitative analysis alone was insufficient to explain persistence behavior among Hispanic students at the case university. Qualitative approaches may be useful.

CHAPTER 5

Summary of Findings

Introduction

As universities brace for ever increasing competition, more importance must be placed on retaining students who will succeed and graduate. Higher than expected college drop out rates carry personal, reputation, financial, societal, and government costs that can become unacceptable to institutions heavily enrollment and tuition dependent. Private colleges, such as the one in this study where more than three-quarters of the entire university budget is based on the revenue generated from tuition and fees, are particularly vulnerable when retention is low. Revenue that must be dedicated to replacing lost students is revenue not available to attract top-notch professors, improve student services, offer extensive institutional financial aid to the needy, or expand curricular offerings. College boards, presidents, provosts, deans, and enrollment managers working with faculty, resident directors, coaches, and student, maintenance and food service workers all have the same goal, to create and sustain an atmosphere where students can grow and graduate. For their part, institutional researchers have a responsibility to collect, analyze, and present data to decision makers for policy enactments so that retention can be continually improved.

This study has been about developing and demonstrating a practical method in which data are collected across the institution, assimilated, analyzed, and presented, and from which inferential conclusions can be drawn. It was quantitative only but not intended to ignore qualitative research which can often reveal nuances in why individual students make the enrollment decisions they make. This research could be part of a mixed

methodology approach in which groups of retained students are tracked and interviewed over the course of enrollment. For example, of the 99 Hispanic students from the 150 initially enrolled, qualitative techniques could help explain reasons for persistence when the Model 104 results in this study were found to be inconclusive.

The work here was undertaken to answer one research question. To what extent do: student demographics and background; academic preparation and achievement; institutional financial aid and personal financial factors; and the collegiate experience influence year-to-year persistence in higher education at a particular university and does the importance of these factors vary as students progress through their studies to graduation? This chapter summarizes the major findings in answering the research question, compares these findings to previous research in the literature, discusses recommendations for institutional policy and practice, and offers some implications for further research.

Summary of Major Findings

Availability and Use of Institutional Data

The collection of institutional data controlled the scope of this study. Enrollment management and admissions sources were developed and tracked across the campus by institutional researchers. Most demographic and pre-college experience factors used in this study were relatively easy to gather from undergraduate admissions records. Miles from campus and parents' educational backgrounds had not been individually tracked or included in campus-wide data sources. Parental information, submitted voluntarily on admissions applications, was extracted from student files in the registrar's office and miles from home of record to campus were calculated through Internet sources.

College experiences factors were not centrally collected or tracked across the university. This was unfortunate because the catch-all EXTRA variable designed in this study was likely inadequate in identifying and accounting for participation in university and campus activities. Institutional researchers will need to do more to document this important contributor for positive retention as identified by Benacci (1991), Boyd (1992), Berson (1996), Terenzini, Pascarella, & Blimling (1999), among others in the literature. Nor were data available to assess the success of the preceptorial program for freshmen, data that could have been useful in verifying the retention effects of faculty and student interaction reported as critical by Spady (1970), Tinto (1993), Light (2001) and others. On campus residency data were not developed across the university. The effects of innovative Resident Living Options (RLOs) founded by the case university could not be evaluated. Criticism of lack of this data notwithstanding, this and other universities can gain valuable insight by designing an institutional master database plan to incorporate participation in various campus programs such as: fraternities; sororities; religious ministry; intramural sports; social and service clubs; academic symposia; public affairs; community outreach; and, hometown recruiting, to name just a few.

Financial factors data were internally maintained in financial aid circles, partially developed for use, but not tracked institutionally. The reluctance to distribute financial aid data, given privacy issues, was understandable. However, better efforts to disguise individual financial factors to allow for broader institutional review could offer considerable benefit to the institution. At the very least, financial aid data needed to be computerized for easier data manipulation and not retained solely in file card records deep in a university vault.

A more sophisticated approach to data collection, management, and distribution would allow the institutional research office to do meaningful work over the continuum of individual student enrollment. The time to make interventions to improve retention for the student population in this study has long passed. A modern and current database would permit timely interventions to future student populations, interventions that could meaningfully improve even the impressive retention rates of a top tier university.

Factors Influencing Year-to-Year Persistence

Demographic and pre-college factors proved of little significance in the semester to semester persistence decisions beyond the initial decision to enroll. This was consistent with the theories of Tinto (1987, 1993). Ironically, with such noted effort made in this study incorporating institutional enrollment management data into university research efforts, little long-term benefits for analyzing retention seemed to be afforded. College entrance exam results (the SAT or ACT), so much a stress for applicants and often vilified by minority advocacy groups as being ethnic insensitive, proved of little worth in predicting continued enrollment or degree attainment. Parental educational background, thought to be of positive correlation for college success, was also of little statistical significance in this study. The only notable factors for positively influencing retention was legacy, prior family enrollment at the university, and the number of college units transferred to the institutional transcript from other colleges. A surprise finding was that transfer units also was a significant negative predictor for the third year when it appeared that, all things being equal, students with fewer units reenrolled while those with greater completed numbers of units disenrolled. Perhaps as was discussed in Chapter 4, this

behavior is explainable for students selecting to pursue less expensive state university options available only to matriculating juniors with all lower division credits completed.

Of the college experiences able to be quantified for this study, cumulative college units and grade point averages were positively significant in most models but cumulative GPA was negatively significant for Spring Year 1 and Fall Year 3 enrollments. A story emerged with the transfer units' phenomenon to suggest a situation where better grades and more units completed may mean acceptance into another institution that junior year and thus a loss of seemingly good students to the competition. This study revealed a phenomenon underreported in the literature and worthy of follow-up.

With the development of the Net Price and the Pain Index variables, the financial factors results were able to model reaction to the actual cost of tuition (Net Price) and to the financial pain that was carried by the student and/or family. Because the Pain Index was used as an additional proxy for student/family income in addition to the more familiar financial need categories, the model results could be interpreted to reflect not only the effects of family income on the decision to reenroll but also the effects of knowing the difference a student/family was asked to pay for the educational experience versus what federal guidelines suggested they should be paying. When summarizing the results of the financial factors, traditional economic principles of demand theory in the higher education context (Siefert, 2002, pp.21-23) was not be strictly recognized.

Accumulated Pain Index did have a negative effect on persistence to degree. The greater the gap between what federal sources said were the student/family expectations for the cost of education and the actual cost incurred the less likely would be degree attainment. On the other hand, results of this study indicated that this was not the case for

cumulative Net Price where the likelihood of degree achievement was actually enhanced by higher cumulative tuition costs. This study also revealed that the greater the total level of financial need reported, as captured by the FNSEMTOT variable, the more likely would degree attainment occur.

For the high-need students, semester financial need in excess of \$12,000, there were no significant financial factors affecting persistence in any of the models in which financial need had been segregated. For this population, high financial need students didn't seem to be deterred from persisting. The degree models in this study tended to show an institution with a successful financial aid strategy for the high need students.

For no-need students, the effects were similar in the degree models to those reporting high need. No-need students were willing to endure a higher cumulative Net Price while enjoying a lower cumulative Pain Index on the way towards degree. This was explainable in part due to the institution's generous merit scholarship program.

The low-need students, those whose financial need were upwards to \$12,000 per semester, seemed to respond differently. In the degree models of this study, the Cumulative Pain Index was a significant positive predictor of persistence while the Cumulative Net Price was a significant negative predictor of persistence. For this cohort, all things being equal, the low-need student was more likely to accept financial pain than his/her no and high need counterparts, but was less likely to accept a higher Net Price for continued enrollment. Does this mean that the low need student was more willing to bear a higher financial burden for his/her education or, might the federal need calculation be inflated to reflect a higher level of need than may be necessary for this group? This hypothesis could be tested in follow-on research. This study gave the case institution the

opportunity to review semester enrollment models as well as the broader degree models to see how these low-need students responded to their situation throughout enrollment.

Variation of Factors between Classes and Among Groups of Students

The semester enrollment models suggested that the demographic and pre-college factors lost significance as predictors of persistence over time as shown in Table 5-1.

Table 5-1

*Demographic and Pre-College Factor Predictors of Significance**

<u>Model Enrollment Group</u>	<u>Positive Predictors</u>	<u>X</u>	<u>Negative Predictors</u>	<u>X</u>
8 DEGREE models	TRANSFER	5	MILES	2
	LEGACY	1	SATVERB	1
	DADNC	1	DADNC	1
	AP	1		
7 ENROLL1S models	TRANSFER	2	GENDER (male)	2
	ATHHS	1	RATE	2
	SATMATH	1	MOMAA	1
	SERVICE	1		
6 ENROLL2F models	LEGACY	3	MILES	3
	GENDER (male)	2	ETHNH	2
	TRANSFER	2	RATE	1
	SERVICE	1	SATVERB	1
	DADNC	1	ATHHS	1
7 ENROLL2S models	TRANSFER	2	DADNC	3
	GENDER (male)	1	LDRSHIP	1
	AP	1		
6 ENROLL3F models			TRANSFER	5
			GENDER (male)	1
6 ENROLL3S models	GENDER (male)	2	TRANSFER	5
6 ENROLL4F models	TRANSFER	5	SATVERB	2
			MILES	1
			DADAA	3
6 ENROLL4S models			RATE	1
5 ENROLL5F models	GENDER (male)	2		
	SATMATH	1		
6 ENROLL5S models	TALENT	1	SATVERB	1

* The table reports the significant variables with $p \leq .05$ for all models in each enrollment group. The "X" column shows the number of times the predictor was significant within each model group. For example: TRANSFER was a positive predictor in five of the eight degree models employing that variable while it was a negative predictor in five of the six Fall Year 3 enrollment models employing that variable.

Of the variables listed in Table 5-1, TRANSFER appeared sixteen times as a positive predictor in the degree, first, second, and fourth year models, and ten times as a negative predictor in the third year models. More than one-third of the demographic and pre-college predictors of significance centered on the transfer of units into the institution. Incorporation of this variable into the enrollment management database is recommended.

Table 5-2 lists the significant predictors among the college experiences factors.

Table 5-2

*College Experiences Factor Predictors of Significance**

<u>Model Enrollment Group</u>	<u>Positive Predictors</u>	<u>X</u>	<u>Negative Predictors</u>	<u>X</u>
8 DEGREE models	GPA	5	DECLARED	1
	UNITS	4		
	RESTOT	1		
	MAJORLIB	1		
6 ENROLL1S models	UNITS	4	GPA	4
	MAJORBIS	4		
	MAJORLIB	4		
	DECLARED	1		
6 ENROLL2F models	DECLARED	6		
	MAJORBIS	5		
	MAJORLIB	4		
	GPA	2		
6 ENROLL2S models	DECLARED	5		
	UNITS	4		
	GPA	4		
6 ENROLL3F models	DECLARED	5		
	UNITS	4		
	MAJORLIB	3		
	MAJORBIS	1		
	RES	1		
6 ENROLL3S models	UNITS	2	DECLARED	1
6 ENROLL4F models	UNITS	4	RES	3
	GPA	3		
6 ENROLL4S models				
5 ENROLL5F models	GPA	4		
4 ENROLL5S models				

* The table reports the significant variables with $p \leq .05$ for all models in each enrollment group. The "X" column shows the number of times the predictor was significant within each model group similar to that displayed in Table 5-1.

There were ninety variables that appeared as significant predictors of persistence among the college experiences models, the vast majority of which were positive predictors. Low GPA as a predictor for second semester enrollment was hypothesized to reflect a small group of good students deciding to transfer out to another institution requiring demonstration of initial college success. The appearance of the residency variable as a negative predictor of Spring Year 3 enrollment could be of concern since it was often viewed in the literature as a positive factor in persistence (Herndon, 1984).

Table 5-3 lists the significant predictors among the financial factors. There were more financial variable effects in the early years and less so as the students progress through the institution.

Table 5-3
*Financial Factor Predictors of Significance**

<u>Model Enrollment Group</u>	<u>Positive Predictors</u>	<u>X</u>	<u>Negative Predictors</u>	<u>X</u>
10 DEGREE models	CUMNP	3	CUMPI	3
	FNSEM	2		
7 ENROLL1S models	NOFN	4	DECNP	5
	CUMPI	1		
6 ENROLL2F models	DECPI	3	CUMPI	5
			DECNP	5
7 ENROLL2S models	DECPI	3	DECNP	4
6 ENROLL3F models			CUMPI	5
			DECNP	4
6 ENROLL3S models	DECPI	3	DECNP	4
	CUMPI	1	CUMPI	1
6 ENROLL4F models			NOFN	2
			DECPI	1
6 ENROLL4S models			CUMPI	2
			DECNP	2
5 ENROLL5F models	DECNP	4		
	DECPI	2		
6 ENROLL5S models				

* The table reports the significant variables with $p \leq .05$ for all models in each enrollment group. The "X" column shows the number of times the predictor was significant within each model group similar to that displayed in Table 5-1.

Note the ENROLL2F models, the period before which the largest attrition occurred in the study population. The Cumulative Pain Index and the Decision Net Price appeared as significant negative predictors of retention in five of the six models in which these financial factors were included as independent variables, while the Decision Pain Index appeared as a significant positive predictor of persistence in three of the six models. All things being equal, this suggested that the lower the Decision Net Price or the lower the Cumulative Pain Index the more likely the student would return to begin the second year. But, again all things being equal, the lower the Decision Pain Index the less likely the student would return. This suggested a cumulative negative effect of the Pain Index over time that might not be apparent or even considered important at the time decisions to return to college were being formed.

Tables 5-1 through 5-3 shows that the number of models in each enrollment group among each set of predictor factors differed. This may seem puzzling especially for a methodological study so structured as in this case. But there is a straightforward explanation that is better illustrated in Appendix B. A study of Appendix B shows that some variables were omitted because of methodological design. But other variables had to be omitted because instances occurred among the small number of non-cases (those students who chose not to return for the particular enrollment period) wherein all the members of the non-case could be identified to the same variable. For example, the two non-cases in Model 73 had the same ethnicity and parental education background. Hence, these independent variables could not be included in the logistic regression prediction equation. In general, the regression models tended to run better when the population was more diverse in the independent predictor characteristics.

The Case of the Low-Need Student

As an example of the efficacy of the multiple models approach to retention study, the case of the low-need student was examined in more detail. Table 5-4 suggested that, on average, although there was some relief in the Decision Net Price, the low-need student shouldered consistently higher Cumulative and Decision Pain Indices than the overall population each semester when making the decision to persist. The low-need student was receiving some discounted tuition, but the Pain Index remained high although not nearly as severe as the high-need student depicted in Tables 4-16 and 4-18. Despite this higher level of financial pain, the low need student graduated at a higher rate than the no-need student as can be seen in Table 5-5.

Table 5-4
*The Low-Need Student Financial Factors in Reenrolling**

<u>Enrollment</u>	<u>N</u>	<u>CUMPI</u>	<u>DECNP</u>	<u>DECPI</u>
Enroll1f	1030	\$766	\$4,012	\$750
Lo Fed Need 1s	399	\$2,512	\$2,858	\$2,457
Enroll1s	1004	\$1,479	\$5,911	\$1,050
Lo Fed Need 2f	264	\$5,298	\$4,219	\$3,076
Enroll2f	888	\$2,429	\$5,387	\$1,132
Lo Fed Need 2s	269	\$8,503	\$3,716	\$3,049
Enroll2s	849	\$3,376	\$5,490	\$282
Lo Fed Need 3f	211	\$11,693	\$4,000	\$2,858
Enroll3f	767	\$3,443	\$4,943	\$304
Lo Fed Need 3s	227	\$14,594	\$3,555	\$2,963
Enroll3s & Grad3s=0	760	\$3,836	\$5,492	\$465
Lo Fed Need 4f	204	\$14,880	\$4,408	\$2,884
Enroll4f & Grad4f=0	754	\$4,267	\$5,415	\$455
Lo Fed Need 4s	209	\$18,384	\$4,189	\$3,008
Enroll4s & Grad4s/4ss=0	161	\$10,584	\$4,476	\$1,400
Lo Fed Need 5f	48	\$21,691	\$3,096	\$2,089
Enroll5f & Grad5f=0	88	\$14,530	\$6,283	\$2,393
Lo Fed Need 5s	20	\$21,382	\$5,453	\$3,066

* The means are recorded from Tables 4-16, 4-17, and 4-18. Figures in Fall Year 1 Dollars.

Degree Attainment Examined by Financial Need Categories

From Table 5-5 below, additional insight can be gained on the potential effects of the financial need levels on graduation rates. The mixed need student category included: students who were continuously enrolled but not consistently reported in a particular financial need category; and, students who stopped out and later returned, or dropped out. In these instances, specific financial need could not be recorded and, to avoid potential contamination of the known need cases, the students were segregated out into this mixed need category.

Table 5-5
Comparison of Four-Year Graduation Rates by Financial Need

<u>Financial Need*</u>	<u>N*</u>	<u>Graduation</u>				<u>Total</u>	<u>Grad %</u>
		<u>3S</u>	<u>4F</u>	<u>4S</u>	<u>4SS</u>		
None (< \$1)	453	4	9	276	2	291	64.2
Low (\$1 - \$12,000)	121	0	1	94	1	96	79.3
High (>\$12,000)	48	0	0	36	0	36	75.0
Mixed (no, low, & high)#	408	1	8	182	0	191	46.8
Total	1030	5	18	588	3	614	59.6

* In 1998 Dollars.

• Number of four year students consistently reporting in same financial need category all enrolled semesters.

Mixed need category includes students who stopped out and disenrolled.

Table 5-5 suggests, however, that despite the institution's very generous merit scholarship program enjoyed by many no-need students (see Tables 4-16 to 4-18), the consistently no-need students graduated at a rate 15 percentage points lower than that of the students with some form of financial aid needed. It would appear that the students in both low and high financial need categories were doing better than their no-need counterparts in persisting to degree in four years. This was in spite of the observation of negative financial pain reported for these no-need students.

Another way to look at the data was to categorize semester to semester reenrollment rates and degree attainment by financial need groupings. This was accomplished and displayed in Appendix E. Interestingly, the high-need students consistently reenrolled at a higher rate than their low and no financial need counterparts, but equally consistently, they graduated at rates lower than their low-need counterparts. The low-need students achieved the highest degree attainment percentages in the third year and beyond, suggesting that Net Price and Pain Index for the low-need students became less significant to the importance of achieving the degree. Table 5-6 summarizes the financial factor variables that were reported as significant in the logistic regression models. There were only three instances for the low-need students where significance was detected. There were no instances of significance for the high-need category.

Table 5-6

*Financial Factor Predictors of Significance by Financial Need**

<u>Enrollment Group</u>	<u>No-Need Student</u>	<u>Low-Need Student</u>
DEGREE	CUMPI (-) CUMNP (+)	
ENROLL1S		DECPI (-)
ENROLL2F	CUMPI (-) DECPI (-) DECNP (-)	
ENROLL2S		
ENROLL3F	CUMPI (+)	
ENROLL3S	CUMPI (+)	CUMPI (-) DECPI (+)
ENROLL4F		
ENROLL4S		
ENROLL5F		
ENROLL5S		

*The table reports the total number of significant financial factors variables with $p \leq .05$ for all models in enrollment groups listed by financial need categories. The minus sign signifies a negatively significant predictor. The positive sign represents a positively significant predictor. Some enrollment groups and all high need models revealed no significant financial factors variables for persistence.

The no-need students, despite the reported consistently low to negative average Pain Indices found in this study, had the lowest semester to semester persistence rates with high degree attainment in the earlier years but tapering off in the latter five semesters. Yet there were seven instances of significant predictors in the financial factors in the models, five of which suggested that all else equal, lower Net Price and Pain Index favored the odds for reenrollment. If these findings seemed inconsistent, they may be more in line with the findings of Somers (1996) who saw a strong negative correlation between financial aid and persistence in the high attrition rate reported for large scholarship recipients. In the case institution, one-third of the initial enrollees received an institution-awarded merit scholarship. How well they persisted can be seen in Table 5-7. The percentage of degree attainment for merit scholarship recipients (rates 7 – 9) is 74.9 compared to the overall percentage of degree attainment of 71.3 for this population.

Table 5-7
Degrees Awards According to Initial Admissions Rate*

<u>Admissions Rate</u>	<u>Initial Population</u>	<u>Receiving Degree</u>	<u>Degree Percent</u>
9	111	90	81.1
8	145	109	75.2
7	147	103	70.1
6	171	111	64.9
5	130	85	65.4
4	86	69	80.2
3	85	57	67.1
2	62	44	71.0
1	58	39	67.2
0	35	27	77.1
Totals:	1030	734	71.3

* Rate 9 received the Trustee Scholarship valued at \$8,800 per semester. Rate 8 received the President's Scholarship valued at \$7,700 per semester. Rate 7 received the Deans' Scholarship valued at \$6,000 per semester. For rates 6 - 9 students, 100% of demonstrated financial need is met in the form of scholarships, grants, work study, and loans as per university policy. Merit scholarships are renewable each year provided specific academic performance standards are met.

Not surprisingly perhaps, the best qualified students in the admissions population, rate “9” receiving the most merit aid, graduated at the highest rate. But this was not shown to be a consistent finding throughout the other ratings. Table 5-7 showed noticeable below average graduation rates for students at rates “5” and “6”. These were above average applicants in the admissions pool who fell short of earning any university awarded merit scholarship and thus lost the opportunity for significant non-need based funding. Conversely, students of rate “4” seemed highly motivated to graduate when compared to their contemporaries. Although evaluated as average to slightly below average candidates, the rate “4” students attained degree as frequently as the top admits and well above the population average suggesting that these “late bloomers” had sufficient pre-college preparation to persist or they made up for it with support or by finding other resources while in college.

In sum, expectations of finding Decision Pain Index and Decision Net Price as consistently negative predictors of persistence were not realized. The Cumulative Pain Index didn’t seem to matter in the later years of college education. No-need students did tend to graduate at rates higher than most but the highest graduation rates were reserved by the low-need students who persisted through the third year. The high-need students consistently reenrolled from semester to semester at the highest rate but this persistence did not transfer over to degree achievement at least during the five years of this study.

This Study as it Relates to the Literature

First, this work was not unique in that it studied a population of students in their efforts to persist through college. As far back as the 1920’s when Edgerton and Toops evaluated student retention at their institution, researchers have studied persistence in

their own backyards where data may be more readily available. Results from these studies were a direct benefit to the university and could be to other institutions seeking ways to evaluate their programs and interventions. But this study was unique in that it suggested a methodology in which all departments could take part to make a database of unparalleled comprehensiveness. It acknowledged that retention is not strictly the purview of top university officials and enrollment managers. Rather, retention is an institutional responsibility requiring full institutional involvement. This study also acknowledged that universities needed to be prepared to make interventions along the continuum of enrollment as student situations, motivations, and commitments change. The inconsistencies of many of the predictors of persistence suggested that retention is a dynamic process requiring dynamic interventions throughout the college experience.

Second, this study followed a long line of prominent research in the literature. Among the many studies in persistence, inspiration for the methodology developed for this work had come from: the dual analysis descriptive and causal approach to retention as espoused by Astin (1993); the organization of predictors by Tinto's longitudinal model of persistence (1993); the use of financial aid variables as proxy for family income as suggested by St. John (1992); the methodological considerations the role of logistic regression cut off points in data analysis as argued by Sadler, Cohen, and Kockesen (1997) and Nichols, Orehovec and Ingold (1998); and, the seminal work using logistic and probit regression modeling at the case university by Siefert (2002).

Third, results of this study contradicted yet supplemented other persistence studies highlighted in the literature. The financial hypotheses of Fuller, Manski, and Wise (1982) who concluded that financial aid could be an important determinant of initial

college attendance was affirmed in this persistence model. The premise of Somers (1996) who demonstrated that an institution can capture its own data and study its own retention status using logistic regression analysis was reaffirmed.

DuBrock's (2000) year-to-year persistence study at Arizona State University, in which descriptive and inferential analysis was employed in a five-year longitudinal study of a college freshman cohort, was expanded in this study. DuBrock developed four models to examine: the effects of receiving any financial aid; the effects of the amount of financial aid; the effects of the amount of cumulative debt; and, the effects of the type of cumulative debt, and concluded that

For students who chose to finance their education with loans, the amount of debt assumed increased their odds of successfully persisting through higher education while the type of debt had no significant impact. (DuBrock, 2000, p.23)

Similar to DuBrock, this study concluded that the relationships among independent variables changed over time as the student persisted through college and that there was also a cumulative financial effect. Added to the literature was the notion that college experiences and performance factors may also be cumulative, but not necessarily positive in significance as noted, for example, by the negative influence of the first semester college GPA in the ENROLL1S models.

This study also suggested that the influence of demographic and pre-college experiences towards the persistence decision waned over time and that broadly accepted indicators of student success, such as SAT test scores, were not necessarily significant and had been found to be of negative prediction in some cases. This was not to suggest that the SAT test, particularly the verbal score found to be a significant negative predictor in some of the models, was not of value. More research needs to be made to ascertain

why the test might come out as a negative predictor. Perhaps, this was an indication that students with higher verbal test scores enrolling at least in this liberal arts institution might have been looking to upgrade to a more prestigious university and hence would drop out to persist elsewhere counting as a non-persist for the case university. But without further study this remained speculative.

Fourth, this study modernized and expanded the pioneering work of Edgerton and Toops (1929) in the very first known published work on persistence. Edgerton and Toops found in their work that, “The women of all colleges (agriculture, engineering, arts, commerce, education, and pharmacy) show considerably less retardation than do the men” (1929, p.135). The four-year university-wide graduation rate was 18.1% (N= 1,958). The researchers used descriptive statistics and elaborate hand-made graphs to display results of quantitative indicators of entrance conditions, intelligence tests, scholastic averages, admission evaluations, and then correlated these factors to develop persistence predictions. Three significant predictors were: first term (quarter) grades; admissions evaluation, the “Entrance Board’s Estimate of High School Record” (p. 140); and, intelligence test percentile. They concluded that “a student who enters with a high Intelligence Test score, a good high-school record, and no entrance conditions has quite good chances of college success” (1929, p.139). Gender was the only demographic distinction made in the Edgerton and Toops work. No other demographic, college or financial factors were considered. What was most intriguing about Edgerton and Toops findings was that their case university was not getting the superior students to produce to potential. “The superior group is apparently not as superior in their academic attainments as the inferior group are inferior in their scholastic achievements” (1929, p.139). By

taking into account the current study, there was indication that Edgerton and Toops may have witnessed the drop out of some “superior students” to other, perhaps more prestigious universities, such as this behavior might have been eight decades ago.

Fifth, this study was unique in its scope. It encompassed a five-year longitudinal evaluation of a population of students, not the sample institutional cohort of DuBrock’s (2000) five-year longitudinal study at Arizona State University, or the population study of first year students at Iona College in Braunstein, McGrath and Pescatrice’s (2000) work. Influenced by these researchers, this work took their work a step further. It collected data hypothesized to be potential predictors of persistence in the models of Tinto (1975, 1987, and 1993), Bean and Metzner (1985), Pascarella and Wolfe (1985), Cabrera, Nora and Castañeda (1993) , Astin (1993) and others.

Sixth, this study’s development of key financial factors variables acknowledged the influence the cost of education played on the decision to enroll and to persist. By not exclusively dealing with financial factors, the study accepted the notion that financial considerations were, in themselves, insufficient to predict persistence behavior with any significant and consistent degree of accuracy. By establishing the premise that merit scholarships, grants, and work study funds not accumulative to post education debt influenced financial pain as well as net cost, this study acknowledged that the cost of one’s tuition alone might not be sufficient enough to predict long-term persistence.

And seventh, this study used logistic regression for inferential analysis. A popular technique in the literature when the decision variable is dichotomous, logistic regression analysis has become more universal with the introduction of statistical software programs like SPSS used in this study. Although number crunching had eased, interpretation of the

data had not. Quantitative research techniques were never intended to usurp good individual qualitative research. What logistic regression allowed was for predictor areas to be flagged for follow-on intervention, the specifics for which may come only from qualitative research.

This Study as a Guide for Institutional Policy and Practice

With a graduation rate in excess of 71%, the study population at this university had done well, exceeding the national average. Even though the female students graduated at a slightly higher rate, the male students graduated at a rate greater than 70%. The lowest minority student graduation rate was recorded at 55% in which 11 of the 20 initially enrolled Native American students earned their degree from this institution after five years. Although lower than that of the white students, this five-year rate exceeded the six-year sample rate quoted by Porter (1990) in Chapter 1. Yet with this success comes the inevitable challenge issued by alumni, faculty, and administration to further improve graduation success while enhancing the financial bottom line. This study, therefore, held significant policy implications for this institution and for any university embarking on data collection and analysis typified in this work.

Admissions Criteria

The first set of policy implications deals with the basic admissions criteria and the evaluation of prospective students. As a result of the findings in this study, four policy change recommendations were offered for consideration: establish a separate admissions process for legacy students; remove parent education information from the application; abolish mandatory SAT/ACT test score submission; and, enhance the importance of college credits made available for transfer in the admissions decision.

As is the case with some of the well-established institutions with a long legacy history, a separate admissions criteria could be established for students of legacy, admitted early or with other criteria taking importance over regular student admission. Legacy candidates could be serviced by the alumni office instead of the admissions office thus giving these students and their families a more individual feeling of service throughout the process. Yield, normally higher for legacy students, might further be improved. Minority legacy cases would also receive special attention and perhaps help improve minority student enrollment. The researcher's alma mater, not the institution of this study, advertises two different admissions rates, one for legacy, and one for all other candidates. That same university boasts of one of the highest alumni donation averages in the country, nearly 50%. Operating a separate office for legacy candidates may prove helpful in improving not only yield, but graduation and alumni donor rates as well.

Perhaps, surprisingly, parents' educational background seemed not to matter at all in this study. Does this question need to be included on the application and could its removal eliminate a potentially intimidating concern for a good student whose parents haven't been to college?

Regarding the use of test scores for predicting success in college, in the 103 persistence models of this study, SATVERB showed up negatively significant in only five models and SATMATH positively significant in two models. In every other case, the test scores were insignificant. If the requirement for the test should be dropped, imagine what that might do to the applicant pool? Minority student, free of the burden of having to take a standardized test many feel doesn't adequately test their academic strengths and skills, might apply in record numbers thus affording the admissions office the opportunity

to enhance minority enrollment. Some of America's most prestigious universities are already going in this direction.

Lastly, if transfer credits were seen as a more significant predictor of persistence than the high school transcript which received so much attention by admissions personnel, this factor should be elevated from an item of general interest to one of significant criterion in the admissions equation.

Campus Residency

The second set of policy implications deals with the encouragement and assignment to live in campus housing. As this study suggested, individual year-to-year campus residence was not consistently significant in either a positive or negative sense, but the cumulative effect (RESTOT) was consistently positive and significant in the no-need student case degree Model 98. Policies should be considered that would keep students on campus at least until the beginning of the third year when most of the attrition seemed to end. One solution might be to offer a room and board discount for a multiple year campus "lease" in a non-Freshman dormitory suite. Not only would a student enjoy a lower room and board fee thus relieving some burden from the potential effects of the Net Price and Pain Index financial factors, he/she would also have an enhanced opportunity to integrate into the campus community, a condition often cited in the literature that improves retention.

Financial Aid Policies and Procedures

The third set of policy implications deals with the financial aid office and the methods in which financial data need be kept. In the 2000 Iona College study of Braunstein, McGrath, and Pescatrice reported in Chapter 2, the researchers found that

“essentially none of the measures of financial aid had any significant impact on student persistence” (p. 201). The current study’s use of Net Price and Pain Index variables offered a new way to examine the potential effects of “free money” (the grants and work study funds not requiring repayment). If the financial aid office updated its data storage and retrieval mechanisms so that these types of indices, Net Price and Pain Index, can be computed and recorded for real time use, effective intervention strategies could be employed. For example, a student’s cumulative indices should be part of a campus wide database system subject to appropriate privacy security but made available to key decision makers who can contact individual students in person or by letter, phone, or electronic mail to encourage continued enrollment if evidence of lower probability of reenrollment was detected. With all vital financial aid records, not just initial awards, computerized and accessible to campus data analysts on an ongoing basis, research into the significance of these variables, and changes made to them could be interpreted for board of trustee level decision making.

The issue of the consistent negative means recorded in Pain Indices for the no-need students in this study should be addressed by administration. Is the institution giving away too much money to the non-needy at the expense of the low or high-need students? If the reason is to encourage the best applicants to enroll, might there be other ways to solidify this enrollment as could be the case with the legacy applicants? Institution-awarded merit scholarships have their rightful place in enrollment strategy and indeed make sense in encouraging top students to stay. But these awards should not be issued automatically once certain academic qualification thresholds are met without due regard to financial need. Although difficult as it may appear to consider removing award money

from top students, with roughly a third of the initial enrolled students receiving one of three institution-awarded merit scholarships without regard to financial aid status, additional study needs to be conducted to evaluate the efficacy of such a generous policy.

The First and Third Year Transfers

A campus wide effort at this institution must be made to explore more into the reasons for the first and third year transfer decision to avoid the loss of good students. If good students were leaving because they felt the institution was not of high enough academic quality or too expensive for the experience, that would be a sobering reality requiring top administration attention.

Implications for Further Research

If there haven't been any dramatic findings in this detailed study of student persistence over a five-year period, it may just be that there aren't any. It just may be that the decision to reenroll is indeed an individual decision influenced by a myriad of factors some of which might not be able to be modeled. How, for example, do you model for the decision of a freshman woman to leave a good fit institution simply because her boy friend is going elsewhere? How do you model for the student forced to leave because his parents want him elsewhere? What variable will account for the effect of just losing interest in college? How do you classify the student who takes his own life? These situations happen at institutions and are difficult to comprehend let alone model.

This study has incorporated every piece of quantifiable data reasonably available across the institution to demonstrate the efficacy of this approach. If data were available to explain more situations, model goodness of fits would likely have improved. But, this is expensive and perhaps beyond the practical reach of the smaller colleges that don't

employ an extensive institutional research staff. In this study, much of the data was not centrally monitored although progress was being made toward assimilation of an institutional database.

Persistence research requires data from multiple departments of the institution. In the past, this institution, like others, has not integrated data across departments. The case institution is presently in the process of creating a university-wide database. The need for this type of research highlights the importance of such efforts for the entire community. (Siefert, 2002, p. 111-112)

To enhance future research, policy makers should assign elements of student data collection to departments and schools across the university and establish its form of collection and storage.

At the case university, this study offered much for further research and suggested additional research questions. Here are a few follow-on research questions to consider. What factors specifically influenced those students who decided to transfer out at the third year, and could the institution successfully have mitigated these factors to retain these successful students? How successful is the Freshman Preceptorial Program at this university in influencing student persistence? What are the factors that might explain why the rate “4” enrolled students graduated at a rate nearly 10% higher than the cohort average while the rates “5” and “6” students presumably better prepared for college graduated at a rate nearly 10% lower than the cohort average and was this observation unique to this population? What were the factors that influenced the no-need students’ decisions to leave the institution when they were experiencing no or even negative financial pain? Or, what college experiences/extracurricular activities most enhanced retention and which were least effective in promoting retention?

For other institutions, this study could be used: as a guide toward the collection of a university-wide database; as a protocol for the evaluation of such data; and as a statistical methodology to predict the significant factors that most effect student decisions to reenroll from semester to semester. By establishing and maintaining this type of database, institutional policy makers would be able to monitor predictors and initiate timely interventions to optimize those factors most likely to result in reenrollment and minimize those factors predicted to have a negative effect on persistence. Through the collection of an ever increasing number of variables and additional research efforts, models can become better predictors of the decision process of enrolled students that is anything but simple. Qualitative techniques should be used to supplement these efforts.

Conclusion

The wealth of information contained in the type of database generated through rigorous collection efforts across the campus is immeasurable. The institutional researchers have at their disposal dozens of areas to explore. From the demographics data alone, studies can be commissioned for each ethnic population, for each parental educational background, for selected geographic groups, for legacy families, for high school athletes, indeed for any population that can be segregated from the data elements. From the college experiences, researchers can look at individual college activities to help determine which may be more likely to enhance retention and thus receive favorable institutional support. The financial factors give the university the opportunity to monitor student financial pain throughout enrollment offering the possibilities of intervention strategies when situations become difficult. Continuous improvement strategies could be initiated along the continuum of the student journey throughout the curriculum.

The burden of assimilating and evaluating an institution-wide database need not be relegated solely to an overworked research staff. Professors of statistics, psychology, sociology and other academic disciplines should take on portions of this effort in their own research and publication and for their class projects and assignments. If Tinto and others are correct in suggesting that student interaction with their professors is among the highest of the positive predictors for retention, why not initiate a collaborative effort by both to enhance that relationship by examining the puzzle of persistence.

It is appropriate to end this work by comparing the case university to national data on persistence. As depicted in Table 5-8, the institution compared favorably to highly selective universities in first to second year retention when examined against these national averages.

Table 5-8

*Comparison to National Data of First-to-Second Year Retention**

<u>Institution Type</u>	<u>Typical SAT</u>	<u>Return %</u>
Highly Selective	>1100	86.8
Selective	1045-1100	79.5
Moderately Selective	990-1044	73.5
Less Selective	<990	68.7
All Institutions	----	79.8
Case Institution	Mean = 1141	86.2

* Consortium for Student Retention Data Exchange, 2001

Despite this considerable achievement, Table 5-9 suggests improvements are warranted among minority student retention even if above the national averages. The apparent success of the middle income students could uncover clues to enhance persistence among these groups.

Table 5-9
Comparison to National Data of Six Year Graduation Rates

<u>Student Category</u>	<u>National Figures*</u>	<u>Case Institution•</u>
Total	63%	71.3% (734/1030)
Low-Income (high need)^	54%	75.0% (69/92)
Middle-Income (low need)^	-----	92.5% (173/187)
High-Income (no need)^	77%	75.0% (435/580)
African American	46%	60.9% (14/23)
Latino	47%	66.0% (99/150)
White	67%	73.0% (526/721)
Men	59%	70.6% (293/415)
Women	66%	71.7% (441/615)

* Source: Berkner, He, Cataldi, *Descriptive Summary of 1995-1996 Beginning Postsecondary Students: Six Years Later*, U.S. Department of Education. National Center for Education Statistics, 2002.

• Five-Year Rates for Case Institution.

^ Students at Case Institution reported in this financial need category during all semesters of enrollment.

By expanding the quantitative methodology suggested in this study to other year groups and employing additional qualitative techniques that narrow in on selected populations, university policy makers at the case institution can work to devise strategies to improve Black and Hispanic retention rates and to further investigate if middle-income students are actually graduating at rates well above the rest of the population. By using these same techniques at other colleges, administrators will have a powerful tool to help them towards solving the puzzle of college student retention.

They who persist in recognizing the wealth of information available to them across the campus, in aggressively developing a protocol to create a useable database, and in employing a solid analytical methodology to evaluate what is found, can only enhance the reputation of the institution, the satisfaction level of the students, and the financial condition of the entity. Retention of good students is well worth this effort.

REFERENCES

- Adelman, C. (1998, May). Academic Resources: Developing an Alternative Index of Individual Student Capital. Paper presented at the Annual Forum of the Association of Institution Research, Minneapolis, MN.
- Andreu, M. (2002). Developing and Implementing Local-Level Retention Studies: A Challenge for Community College Institutional Researchers. *Community College Journal of Research and Practice*, 26. 333 - 344.
- Astin, A. (1975). *Preventing Students From Dropping Out*. San Francisco. Jossey-Bass.
- Astin, A. (1993). *Assessment for Excellence*. American Council on Education. Phoenix, AZ. Oryx Press.
- Baird, L. (2000). College Climate and the Tinto Model. In J.M. Braxton (ed.), *Reworking the Student Departure Puzzle*, pp. 62-80. Nashville: Vanderbilt University Press.
- Baker, S. & Pomerantz, N. (2000). Impact of Learning Communities on Retention at a Metropolitan University. *Journal of College Student Retention* 2(2). 115 - 126.
- Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, N.J.: Prentice-Hall.
- Bean, J. P. (1980). Dropouts and Turnover: The Synthesis of a Causal Model of Student Attrition. *Research in Higher Education*, 1980, 12, pp.155-187.
- Bean, J.P. (1983). The Application of a Model of Turnover in Work Organizations to the Student Attrition Process. *Review of Higher Education*, 6, pp. 129-148.
- Bean, J.P. (1990). Using Retention Research in Enrollment Management. In Hossler, D. and Bean, J. (ed.), *The Strategic Management of College Enrollments*, pp 170-185. San Francisco: Jossey-Bass Publishers.
- Bean, J.P., and Eaton, S.B. (2000). A Psychological Model of College Student Retention. In J.M. Braxton (ed.), *Reworking the Student Departure Puzzle*, pp. 48-61. Nashville: Vanderbilt University Press.
- Bean, J.P., & Metzner, B.S. (1985). A Conceptual Model of Non-Traditional Student Attrition. *Review of Educational Research*, 55 (4), pp. 485-540.
- Benacci, K. (1991). *Sunshine Community College: Student Activities...To Be or Not to Be? Case Study*. Gainesville: University of Florida seminar paper; Arlington, VA: ERIC Document Reproduction Service. ED 331 561.

- Bentler, P.M., and Speckart, G. (1979). Models of Attitude-Behavior Relations. *Psychological Review* 86 (5): 452-464.
- Berger, J. (2001). Understanding the Organizational Nature of Student Persistency: Empirically-based Recommendations for Practice. *Journal of College Student Retention*, vol. 2(1). 3 - 21.
- Berson, J.S. (1996). *Student Perceptions of the Intercollegiate Athletic Program at a Community College*. Atlanta, GA: Annual Convention of the National Association of Student Personnel Administrators; Arlington, VA: ERIC Document Reproduction Service. ED 404 607.
- Blecher, L., Michael, W., & Hagedorn, L. (2002). *Factors Related to the "System" Persistence of Students Seeking the Bachelor's Degree at Four-Year Institutions*. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA.
- Boyd, D. (1992). The Importance of Extracurricular Activities as a Retention Tool on the Community College Campus. *Campus Activities Programming* 25 (December): 35-38.
- Brace, N., Kemp, R., & Snelgar, R. (2003). *SPSS for Psychologists, Second Edition*. Lawrence Erlbaum Associates, Publishers, Mahwah, New Jersey.
- Braunstein, A., McGrath, M., & Pescatrice, D. (2000). Measuring the impact of Financial Factors on College Persistence. *Journal of College Student Retention*, vol. 2(1). pp. 191 - 203.
- Brawer, F.B. (1973). *A Comparison of the Personality Characteristics of Community College Dropouts and Persisters*. Los Angeles: University of California; Arlington, VA: ERIC Document Reproduction Services: ED 083 980.
- Braxton, J.M. (2000). Reinvigorating Theory and Research on the Departure Puzzle. In J.M. Braxton (ed.), *Reworking the Student Departure Puzzle*, pp. 257-274. Nashville: Vanderbilt University Press.
- Braxton, J.M., & Lien, L.A. (2000). The Viability of Academic Integration as a Central Construct in Tinto's Interactionalist Theory of College Student Departure. In J.M. Braxton (ed.), *Reworking the Student Departure Puzzle*, pp. 11-28. Nashville: Vanderbilt University Press.
- Brooks, B. (2001, February). How to Handle Discrete Dependent Variables in the Univariate Case: A Primer on Logistic Regression. Paper presented at the annual meeting of the Southwest Educational Research Association, New Orleans, LA.

- Cabrera, A.F., Castañeda, M.B., Nora, A., & Hengstler, D. (1992). The Convergence between Two Theories of College Persistence. *Journal of Higher Education*, Vol. 63 (2), 143 - 164.
- Cabrera, A.F., Nora, A., & Castañeda, M.B. (1993). College Persistence. Structural Equations Modeling Test of an Integrated Model of Student Retention. *Journal of Higher Education*, Vol. 64(2), 124 - 139.
- Cabrera, A.F., Stampen, J.O., and Hansen, W.L. (1990). Exploring the Effects of Ability to Pay on Persistence in College. *Review of Higher Education* 13 (3): 303-336.
- Choy, S. (2002). Access & Persistence: Findings from 10 Years of Longitudinal Research on Students. (Center for Policy Analysis Rep. No. 309375). Washington, DC: American Council on Education.
- Christoffel, P. (1986). *Minority Student Access and Retention: a review*. New York: College Entrance Examination Board; Arlington, VA: ERIC Document Reproduction Service. ED 279 217.
- Clark, B.R., Heist, P., McConnell, T.R., Trow, M.A., & Young, G. (1972). *Students and Colleges: Interaction and Change*. Berkeley, CA. Center for Research and Development in Higher Education.
- Cofer, J., & Somers, P. (2000). A Comparison of the Persistence of Students at Two-year And Four-year Colleges. How Debtload Influences Student Decisions at Public And Private Colleges: A Comparison Between 1987 and 1992. Retrieved January 14, 2003 from <http://www.umsl.edu/~edupsome/persistpubpri.htm>.
- Cohen, J., Cohen, P., West, S.G., & Aiken, L.S. (2003). *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*. Lawrence Erlbaum Associates, Publishers, Mahwah, New Jersey.
- College Board, The (2002). *Trends in college pricing*. Washington, D.C.
- Dubrock, C.P. (2000, May). Financial Aid and College Persistence: A Five-Year Longitudinal Study of 1993 and 1994 Beginning Freshmen Students. Paper presented at the Annual Forum of the Association for Institutional Research, Cincinnati, OH.
- Durkheim, E. (1961). *Suicide*. (Spaulding, J.S. & Simpson, G., trans.) New York: Free Press.
- Edgerton, H., & Toops, H. (1929). *Academic Progress: A Follow-up Study of the Freshmen Entering the University in 1923*. Columbus, OH. The Ohio State University Press.

- Ewell, P.T. (2005). In D. Lederman *Improving Student Retention and Persistence*. Association of Governing Boards Priorities, No. 26, Fall 2005.
- Fishbein, M., and Ajzen, I. (1975). *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*. Reading, MA. Addison-Wesley.
- Forest, D. V. (1967). High School Underachievers in College. *Journal of Educational Research* 61 (December): 147-50.
- Fuller, W., Manski, C., & Wise, D. (1982). New Evidence on the Economic Determinants of Postsecondary Schooling Choices. *The Journal of Human Resources* (XVII 4). 477 - 498.
- Galloway, F. (2004). *The secrets behind producing meaningful quantitative research: What every foundation official really needs to know*. Retrieved September 22, 2004 from the Lumina Foundation for Education Web site: <http://www.luminafoundation.org/research/basics>.
- Glass, J., & Harrington, A. (2002). Academic Performance of Community College Transfer Students and "Native" Students at a Large State University. *Community College Journal of Research and Practice*, 26. 415 - 430.
- Gohn, L., Swartz, J., & Donnelly, S. (2001). A Case Study of Second year Student Persistence. *Journal of College Student Retention*, Vol 2(4). 271 - 294.
- Herndon, S. (1984). Recent findings concerning the relative importance of housing to student retention. *Journal of College and University Housing* 14 (Summer): 27-31.
- Hosmer, D. and Lemeshow, S. (1989). *Applied Logistic Regression*. New York: John Wiley and Sons.
- Horn, L., & Carroll, C. (1998). Stopouts or Stayouts? Undergraduates Who Leave College in Their First Year (National Center for Education Statistics Rep. No. NCES 1999-087). Washington, DC: U. S. Department of Education, Office of Educational Research and Improvement.
- House, J.D. (1996). College Persistence and Grade outcomes: Noncognitive Variable as Predictors for African-American, Asian-American, Hispanic, Native American, and White Students. Paper presented at the Annual Forum of the Association for Institutional Research, Albuquerque, NM.
- Hoyt, J. (2000). Remedial Education and Student Attrition. *Community College Review* Vol. 27 No.2: 51 - 72.

- Huber, W.H. (1971). Channeling Students for Greater Retention. *College and University* 47 (Fall): 19-29.
- Hull-Toye, C.S. (1995). Persistence Based upon Degree Aspirations. Paper presented at the Annual Meeting of the Association for the Study of Higher Education, Orlando, FL.
- Hurtado, S. and Carter, D.F. (1997). Effects of College Transition and Perceptions on the Campus Racial Climate on Latino College Students' Sense of Belonging. *Sociology of Education* 70: 334-345.
- Kamens, D.H. (1971). The College "Charter" and College Size: Effects on Occupational Choice and College Attrition. *Sociology of Education*, 44, 270-296.
- Kamens, D.H. (1974). Colleges and Elite Formation: The Case of Prestigious American Colleges. *Sociology of Education*, 47, 354-378.
- Karp, R., & Parker, M. (2002). Student Retention. Review of the Literature. Clarion University. Retrieved October 16, 2002 from: <http://www.clarion.edu/admin/academicaffairs/ue/Review%20of%20the%20Literature.pdf>.
- Lazarus, R.S. (1966). *Psychological Stress and the Coping Process*. New York: McGraw-Hill.
- Lenning, O.T.; Beal, P.E.; and Sauer, K. (1980). *Retention and Attrition: Evidence for Action and Research*. Boulder, Colorado: National Center for Higher Education Management Systems.
- Lenning, O.T.; Sauer, K.; and Beal, P.E. (1980). *Student Retention Strategies*. Washington, DC: American Association for Higher Education.
- Light, Richard. (2001). *Making the Most of College: Students Speak Their Minds*. Cambridge, MA: Harvard University Press.
- Martin, C.J. (1997). The Relationship of Student Retention to Teacher/Student Personality Types at Summit Christian College. Ph.D. Dissertation, Andrews University.
- Meyer, J.W. (1970). The Charter: Conditions of Diffuse Socialization in Schools. In W.R. Scott (Ed.), *Social Processes and Social Structure* (pp. 564-578). New York: Holt, Rinehart and Winston.
- Molnar, D. (1993, May). The Impact of Mission Effectiveness on Student Retention. Paper presented at the Annual Forum of the Association for Institutional Research, Chicago, IL.

- Nauta, M.M., & Kahn, J.H. (2000, August). The Social-Cognitive Model Applied to Academic Performance and Persistence. Paper presented at the Annual Conference of the American Psychological Association, Washington, DC.
- Ness, J. (2002). Crossing the Finish Line. American Indian Completers and Non-Completers in a Tribal College. *Tribal College (Summer 2002, Vol. 13 Issue 4)*.
- Nichols, J., Orehovec, P., & Ingold, S. (1998). Using Logistic Regression to Identify New "At-Risk" Freshmen. *Journal of Marketing for Higher Education, Vol. 9(1)*: 25 - 37.
- Office of the Provost, University of San Diego. (1998). Fiscal Year Budget Summary, Fiscal Year 1998 – 1999.
- Pascarella, E. (1985). The Influence of On-Campus Living Versus Commuting to College on Intellectual and Interpersonal Self-Concept. *Journal of College Student Personnel* 25 (4): 292-299.
- Pascarella, E., & Terenzini, P. (1977). Patterns of Student-Faculty Informal Interaction Beyond the Classroom and Voluntary Freshman Attrition. *Journal of Higher Education* 48 (September/October): 540 - 552.
- Pascarella, E.T., & Wolfe, L.M. (1985). Persistence in higher education: A nine-year test of a Theoretical model. Paper presented at the annual meeting of the American Education Research Association, Chicago.
- Pascarella, E., & Terenzini, P. (2001). Student-Faculty Informal Contact and College Persistence: A Further Investigation. *Journal of Educational Research* 72 (March/April): 21 - 218.
- Paulsen, M.B. & St John, E.P. (1997). The financial nexus between college choice and persistence. In R.A. Voorhees (ed.) *Researching student aid: Creating an action agenda*, Pp. 65-82. New Directions in Institutional Research, no. 95. San Francisco: Jossey-Bass.
- Porter, O. (1990). Undergraduate Completion and Persistence at Four-Year Colleges and Universities (The National Institute of Independent Colleges and Universities) Washington, DC.
- Reyes, M. (2000). What Does It Take? Successful Alaska Native Students at the University of Alaska Fairbanks. *Journal of College Student Retention* 2(2). 141 - 159.
- Richmond, D.R. (1985). Sophomore Slump: An Individual Approach to Recognition And Response. *Journal of College Student Personnel*, 26, 176-177.

- Rotter, J.B. (1966). Generalized Expectancies for Internal Versus External Control of Reinforcement. *Psychological Monographs* 80 (1, Whole No. 609).
- Sadler, W., Cohen, F., & Kockesen, L. (1997, May). Factors Affecting Retention Behavior: A Model to Predict At-Risk Students. Paper presented at the Annual Forum of the Association for Institutional Research, Orlando, FL.
- Sadler, J. (2002). First Impressions Count: How Effective Recruitment and Admissions Can Encourage Students To Stay at College. London, UK. Learning and Skills Development Agency. (ERIC Document Reproduction Service No. ED465106)
- Siefert, L. (2002). *Modeling the Effects of Financial Aid on Student Enrollment Decisions: A Quantitative Case Study of a Private Catholic University*. Ed.D. Dissertation. University of San Diego.
- Smart, J.C. (ed.) (1997). Higher Education: A Handbook of Theory and Research, Vol. 12. New York: Agathon Press.
- Smith, D. (1976). Personality differences between persisters and withdrawals in a small women's college. *Research in Higher Education* 5 (August): 15-25.
- Solberg, V.S., O'Brien, K., Villareal, P., Kennel, R., and Davis, B. (1993). Self-Efficacy And Hispanic College Students: Validation of the College Self-Efficacy Instrument. *Hispanic Journal of Behavioral Sciences* 15 (1): 80-95.
- Somers, P. (1996). The Influence of Price on Year-to-Year Persistence of College Students. *NASPA Journal*, Vol.33, No.2. (Winter 1996): 94 - 104.
- Somers, P., Austin, J., Birkner, L., Flowers, T., Inman, D., Martin, T., et al. (1998, October). *Voices of Two-Year and Technical College Students*. Paper presented at Arkansas Association of Two Year Colleges Meeting. Retrieved January 24, 2003 from <http://www.umsl.edu/~edupsome/Voicesoftwoyearstudents.htm>.
- Spady, W. (1970). Dropouts from higher education: Toward an empirical model. *Interchange* 2: 38-62.
- St. John, E.P. (1992). Workable Models for Institutional Research on the Impact of Student Financial Aid. *Journal of Student Financial Aid* 22 (3), 13-26.
- St. John, E.P., Cabrera, A.F., Nora, A., & Asker, E.H. (2000). Economic Influences on Persistence Reconsidered. How Can Finance Research Inform the Reconceptualization of Persistence Models? In *Reworking the Student Departure Puzzle*, Braxton, ed. pp. 29-47.

- Staehr, L., Martin, M., & Byrne, G. (2000). Improving the Retention Rates of Women in Computing: An Intervention Program. *Journal of College Student Retention* 2(2). 127 - 140.
- State University of New York, Albany. (1989). *Programs That Promote Retention of Minority Students in Postsecondary Occupational Education*. Albany, NY; Two Year College Development Center; Arlington, VA: ERIC Document Reproduction Service. ED 310 811.
- Strauss, L., & Volkwein, J. (2001, November). Paper presented at the Annual Meeting of the Association for the Study of Higher Education. (ERIC Document Reproduction Service No. ED458854)
- Szafran, R. (2001). Then Effect of Academic Load on Success for New College Students: Is Lighter Better? *Research in Higher Education*. Vol. 42. No.1. 27 - 50.
- Terenzini, P.T., Pascarella, E.T., & Blimling, G.S. (1999). Students' Out-of-Class Experiences and Their Influence on Learning and Cognitive Development: A Literature Review. *Journal of College Student Development*. 40 (September-October): 610-623.
- Tierney, W.G. (ed.) (1998). *The responsive university: Restructuring for high performance*. Baltimore: Johns Hopkins University Press.
- Tierney, W.G. (2000). Power, Identity, and the Dilemma of College Student Departure. In J.M. Braxton (ed.), *Reworking the Student Departure Puzzle*, pp. 213-234. Nashville: Vanderbilt University Press.
- Tinto, V. (1975). Dropout from higher education: a theoretical synthesis of recent Research. *Review of Educational Research* 45 (Winter): 89 - 125.
- Tinto, V. (1987) *Leaving College: Rethinking the Causes and Cures of Student Attrition*. Chicago: University of Chicago Press.
- Tinto, V. (1989). Misconceptions Mar Campus Discussions of Student Retention. *The Chronicle of Higher Education*. 36 (September 6): B2.
- Tinto, V. (1993). *Leaving College: Rethinking the Causes and Cures of Student Attrition*. 2nd Edition. Chicago: University of Chicago Press.
- Tinto, V. (2002, June). Promoting Student Retention: Lessons Learned from the United States. Paper presented at the 11th Annual Conference of the European Access Network, Prato, Italy. Retrieved December 4, 2002 from <http://soeweb.syr.edu/Vtinto/index.html>.

- Trent, J.W. & Ruyle, J.H. (1965). Variations, Flow, and Patterns of College Attendance. *College and University* 41 (Fall): 61-76.
- Van Gennep, A. (1960). *The Rites of Passage*. (Vizedon, M. & Caffee, G., trans.) Chicago: University of Chicago Press.
- Van Overwalle, F., Mervielde, I., and De Shuyer, J. (1995). Structural Modelling of the Relationships Between Attributional Dimensions, Emotions, and Performance of College Freshmen. *Cognition and Emotion* 9 (1): 59-85.
- Villella, J.W. (1997). *Freshman Involvement in a Pennsylvania State University and Its Effects on Grade Point Average and Satisfaction with the Institution*. Ph.D. Dissertation. Widener University.
- Voorhees, R.A. (1987). Toward Building Models of Community College Persistence: A Logit Analysis. *Research in Higher Education*, Vol. 26, (2). 115 - 129.
- Weiner, B. (1986). *An Attributional Theory of Motivation and Emotion*. New York: Springer-Verlag.
- Ybarra, R. (2000). Latino Students and Anglo-Mainstream Instructors: A Study of Classroom Communication. *Journal of College Student Retention* 2(2). 161 - 171.
- Zhang, Z., & RiCharde, R.S. (1998, May). Prediction and Analysis of Freshman Retention. Paper presented at the Annual Forum of the Association for Institutional Research, Minneapolis, MN.

APPENDIX A: Model Details

Table A-1

Specification of Variables in the Persistence Model

<u>Variable</u>	<u>Description and Coding</u>
ENROLL1F	the count variable to represent the entire population of 1,030 students who initially enrolled in the Fall Semester, Year One – used to define the totality of cases for SPSS analysis.
<i>The Ten Dependent Variables: Decision to reenroll and graduate.</i>	
ENROLL1S	0 if the enrolled student did not reenroll in the Spring Semester, Year One; 1 if the student reenrolled – the dependent variable.
ENROLL2F	0 if the enrolled student did not reenroll in the Fall Semester, Year Two; 1 if the student reenrolled – the dependent variable.
ENROLL2S	0 if the enrolled student did not reenroll in the Spring Semester, Year Two; 1 if the student reenrolled – the dependent variable.
ENROLL3F	0 if the enrolled student did not reenroll in the Fall Semester, Year Three; 1 if the student reenrolled – the dependent variable.
ENROLL3S	0 if the enrolled student did not reenroll in the Spring Semester, Year Three; 1 if the student reenrolled – the dependent variable.
ENROLL4F	0 if the enrolled student did not reenroll in the Fall Semester, Year Four; 1 if the student reenrolled – the dependent variable.
ENROLL4S	0 if the enrolled student did not reenroll in the Spring Semester, Year Four; 1 if the student reenrolled – the dependent variable.
ENROLL5F	0 if the enrolled student did not reenroll in the Fall Semester, Year Five; 1 if the student reenrolled – the dependent variable.
ENROLL5S	0 if the enrolled student did not reenroll in the Spring Semester, Year Five; 1 if the student reenrolled – the dependent variable.
DEGREE	0 if the initially enrolled student did not graduate by the Spring Semester of Year Five; 1 if the initially enrolled student graduated by the Spring Semester of Year Five – the dependent variable.

The Twenty-Four Independent Variables: Demographic and Pre-College Experiences.

GENDER	0 if female; 1 if male.
LEGACY	0 if other; 1 if parent, sibling or other relative attended the university.
MILES	Distance in hundreds of miles (divided by 100) between home of record and university campus as calculated by Zip Code separation (international addresses - by distance between city of record and city in which the university is located).
RATE	Rating of competitive factors for admission to include: high school GPA; SAT/ACT scores; leadership; service; and, talent. Rating is on a scale of 0 to 9 with 9 the highest rating and 0 the lowest.
GPAHS	High School GPA as calculated by admissions prior to enrollment.
SATVERB	Highest reported SAT verbal or ACT equivalent score (divided by 10).
SATMATH	Highest reported SAT math or ACT equivalent score (divided by 10).
LDRSHIP	An admissions determination of level of leadership exhibited through high school performance on a scale from 0 (least) to 5 (most).
SERVICE	An admissions determination of level of service exhibited through high school performance on a scale from 0 (least) to 5 (most).
TALENT	An admissions determination of level of talent exhibited through high school performance on a scale from 0 (least) to 5 (most).
TRANSFER	The number of semester units transferred from other universities and colleges to the university in this study both before and during enrollment.
AP	The number of semester units applied as a result of advanced placement, international baccalaureate, and CLEP examinations taken by the college student while in high school.
ATHHS	0 if not; 1 if reported as having been an athlete in high school.
DADNC	0 if not; 1 if Dad's highest degree is high school.
DADAA	0 if not; 1 if Dad's highest degree is associate degree or up to two years attendance at college.
DADBA	0 if not; 1 if Dad's highest degree is bachelor's degree or at least three years attendance in four year college.
DADPG	0 if not; 1 if Dad's highest degree is higher than a bachelor's degree – master's, professional, PhD, etc.
MOMNC	0 if not; 1 if Mom's highest degree is high school.
MOMAA	0 if not; 1 if Mom's highest degree is associate degree or up to two years attendance at college.
MOMBA	0 if not; 1 if Mom's highest degree is bachelor's degree or at least three years attendance in four year college.
MOMPG	0 if not; 1 if Mom's highest degree is higher than a bachelor's degree – master's, professional, PhD, etc.

ETHNC	0 if not; 1 if Caucasian.
ETHNH	0 if not; 1 if Hispanic, Chicano, Latin/Central American, Puerto Rican.
ETHNO	0 if not; 1 if not Caucasian or Hispanic origin – Asian, Asian American, Pacific Islander, African American, Black African, Haitian, Filipino, Native American, Eskimo (relative homogeneity of study population requires this ethnic lumping to overcome data separation restrictions in logistic regression modeling).

The Thirty-One Independent Variables: College Experiences.

MAJORBIS	0 if not; 1 if a business related major.
MAJORLIB	0 if not; 1 if a liberal arts related major.
MAJOROTH	0 if not; 1 if a major other than business related or liberal arts related such as engineering, science, computer science, or math (relative popularity of business and liberal arts majors in the study population requires this majors lumping to overcome data separation restrictions in logistic regression modeling).
DECLARED	Date of declared final major listed as a number from 1 – 10 based on the semester during which such declaration is made: 1 if declared June through December Year One; 2 if declared January through May Year One; 3 if declared June through December Year Two; 4 if declared January through May Year Two; 5 if declared June through December Year Three; 6 if declared January through May Year Three; 7 if declared June through December Year Four; 8 if declared January through May Year Four; 9 if declared June through December Year Five; 10 if declared January through May Year Five.
EXTRA	0 if not; 1 if NCAA Division 1 student athlete on scholarship, if Choral Scholar student singer on scholarship, if NROTC student on scholarship, or if a resident assistant receiving room and board stipend (relatively small number of students in each category requires this extracurricular lumping to overcome data separation restrictions in logistic regression modeling).
RES1	0 if not; 1 if living on campus Year One.
RES2	0 if not; 1 if living on campus Year Two.
RES3	0 if not; 1 if living on campus Year Three.
RES4	0 if not; 1 if living on campus Year Four.
RES5	0 if not; 1 if living on campus Year Five.
RESTOT	The total number of years a student lived on campus (0 – 5).
UNITS1F	Cumulative semester units completed Fall Year One.
UNITS1S	Cumulative semester units completed Spring Year One.

UNITS2F	Cumulative semester units completed Fall Year Two.
UNITS2S	Cumulative semester units completed Spring Year Two.
UNITS3F	Cumulative semester units completed Fall Year Three.
UNITS3S	Cumulative semester units completed Spring Year Three.
UNITS4F	Cumulative semester units completed Fall Year Four.
UNITS4S	Cumulative semester units completed Spring Year Four.
UNITS5F	Cumulative semester units completed Fall Year Five.
UNITS5S	Cumulative semester units completed Spring Year Five.
GPA1F	Cumulative grade point average earned Fall Year One.
GPA1S	Cumulative grade point average earned Spring Year One.
GPA2F	Cumulative grade point average earned Fall Year Two.
GPA2S	Cumulative grade point average earned Spring Year Two.
GPA3F	Cumulative grade point average earned Fall Year Three.
GPA3S	Cumulative grade point average earned Spring Year Three.
GPA4F	Cumulative grade point average earned Fall Year Four.
GPA4S	Cumulative grade point average earned Spring Year Four.
GPA5F	Cumulative grade point average earned Fall Year Five.
GPA5S	Cumulative grade point average earned Spring Year Five.

The Two General Financial Factors from which Financial Variables are Determined.

Net Price:	Tuition and fees minus total grant aid (institutional, government, private) in thousands of dollars converted to base year 1998 (the actual price a student and/or family would pay for the education, either directly or through combinations of payments and loans).
Pain Index:	Calculated total federal need minus total grant aid in thousands of dollars converted to base year 1998 (the difference between what the Federal Government determines to be the individual need to be met and the amount of grant aid or “free” money offered to meet that need).

The Fifty-Seven Independent Variables: Financial Factors.

CUMPI1F	Cumulative Pain Index, Fall Year One: Calculated cumulative total federal need minus total grant aid in thousands of dollars converted to base year 1998 (the total pain index previously incurred by the student and/or family proximate to the decision to return in Spring Year One).
DECPI1S	Decision Pain Index, Spring Year One: Calculated semester total federal need minus total grant aid in thousands of dollars converted to base year 1998 assumed known to the student and/or family proximate to the decision to return in Spring Year One.

DECNP1S	Decision Net Price, Spring Year One: Semester tuition and fees minus total grant aid (institutional, government, private) in thousands of dollars converted to base year 1998 assumed known to the student and/or family proximate to the decision to return in Spring Year One.
NOFN1S	Federal Need, Spring Year One, No Need: Calculated federal need from financial aid sources converted to base year 1998 for Spring Year One; 0 if not; 1 if no need (non submittal of financial aid documents is assumed to be a no need situation).
LOFN1S	Federal Need, Spring Year One, Low Need: Calculated federal need from financial aid sources converted to base year 1998 for Spring Year One; 0 if not; 1 if low need (\$1 - \$12,000).
HIFN1S	Federal Need, Spring Year One, High Need: Calculated federal need from financial aid sources converted to base year 1998 for Spring Year One; 0 if not; 1 if high need (> \$12,000).
CUMPI1S	Cumulative Pain Index, Spring Year One: Calculated cumulative total federal need minus total grant aid in thousands of dollars converted to base year 1998 (the total pain index incurred by the student and/or family proximate to the decision to return in Fall Year Two).
DECPI2F	Decision Pain Index, Fall Year Two: Calculated semester total federal need minus total grant aid in thousands of dollars converted to base year 1998 assumed known to the student and/or family proximate to the decision to return in Fall Year Two.
DECNP2F	Decision Net Price, Fall Year Two: Semester tuition and fees minus total grant aid (institutional, government, private) in thousands of dollars converted to base year 1998 assumed known to the student and/or family proximate to the decision to return in Fall Year Two.
NOFN2F	Federal Need, Fall Year Two, No Need: Calculated federal need from financial aid sources converted to base year 1998 for Fall Year Two; 0 if not; 1 if no need (non submittal of financial aid documents is assumed to be a no need situation).
LOFN2F	Federal Need, Fall Year Two, Low Need: Calculated federal need from financial aid sources converted to base year 1998 for Fall Year Two; 0 if not; 1 if low need (\$1 - \$12,000).
HIFN2F	Federal Need, Fall Year Two, High Need: Calculated federal need from financial aid sources converted to base year 1998 for Fall Year Two; 0 if not; 1 if high need (> \$12,000).
CUMPI2F	Cumulative Pain Index, Fall Year Two: Calculated cumulative total federal need minus total grant aid in thousands of dollars converted to base year 1998 (the total pain index previously incurred by the student and/or family proximate to the decision to return in Spring Year Two).

DECPI2S	Decision Pain Index, Spring Year Two: Calculated semester total federal need minus total grant aid in thousands of dollars converted to base year 1998 assumed known to the student and/or family proximate to the decision to return in Spring Year Two.
DECNP2S	Decision Net Price, Spring Year Two: Semester tuition and fees minus total grant aid (institutional, government, private) in thousands of dollars converted to base year 1998 assumed known to the student and/or family proximate to the decision to return in Spring Year Two.
NOFN2S	Federal Need, Spring Year Two, No Need: Calculated federal need from financial aid sources converted to base year 1998 for Spring Year Two; 0 if not; 1 if no need (non submittal of financial aid documents is assumed to be a no need situation).
LOFN2S	Federal Need, Spring Year Two, Low Need: Calculated federal need from financial aid sources converted to base year 1998 for Spring Year Two; 0 if not; 1 if low need (\$1 - \$12,000).
HIFN2S	Federal Need, Spring Year Two, High Need: Calculated federal need from financial aid sources converted to base year 1998 for Spring Year Two; 0 if not; 1 if high need (> \$12,000).
CUMPI2S	Cumulative Pain Index, Spring Year Two: Calculated cumulative total federal need minus total grant aid in thousands of dollars converted to base year 1998 (the total pain index incurred by the student and/or family proximate to the decision to return in Fall Year Three).
DECPI3F	Decision Pain Index, Fall Year Three: Calculated semester total federal need minus total grant aid in thousands of dollars converted to base year 1998 assumed known to the student and/or family proximate to the decision to return in Fall Year Three.
DECNP3F	Decision Net Price, Fall Year Three: Semester tuition and fees minus total grant aid (institutional, government, private) in thousands of dollars converted to base year 1998 assumed known to the student and/or family proximate to the decision to return in Fall Year Three.
NOFN3F	Federal Need, Fall Year Three, No Need: Calculated federal need from financial aid sources converted to base year 1998 for Fall Year Three; 0 if not; 1 if no need (non submittal of financial aid documents is assumed to be a no need situation).
LOFN3F	Federal Need, Fall Year Three, Low Need: Calculated federal need from financial aid sources converted to base year 1998 for Fall Year Three; 0 if not; 1 if low need (\$1 - \$12,000).
HIFN3F	Federal Need, Fall Year Three, High Need: Calculated federal need from financial aid sources converted to base year 1998 for Fall Year Three; 0 if not; 1 if high need (> \$12,000).

CUMPI3F	Cumulative Pain Index, Fall Year Three: Calculated cumulative total federal need minus total grant aid in thousands of dollars converted to base year 1998 (the total pain index previously incurred by the student and/or family proximate to the decision to return in Spring Year Three).
DECPI3S	Decision Pain Index, Spring Year Three: Calculated semester total federal need minus total grant aid in thousands of dollars converted to base year 1998 assumed known to the student and/or family proximate to the decision to return in Spring Year Three.
DECNP3S	Decision Net Price, Spring Year Three: Semester tuition and fees minus total grant aid (institutional, government, private) in thousands of dollars converted to base year 1998 assumed known to the student and/or family proximate to the decision to return in Spring Year Three.
NOFN3S	Federal Need, Spring Year Three, No Need: Calculated federal need from financial aid sources converted to base year 1998 for Spring Year Three; 0 if not; 1 if no need (non submittal of financial aid documents is assumed to be a no need situation).
LOFN3S	Federal Need, Spring Year Three, Low Need: Calculated federal need from financial aid sources converted to base year 1998 for Spring Year Three; 0 if not; 1 if low need (\$1 - \$12,000).
HIFN3S	Federal Need, Spring Year Three, High Need: Calculated federal need from financial aid sources converted to base year 1998 for Spring Year Three; 0 if not; 1 if high need (> \$12,000).
CUMPI3S	Cumulative Pain Index, Spring Year Three: Calculated cumulative total federal need minus total grant aid in thousands of dollars converted to base year 1998 (the total pain index incurred by the student and/or family proximate to the decision to return in Fall Year Four).
DECPI4F	Decision Pain Index, Fall Year Four: Calculated semester total federal need minus total grant aid in thousands of dollars converted to base year 1998 assumed known to the student and/or family proximate to the decision to return in Fall Year Four.
DECNP4F	Decision Net Price, Fall Year Four: Semester tuition and fees minus total grant aid (institutional, government, private) in thousands of dollars converted to base year 1998 assumed known to the student and/or family proximate to the decision to return in Fall Year Four.
NOFN4F	Federal Need, Fall Year Four, No Need: Calculated federal need from financial aid sources converted to base year 1998 for Fall Year Four; 0 if not; 1 if no need (non submittal of financial aid documents is assumed to be a no need situation).
LOFN4F	Federal Need, Fall Year Four, Low Need: Calculated federal need from financial aid sources converted to base year 1998 for Fall Year Four; 0 if not; 1 if low need (\$1 - \$12,000).

HIFN4F	Federal Need, Fall Year Four, High Need: Calculated federal need from financial aid sources converted to base year 1998 for Fall Year Four; 0 if not; 1 if high need (> \$12,000).
CUMPI4F	Cumulative Pain Index, Fall Year Four: Calculated cumulative total federal need minus total grant aid in thousands of dollars converted to base year 1998 (the total pain index previously incurred by the student and/or family proximate to the decision to return in Spring Year Four).
DECPI4S	Decision Pain Index, Spring Year Four: Calculated semester total federal need minus total grant aid in thousands of dollars converted to base year 1998 assumed known to the student and/or family proximate to the decision to return in Spring Year Four.
DECNP4S	Decision Net Price, Spring Year Four: Semester tuition and fees minus total grant aid (institutional, government, private) in thousands of dollars converted to base year 1998 assumed known to the student and/or family proximate to the decision to return in Spring Year Four.
NOFN4S	Federal Need, Spring Year Four, No Need: Calculated federal need from financial aid sources converted to base year 1998 for Spring Year Four; 0 if not; 1 if no need (non submittal of financial aid documents is assumed to be a no need situation).
LOFN4S	Federal Need, Spring Year Four, Low Need: Calculated federal need from financial aid sources converted to base year 1998 for Spring Year Four; 0 if not; 1 if low need (\$1 - \$12,000).
HIFN4S	Federal Need, Spring Year Four, High Need: Calculated federal need from financial aid sources converted to base year 1998 for Spring Year Four; 0 if not; 1 if high need (> \$12,000).
CUMPI4S	Cumulative Pain Index, Spring Year Four: Calculated cumulative total federal need minus total grant aid in thousands of dollars converted to base year 1998 (the total pain index incurred by the student and/or family proximate to the decision to return in Fall Year Five).
DECPI5F	Decision Pain Index, Fall Year Five: Calculated semester total federal need minus total grant aid in thousands of dollars converted to base year 1998 assumed known to the student and/or family proximate to the decision to return in Fall Year Five.
DECNP5F	Decision Net Price, Fall Year Five: Semester tuition and fees minus total grant aid (institutional, government, private) in thousands of dollars converted to base year 1998 assumed known to the student and/or family proximate to the decision to return in Fall Year Five.
NOFN5F	Federal Need, Fall Year Five, No Need: Calculated federal need from financial aid sources converted to base year 1998 for Fall Year Five; 0 if not; 1 if no need (non submittal of financial aid documents is assumed to be a no need situation).

LOFN5F	Federal Need, Fall Year Five, Low Need: Calculated federal need from financial aid sources converted to base year 1998 for Fall Year Five; 0 if not; 1 if low need (\$1 - \$12,000).
HIFN5F	Federal Need, Fall Year Five, High Need: Calculated federal need from financial aid sources converted to base year 1998 for Fall Year Five; 0 if not; 1 if high need (> \$12,000).
CUMPI5F	Cumulative Pain Index, Fall Year Five: Calculated cumulative total federal need minus total grant aid in thousands of dollars converted to base year 1998 (the total pain index previously incurred by the student and/or family proximate to the decision to return in Spring Year Five).
DECPI5S	Decision Pain Index, Spring Year Five: Calculated semester total federal need minus total grant aid in thousands of dollars converted to base year 1998 assumed known to the student and/or family proximate to the decision to return in Spring Year Five.
DECNP5S	Decision Net Price, Spring Year Five: Semester tuition and fees minus total grant aid (institutional, government, private) in thousands of dollars converted to base year 1998 assumed known to the student and/or family proximate to the decision to return in Spring Year Five.
NOFN5S	Federal Need, Spring Year Five, No Need: Calculated federal need from financial aid sources converted to base year 1998 for Spring Year Five; 0 if not; 1 if no need (non submittal of financial aid documents is assumed to be a no need situation).
LOFN5S	Federal Need, Spring Year Five, Low Need: Calculated federal need from financial aid sources converted to base year 1998 for Spring Year Five; 0 if not; 1 if low need (\$1 - \$12,000).
HIFN5S	Federal Need, Spring Year Five, High Need: Calculated federal need from financial aid sources converted to base year 1998 for Spring Year Five; 0 if not; 1 if high need (> \$12,000).
CUMPITOT	Cumulative Pain Index, Total: Calculated cumulative total federal need minus total grant aid in thousands of dollars converted to base year 1998 (the total pain index incurred by the student and/or family throughout the entire enrollment).
CUMNPTOT	Cumulative Net Price, Total: Cumulative semester tuition and fees minus total grant aid (institutional, government, private) in thousands of dollars converted to base year 1998 (the total net price incurred by the student and/or family throughout the entire enrollment).
FNSEMTOT	Federal Need, Semester, Total: The total number of semesters of recorded financial need (the sum of all semesters irrespective of low or high need determinations) numbered from 0 – 10.

Table A-3

*Specification of the 103 Logistic Regression Models*Models 1 – 10 (Individual Models)

Independent Variables: Appropriate Demographic and Pre-College Experiences

<i>Model 1</i>	Dependent Variable: ENROLL1S
<i>Model 2</i>	Dependent Variable: ENROLL2F
<i>Model 3</i>	Dependent Variable: ENROLL2S
<i>Model 4</i>	Dependent Variable: ENROLL3F
<i>Model 5</i>	Dependent Variable: ENROLL3S
<i>Model 6</i>	Dependent Variable: ENROLL4F
<i>Model 7</i>	Dependent Variable: ENROLL4S
<i>Model 8</i>	Dependent Variable: ENROLL5F
<i>Model 9</i>	Dependent Variable: ENROLL5S
<i>Model 10</i>	Dependent Variable: DEGREE

Models 11 – 20 (Individual Models)

Independent Variables: Appropriate College Experiences

<i>Model 11</i>	Dependent Variable: ENROLL1S
<i>Model 12</i>	Dependent Variable: ENROLL2F
<i>Model 13</i>	Dependent Variable: ENROLL2S
<i>Model 14</i>	Dependent Variable: ENROLL3F
<i>Model 15</i>	Dependent Variable: ENROLL3S
<i>Model 16</i>	Dependent Variable: ENROLL4F
<i>Model 17</i>	Dependent Variable: ENROLL4S
<i>Model 18</i>	Dependent Variable: ENROLL5F
<i>Model 19</i>	Dependent Variable: ENROLL5S
<i>Model 20</i>	Dependent Variable: DEGREE

Models 21 – 30 (Individual Models)

Independent Variables: Appropriate Financial Factors

<i>Model 21</i>	Dependent Variable: ENROLL1S
<i>Model 22</i>	Dependent Variable: ENROLL2F
<i>Model 23</i>	Dependent Variable: ENROLL2S
<i>Model 24</i>	Dependent Variable: ENROLL3F
<i>Model 25</i>	Dependent Variable: ENROLL3S
<i>Model 26</i>	Dependent Variable: ENROLL4F
<i>Model 27</i>	Dependent Variable: ENROLL4S
<i>Model 28</i>	Dependent Variable: ENROLL5F
<i>Model 29</i>	Dependent Variable: ENROLL5S
<i>Model 30</i>	Dependent Variable: DEGREE

Models 31 – 40 (Composite Models)

Independent Variables: Appropriate Demographic, Pre-College, and College Experiences

<i>Model 31</i>	Dependent Variable: ENROLL1S
<i>Model 32</i>	Dependent Variable: ENROLL2F
<i>Model 33</i>	Dependent Variable: ENROLL2S
<i>Model 34</i>	Dependent Variable: ENROLL3F
<i>Model 35</i>	Dependent Variable: ENROLL3S
<i>Model 36</i>	Dependent Variable: ENROLL4F
<i>Model 37</i>	Dependent Variable: ENROLL4S
<i>Model 38</i>	Dependent Variable: ENROLL5F
<i>Model 39</i>	Dependent Variable: ENROLL5S
<i>Model 40</i>	Dependent Variable: DEGREE

Models 41 – 50 (Composite Models)

Independent Variables: Appropriate Demographic, Pre-College Experiences, and Financial Factors

<i>Model 41</i>	Dependent Variable: ENROLL1S
<i>Model 42</i>	Dependent Variable: ENROLL2F
<i>Model 43</i>	Dependent Variable: ENROLL2S
<i>Model 44</i>	Dependent Variable: ENROLL3F
<i>Model 45</i>	Dependent Variable: ENROLL3S
<i>Model 46</i>	Dependent Variable: ENROLL4F
<i>Model 47</i>	Dependent Variable: ENROLL4S
<i>Model 48</i>	Dependent Variable: ENROLL5F
<i>Model 49</i>	Dependent Variable: ENROLL5S
<i>Model 50</i>	Dependent Variable: DEGREE

Models 51 – 60 (Composite Models)

Independent Variables: Appropriate College Experiences, and Financial Factors

<i>Model 51</i>	Dependent Variable: ENROLL1S
<i>Model 52</i>	Dependent Variable: ENROLL2F
<i>Model 53</i>	Dependent Variable: ENROLL2S
<i>Model 54</i>	Dependent Variable: ENROLL3F
<i>Model 55</i>	Dependent Variable: ENROLL3S
<i>Model 56</i>	Dependent Variable: ENROLL4F
<i>Model 57</i>	Dependent Variable: ENROLL4S
<i>Model 58</i>	Dependent Variable: ENROLL5F
<i>Model 59</i>	Dependent Variable: ENROLL5S
<i>Model 60</i>	Dependent Variable: DEGREE

Models 61 – 70 (Full Models)

Independent Variables: Appropriate Demographic, Pre-College, and College Experiences, and Financial Factors

<i>Model 61</i>	Dependent Variable: ENROLL1S
<i>Model 62</i>	Dependent Variable: ENROLL2F
<i>Model 63</i>	Dependent Variable: ENROLL2S
<i>Model 64</i>	Dependent Variable: ENROLL3F
<i>Model 65</i>	Dependent Variable: ENROLL3S
<i>Model 66</i>	Dependent Variable: ENROLL4F
<i>Model 67</i>	Dependent Variable: ENROLL4S
<i>Model 68</i>	Dependent Variable: ENROLL5F
<i>Model 69</i>	Dependent Variable: ENROLL5S
<i>Model 70</i>	Dependent Variable: DEGREE

Models 71 – 97 (Full Models Divided into Three Financial Need Groupings)

Independent Variables: Appropriate Demographic, Pre-College, and College Experiences, and Financial Factors

<i>Model 71</i>	Dependent Variable: ENROLL1S	Case of NOFN1S
<i>Model 72</i>	Dependent Variable: ENROLL1S	Case of LOFN1S
<i>Model 73</i>	Dependent Variable: ENROLL1S	Case of HIFN1S
<i>Model 74</i>	Dependent Variable: ENROLL2F	Case of NOFN2F
<i>Model 75</i>	Dependent Variable: ENROLL2F	Case of LOFN2F
<i>Model 76</i>	Dependent Variable: ENROLL2F	Case of HIFN2F
<i>Model 77</i>	Dependent Variable: ENROLL2S	Case of NOFN2S
<i>Model 78</i>	Dependent Variable: ENROLL2S	Case of LOFN2S
<i>Model 79</i>	Dependent Variable: ENROLL2S	Case of HIFN2S
<i>Model 80</i>	Dependent Variable: ENROLL3F	Case of NOFN3F
<i>Model 81</i>	Dependent Variable: ENROLL3F	Case of LOFN3F
<i>Model 82</i>	Dependent Variable: ENROLL3F	Case of HIFN3F
<i>Model 83</i>	Dependent Variable: ENROLL3S	Case of NOFN3S
<i>Model 84</i>	Dependent Variable: ENROLL3S	Case of LOFN3S
<i>Model 85</i>	Dependent Variable: ENROLL3S	Case of HIFN3S
<i>Model 86</i>	Dependent Variable: ENROLL4F	Case of NOFN4F
<i>Model 87</i>	Dependent Variable: ENROLL4F	Case of LOFN4F
<i>Model 88</i>	Dependent Variable: ENROLL4F	Case of HIFN4F
<i>Model 89</i>	Dependent Variable: ENROLL4S	Case of NOFN4S
<i>Model 90</i>	Dependent Variable: ENROLL4S	Case of LOFN4S
<i>Model 91</i>	Dependent Variable: ENROLL4S	Case of HIFN4S

<i>Model 92</i>	Dependent Variable: ENROLL5F	Case of NOFN5F
<i>Model 93</i>	Dependent Variable: ENROLL5F	Case of LOFN5F
<i>Model 94</i>	Dependent Variable: ENROLL5F	Case of HIFN5F
<i>Model 95</i>	Dependent Variable: ENROLL5S	Case of NOFN5S
<i>Model 96</i>	Dependent Variable: ENROLL5S	Case of LOFN5S
<i>Model 97</i>	Dependent Variable: ENROLL5S	Case of HIFN5S

Models 98 – 100 (Full 5 Year Models Divided into Three Financial Need Groupings)

Independent Variables: Appropriate Demographic, Pre-College, and College Experiences, and Financial Factors

<i>Model 98</i>	Dependent Variable: DEGREE	Case of NOFN1S (all five years)
<i>Model 99</i>	Dependent Variable: DEGREE	Case of LOFN1S (all five years)
<i>Model 100</i>	Dependent Variable: DEGREE	Case of HIFN1S (all five years)

Models 101 – 103 (Full 4 Year Models Divided into Three Financial Need Groupings)

Independent Variables: Appropriate Demographic, Pre-College, and College Experiences, and Financial Factors

<i>Model 101</i>	Dependent Variable: DEGREE	Case of NOFN1S (first four years)
<i>Model 102</i>	Dependent Variable: DEGREE	Case of LOFN1S (first four years)
<i>Model 103</i>	Dependent Variable: DEGREE	Case of HIFN1S (first four years)

APPENDIX B Model Results
Organized by Model Categories
The Analysts' Perspective

174

Model No.	Pop	Dep Variable	Logistic Regression Statistics				
			-2LL	C&S R ²	Nagel R ²	H&L X ²	H&L Sig
1	1030	Enroll1s	212.28	0.03	0.14	28.10	0.00
2	1004	Enroll2f	626.61	0.09	0.18	45.07	0.00
3	888	Enroll2s	316.50	0.04	0.13	11.63	0.17
4	849	Enroll3f	556.41	0.03	0.06	7.76	0.46
5	767	Enroll3s	243.02	0.05	0.15	11.66	0.17
6	760	Enroll4f	163.25	0.04	0.17	11.29	0.19
7	754	Enroll4s	77.59	0.03	0.22	5.34	0.72
8	161	Enroll5f	65.05	0.15	0.34	4.65	0.80
9	88	Enroll5s	48.27	0.15	0.29	6.99	0.54
10	1030	Degree	1064.21	0.15	0.22	54.95	0.00
11	1030	Enroll1s	188.49	0.05	0.24	8.27	0.41
12	1004	Enroll2f	351.81	0.31	0.60	26.58	0.00
13	888	Enroll2s	215.22	0.15	0.44	8.70	0.37
14	849	Enroll3f	482.20	0.11	0.23	30.40	0.00
15	767	Enroll3s	266.81	0.02	0.05	10.74	0.22
16	760	Enroll4f	169.95	0.03	0.13	3.67	0.89
17	754	Enroll4s	81.83	0.02	0.17	8.63	0.38
18	161	Enroll5f	78.33	0.07	0.17	11.01	0.20
19	88	Enroll5s	59.50	0.03	0.06	4.84	0.77
20	1030	Degree	223.13	0.63	0.90	6.29	0.62
21	1030	Enroll1s	218.61	0.02	0.11	10.55	0.10
22	1004	Enroll2f	580.62	0.13	0.26	62.31	0.00
23	888	Enroll2s	330.23	0.03	0.09	4.20	0.76
24	849	Enroll3f	471.99	0.12	0.25	27.09	0.00
25	767	Enroll3s	261.86	0.02	0.07	10.33	0.17
26	760	Enroll4f	176.37	0.02	0.09	16.25	0.02
27	754	Enroll4s	84.90	0.02	0.14	1.89	0.97
28	161	Enroll5f	71.72	0.11	0.25	23.21	0.00
29	88	Enroll5s	52.17	0.11	0.22	23.46	0.00
30	1030	Degree	633.42	0.44	0.63	175.58	0.00
31	1030	Enroll1s	160.95	0.08	0.36	5.03	0.76
32	1004	Enroll2f	328.88	0.33	0.63	9.31	0.32
33	888	Enroll2s	195.40	0.17	0.50	5.31	0.72
34	849	Enroll3f	448.14	0.15	0.30	19.13	0.01
35	767	Enroll3s	229.91	0.06	0.20	5.80	0.67
36	760	Enroll4f	133.12	0.08	0.34	4.35	0.83
37	754	Enroll4s	71.05	0.04	0.29	2.80	0.95
38	161	Enroll5f	53.45	0.21	0.48	5.79	0.67
39	88	Enroll5s	37.37	0.25	0.49	14.97	0.06
40	1030	Degree	138.15	0.66	0.94	35.85	0.00
41	1030	Enroll1s	179.52	0.06	0.28	6.64	0.58
42	1004	Enroll2f	448.41	0.24	0.47	8.27	0.41
43	888	Enroll2s	290.02	0.07	0.22	15.45	0.05
44	849	Enroll3f	431.08	0.16	0.33	15.72	0.05
45	767	Enroll3s	218.05	0.08	0.25	11.43	0.18
46	760	Enroll4f	148.67	0.06	0.25	13.03	0.11
47	754	Enroll4s	63.54	0.04	0.36	1.21	1.00
48	161	Enroll5f	43.74	0.25	0.59	3.23	0.92
49	88	Enroll5s	39.11	0.23	0.46	4.72	0.79
50	1030	Degree	581.34	0.47	0.67	188.81	0.00
51	1030	Enroll1s	156.94	0.08	0.38	12.55	0.13
52	1004	Enroll2f	267.80	0.36	0.71	20.63	0.01
53	888	Enroll2s	197.18	0.16	0.50	7.18	0.52

Blue = IV positive influence.

Red = IV negative influence.

Black = IV no influence.

Green Shade = $p \leq .05$.

Gray Shade = omitted IV.

Orange Shade = model not run.

APPENDIX B Model Results
Organized by Model Categories
The Analysts' Perspective

175

Model Cut Pt.	Sensitivity			Specificity		
	Enr Pred Enr	Actual Enroll	Enr Pred NEnr	Nenr Pred NEnr	Actual Not Enroll	Nenr Pred Enr
0.03	1004	1004	0	0	26	26
0.12	887	887	0	0	117	117
0.05	843	843	0	0	45	45
0.11	757	757	0	0	92	92
0.04	733	733	0	0	34	34
0.03	739	739	0	0	21	21
0.01	745	745	0	0	9	9
0.07	148	148	0	0	13	13
0.11	78	78	0	0	10	10
0.29	733	734	1	5	296	291
0.03	1004	1004	0	0	26	26
0.12	887	887	0	0	117	117
0.05	843	843	0	0	45	45
0.11	757	757	0	1	92	91
0.04	733	733	0	0	34	34
0.03	739	739	0	0	21	21
0.01	745	745	0	0	9	9
0.07	148	148	0	0	13	13
0.11	78	78	0	0	10	10
0.29	730	734	4	256	296	40
0.03	1004	1004	0	0	26	26
0.12	887	887	0	0	117	117
0.05	843	843	0	0	45	45
0.11	757	757	0	0	92	92
0.04	733	733	0	0	34	34
0.03	739	739	0	0	21	21
0.01	745	745	0	0	9	9
0.07	148	148	0	0	13	13
0.11	78	78	0	0	10	10
0.29	734	734	0	194	296	102
0.03	1004	1004	0	0	26	26
0.12	887	887	0	2	117	115
0.05	843	843	0	0	45	45
0.11	756	757	1	3	92	89
0.04	733	733	0	0	34	34
0.03	739	739	0	0	21	21
0.01	745	745	0	0	9	9
0.07	148	148	0	1	13	12
0.11	78	78	0	1	10	9
0.29	734	734	0	278	296	18
0.03	1004	1004	0	0	26	26
0.12	886	887	1	0	117	117
0.05	843	843	0	0	45	45
0.11	757	757	0	0	92	92
0.04	733	733	0	0	34	34
0.03	739	739	0	0	21	21
0.01	745	745	0	0	9	9
0.07	148	148	0	2	13	11
0.11	78	78	0	0	10	10
0.29	732	734	2	206	296	90
0.03	1004	1004	0	0	26	26
0.12	886	887	1	11	117	106
0.05	842	843	1	1	45	44

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

176

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

APPENDIX B Model Results
Organized by Model Categories
The Analysts' Perspective

180

Model No.	Pop	Dep Variable	Logistic Regression Statistics				
			-2LL	C&S R ²	Nagel R ²	H&L X ²	H&L Sig
54	849	Enroll3f	395.90	0.20	0.40	8.83	0.36
55	767	Enroll3s	252.63	0.03	0.11	5.85	0.67
56	760	Enroll4f	152.27	0.05	0.23	1.40	0.99
57	754	Enroll4s	75.50	0.03	0.24	5.88	0.66
58	161	Enroll5f	50.69	0.22	0.51	100.99	0.00
59	88	Enroll5s	48.72	0.14	0.28	5.36	0.62
60	1030	Degree	222.13	0.63	0.90	7.10	0.53
61	1030	Enroll1s	120.77	0.11	0.53	1.00	1.00
62	1004	Enroll2f	214.17	0.40	0.77	3.24	0.92
63	888	Enroll2s	171.48	0.19	0.57	3.45	0.90
64	849	Enroll3f	361.48	0.23	0.46	5.06	0.75
65	767	Enroll3s	210.53	0.09	0.28	14.42	0.07
66	760	Enroll4f	111.51	0.10	0.45	3.24	0.92
67	754	Enroll4s	60.31	0.05	0.40	2.54	0.96
68	161	Enroll5f	30.69	0.31	0.72	28.02	0.00
69	88	Enroll5s	39.58	0.23	0.45	4.67	0.79
70	1030	Degree	137.12	0.66	0.94	36.34	0.00
71	483	Enroll1s	52.89	0.10	0.52	4.36	0.82
72	399	Enroll1s	71.65	0.10	0.41	8.88	0.35
73	148	Enroll1s	12.19	0.06	0.44	0.31	1.00
74	599	Enroll2f	155.04	0.49	0.81	7.62	0.47
75	264	Enroll2f	47.82	0.19	0.59	1.30	1.00
77	495	Enroll2s	88.92	0.15	0.51	2.22	0.97
78	269	Enroll2s	39.18	0.34	0.79	0.61	1.00
79	124	Enroll2s	9.05	0.14	0.70	0.16	1.00
80	520	Enroll3f	293.52	0.27	0.46	2.89	0.94
81	211	Enroll3f	20.60	0.20	0.73	0.01	1.00
83	441	Enroll3s	117.92	0.13	0.39	9.82	0.28
84	227	Enroll3s	30.53	0.22	0.70	2.56	0.96
86	431	Enroll4f	70.84	0.17	0.57	2.85	0.94
87	204	Enroll4f	9.28	0.06	0.60	0.04	1.00
89	431	Enroll4s	48.55	0.03	0.25	2.42	0.97
90	209	Enroll4s	14.69	0.08	0.55	0.02	1.00
92	93	Enroll5f	34.36	0.36	0.64	1.99	0.98
95	46	Enroll5s	19.65	0.39	0.65	0.62	0.99
96	20	Enroll5s	8.72	0.19	0.40	1.22	1.00
98	451	Degree	83.53	0.60	0.90	273.53	0.00
99	16	Degree	4.87	0.15	0.40	0.79	0.99
100	6	Degree	6.03	0.32	0.42	5.57	0.23
101	453	Degree	23.38	0.65	0.97	0.00	1.00
102	121	Degree	8.42	0.20	0.79	0.02	1.00
103	48	Degree	13.92	0.32	0.65	2.29	0.97

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

APPENDIX B Model Results
Organized by Model Categories
The Analysts' Perspective

181

Model Cut Pt.	Sensitivity			Specificity		
	Enr Pred Enr	Actual Enroll	Enr Pred NEnr	Nenr Pred NEnr	Actual Not Enroll	Nenr Pred Enr
0.11	757	757	0	3	92	89
0.04	733	733	0	0	34	34
0.03	739	739	0	0	21	21
0.01	745	745	0	0	9	9
0.07	148	148	0	1	13	12
0.11	78	78	0	0	10	10
0.29	730	734	4	257	296	39
0.03	1004	1004	0	1	26	25
0.12	884	887	3	50	117	67
0.05	842	843	1	4	45	41
0.11	757	757	0	7	92	85
0.04	733	733	0	0	34	34
0.03	739	739	0	0	21	21
0.01	745	745	0	0	9	9
0.07	148	148	0	4	13	9
0.11	78	78	0	2	10	8
0.29	733	734	1	277	296	19
0.53	471	472	1	3	11	8
0.61	383	386	3	3	13	10
0.86	143	146	3	1	2	1
0.40	482	495	13	80	104	24
0.74	241	251	10	9	13	4
0.44	474	475	1	6	20	14
0.70	243	247	4	18	22	4
0.86	119	121	2	2	3	1
0.39	432	437	5	26	83	57
0.75	198	203	5	8	8	0
0.43	416	418	2	3	23	20
0.70	211	216	5	8	11	3
0.44	410	413	3	5	18	13
0.73	201	202	1	1	2	1
0.43	425	425	0	0	6	6
0.72	204	206	2	1	3	2
0.42	78	80	2	5	13	8
0.48	37	38	1	6	8	2
0.77	16	18	2	1	2	1
0.05	343	343	0	83	108	25
0.97	11	15	4	1	1	0
0.99	0	3	3	3	3	0
0.27	344	344	0	105	109	4
0.81	115	117	2	4	4	0
0.92	34	43	9	5	5	0

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

[illegible]

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

[illegible]

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

APPENDIX B Model Results
Organized by Model Categories
The Analysts' Perspective

184

College Experiences Independent Variables							
maibis	mailib	maioth	declared	extra	res	units	opa
X					2		2S
X	X		X	X	3		3F
X	X		X	X			3S
X	X		X		4	4F	4F
X	X		X	X	4	4S	
X	X		X		5	5F	5F
X	X		X	X	TOTAL		
			X	X	1		
					1	1S	1S
X	X			X	2		
X	X				2		2S
X	X		X	X	3	3F	3F
X	X		X	X			
X	X		X		4	4F	4F
X	X		X	X	4	4S	
X	X		X		5	5F	5F
X	X		X	X	TOTAL		
					1	1F	1F
					1	1F	1F
			X		1	1F	1F
	X				1	1S	1S
	X	X			1	1S	
	X	X		X	2	2F	2F
X	X		X		2		2F
					2	2F	2F
X	X					2S	2S
					2	2S	2S
X	X			X	3	3F	3F
X		X			3		3F
X	X		X	X		3S	3S
					3	3S	3S
	X	X	X		4	4F	4F
					4	4F	4F
X	X		X	X	4	4S	4S
					5	5F	5F
					5	5F	5F
X	X			X		5S	
					TOTAL	5S	5S
					TOTAL	5S	5S
X	X		X	X	TOTAL	5S	5S
					TOTAL	5S	5S
					TOTAL	5S	5S

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

APPENDIX B Model Results
Organized by Model Categories
The Analysts' Perspective

185

Financial Factors Independent Variables							
cumoi	decpi	decno	cumno	nofn	lofn	hifn	fnsem
3F	3F			3F	3F	3F	
3S	3S			3S	3S	3S	
4F	4F	4F			4F	4F	
4S	4S	4S		4S	4S	4S	
5F	5F	5F		5F	5F	5F	
5S	5S	5S		5S	5S	5S	
5S			5S				X
1F	1S red				1S	1S	
	2F			2F	2F	2F	
2F				2S	2S	2S	
	3F			3F	3F	3F	
3F				3S	3S	3S	
3S		4F			4F	4F	
	4S	4S		4S	4S	4S	
4S				5F	5F	5F	
5F	5S	5S		5S	5S	5S	
5S			5S				X
1F	1S	1S					
1F	1S						
1F	1S	1S					
	2F red						
1S	2F	2F					
2F	2S	2S					
2F	2S	2S					
2F	2S	2S					
	3F	3F					
2S	3F	3F					
	3S	3S					
		3S					
3S	4F	4F					
3S	4F	4F					
4F	4S	4S					
4F	4S	4S					
4S	5F	5F					
5F	5S	5S					
5F	5S	5S					
5S			5S				
5S			5S				
5S			5S				
5S			5S				
5S			5S				

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

APPENDIX B Model Results
Organized by Enrollment Period
The Practitioners' Perspective

186

Model No.	Pop	Dep Variable	Logistic Regression Statistics				
			-2LL	C&S R ²	Nagel R ²	H&L X ²	H&L Sig
10	1030	Degree	1064.21	0.15	0.22	54.95	0.00
20	1030	Degree	223.13	0.63	0.90	6.29	0.62
30	1030	Degree	633.42	0.44	0.63	175.58	0.00
40	1030	Degree	138.15	0.66	0.94	35.85	0.00
50	1030	Degree	581.34	0.47	0.67	188.81	0.00
60	1030	Degree	222.13	0.63	0.90	7.10	0.53
70	1030	Degree	137.12	0.66	0.94	36.34	0.00
98	451	Degree	83.53	0.60	0.90	273.53	0.00
99	16	Degree	4.87	0.15	0.40	0.79	0.99
100	6	Degree	6.03	0.32	0.42	5.57	0.23
101	453	Degree	23.38	0.65	0.97	0.00	1.00
102	121	Degree	8.42	0.20	0.79	0.02	1.00
103	48	Degree	13.92	0.32	0.65	2.29	0.97
1	1030	Enroll1s	212.28	0.03	0.14	28.10	0.00
11	1030	Enroll1s	188.49	0.05	0.24	8.27	0.41
21	1030	Enroll1s	218.61	0.02	0.11	10.55	0.10
31	1030	Enroll1s	160.95	0.08	0.36	5.03	0.76
41	1030	Enroll1s	179.52	0.06	0.28	6.64	0.58
51	1030	Enroll1s	156.94	0.08	0.38	12.55	0.13
61	1030	Enroll1s	120.77	0.11	0.53	1.00	1.00
71	483	Enroll1s	52.89	0.10	0.52	4.36	0.82
72	399	Enroll1s	71.65	0.10	0.41	8.88	0.35
73	148	Enroll1s	12.19	0.06	0.44	0.31	1.00
2	1004	Enroll2f	626.61	0.09	0.18	45.07	0.00
12	1004	Enroll2f	351.81	0.31	0.60	26.58	0.00
22	1004	Enroll2f	580.62	0.13	0.26	62.31	0.00
32	1004	Enroll2f	328.88	0.33	0.63	9.31	0.32
42	1004	Enroll2f	448.41	0.24	0.47	8.27	0.41
52	1004	Enroll2f	267.80	0.36	0.71	20.63	0.01
62	1004	Enroll2f	214.17	0.40	0.77	3.24	0.92
74	599	Enroll2f	155.04	0.49	0.81	7.62	0.47
75	264	Enroll2f	47.82	0.19	0.59	1.30	1.00
3	888	Enroll2s	316.50	0.04	0.13	11.63	0.17
13	888	Enroll2s	215.22	0.15	0.44	8.70	0.37
23	888	Enroll2s	330.23	0.03	0.09	4.20	0.76
33	888	Enroll2s	195.40	0.17	0.50	5.31	0.72
43	888	Enroll2s	290.02	0.07	0.22	15.45	0.05
53	888	Enroll2s	197.18	0.16	0.50	7.18	0.52
63	888	Enroll2s	171.48	0.19	0.57	3.45	0.90
77	495	Enroll2s	88.92	0.15	0.51	2.22	0.97
78	269	Enroll2s	39.18	0.34	0.79	0.61	1.00
79	124	Enroll2s	9.05	0.14	0.70	0.16	1.00
4	849	Enroll3f	556.41	0.03	0.06	7.76	0.46
14	849	Enroll3f	482.20	0.11	0.23	30.40	0.00
24	849	Enroll3f	471.99	0.12	0.25	27.09	0.00
34	849	Enroll3f	448.14	0.15	0.30	19.13	0.01
44	849	Enroll3f	431.08	0.16	0.33	15.72	0.05
54	849	Enroll3f	395.90	0.20	0.40	8.83	0.36
64	849	Enroll3f	361.48	0.23	0.46	5.06	0.75
80	520	Enroll3f	293.52	0.27	0.46	2.89	0.94
81	211	Enroll3f	20.60	0.20	0.73	0.01	1.00

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

APPENDIX B Model Results
Organized by Enrollment Period
The Practitioners' Perspective

187

Model Cut Pt	Sensitivity			Specificity		
	Enr Pred Enr	Actual Enroll	Enr Pred NEnr	Nenr Pred NEnr	Actual Not Enroll	Nenr Pred Enr
0.29	733	734	1	5	296	291
0.29	730	734	4	256	296	40
0.29	734	734	0	194	296	102
0.29	734	734	0	278	296	18
0.29	732	734	2	206	296	90
0.29	730	734	4	257	296	39
0.29	733	734	1	277	296	19
0.05	343	343	0	83	108	25
0.97	11	15	4	1	1	0
0.99	0	3	3	3	3	0
0.27	344	344	0	105	109	4
0.81	115	117	2	4	4	0
0.92	34	43	9	5	5	0
0.03	1004	1004	0	0	26	26
0.03	1004	1004	0	0	26	26
0.03	1004	1004	0	0	26	26
0.03	1004	1004	0	0	26	26
0.03	1004	1004	0	0	26	26
0.03	1004	1004	0	0	26	26
0.03	1004	1004	0	1	26	25
0.53	471	472	1	3	11	8
0.61	383	386	3	3	13	10
0.86	143	146	3	1	2	1
0.12	887	887	0	0	117	117
0.12	887	887	0	0	117	117
0.12	887	887	0	0	117	117
0.12	887	887	0	2	117	115
0.12	886	887	1	0	117	117
0.12	886	887	1	11	117	106
0.12	884	887	3	50	117	67
0.40	482	495	13	80	104	24
0.74	241	251	10	9	13	4
0.05	843	843	0	0	45	45
0.05	843	843	0	0	45	45
0.05	843	843	0	0	45	45
0.05	843	843	0	0	45	45
0.05	843	843	0	0	45	45
0.05	842	843	1	1	45	44
0.05	842	843	1	4	45	41
0.44	474	475	1	6	20	14
0.70	243	247	4	18	22	4
0.86	119	121	2	2	3	1
0.11	757	757	0	0	92	92
0.11	757	757	0	1	92	91
0.11	757	757	0	0	92	92
0.11	756	757	1	3	92	89
0.11	757	757	0	0	92	92
0.11	757	757	0	3	92	89
0.11	757	757	0	7	92	85
0.39	432	437	5	26	83	57
0.75	198	203	5	8	8	0

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

APPENDIX B Model Results
Organized by Enrollment Period
The Practitioners' Perspective

190

College Experiences Independent Variables							
maibis	mailib	maioth	declared	extra	res	units	gpa
X	X		X	X	TOTAL		
X			X	X	TOTAL		
X	X		X	X	TOTAL		
X	X		X	X	TOTAL		
X	X			X		5S	
					TOTAL	5S	5S
					TOTAL	5S	5S
X	X		X	X	TOTAL	5S	5S
					TOTAL	5S	5S
					TOTAL	5S	5S
			X	X	1		
			X	X	1		
			X	X	1		
			X	X	1		
					1	1F	1F
					1	1F	1F
			X		1	1F	1F
					1	1S	1S
					1	1S	
					1	1S	1S
					1	1S	1S
	X				1	1S	1S
	X	X			1	1S	
X	X			X	2		
X	X			X	2	2F	
X	X			X	2		
X	X			X	2		
X	X	X		X	2	2F	2F
X	X		X		2		2F
					2	2F	2F
X					2		2S
					2		2S
X					2		2S
X	X				2		2S
X	X					2S	2S
					2	2S	2S

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

APPENDIX B Model Results
Organized by Enrollment Period
The Practitioners' Perspective

191

Financial Factors							
Independent Variables							
cumpoi	decpi	decnp	cumpn	nofn	lofn	hifn	fnsem
5S			5S				X
5S			5S				X
5S			5S				
5S			5S				
5S			5S				
5S			5S				
5S			5S				
1F	1S red				1S	1S	
1F	1S red				1S	1S	
	1S red				1S	1S	
1F	1S red				1S	1S	
1F	1S	1S					
1F	1S						
1F	1S	1S					
				2F	2F	2F	
				2F	2F	2F	
				2F	2F	2F	
	2F			2F	2F	2F	
	2F red						
1S	2F	2F					
2F	2S			2S	2S	2S	
2F				2S	2S	2S	
2F				2S	2S	2S	
2F				2S	2S	2S	
2F	2S	2S					
2F	2S	2S					
2F	2S	2S					
	3F			3F	3F	3F	
	3F			3F	3F	3F	
	3F			3F	3F	3F	
	3F			3F	3F	3F	
	3F	3F					
2S	3F	3F					

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

APPENDIX B Model Results
Organized by Enrollment Period
The Practitioners' Perspective

192

Model No.	Pop	Dep Variable	Logistic Regression Statistics				
			-2LL	C&S R ²	Nagel R ²	H&L X ²	H&L Sig
5	767	Enroll3s	243.02	0.05	0.15	11.66	0.17
15	767	Enroll3s	266.81	0.02	0.05	10.74	0.22
25	767	Enroll3s	261.86	0.02	0.07	10.33	0.17
35	767	Enroll3s	229.91	0.06	0.20	5.80	0.67
45	767	Enroll3s	218.05	0.08	0.25	11.43	0.18
55	767	Enroll3s	252.63	0.03	0.11	5.85	0.67
65	767	Enroll3s	210.53	0.09	0.28	14.42	0.07
83	441	Enroll3s	117.92	0.13	0.39	9.82	0.28
84	227	Enroll3s	30.53	0.22	0.70	2.56	0.96
6	760	Enroll4f	163.25	0.04	0.17	11.29	0.19
16	760	Enroll4f	169.95	0.03	0.13	3.67	0.89
26	760	Enroll4f	176.37	0.02	0.09	16.25	0.02
36	760	Enroll4f	133.12	0.08	0.34	4.35	0.83
46	760	Enroll4f	148.67	0.06	0.25	13.03	0.11
56	760	Enroll4f	152.27	0.05	0.23	1.40	0.99
66	760	Enroll4f	111.51	0.10	0.45	3.24	0.92
86	431	Enroll4f	70.84	0.17	0.57	2.85	0.94
87	204	Enroll4f	9.28	0.06	0.60	0.04	1.00
7	754	Enroll4s	77.59	0.03	0.22	5.34	0.72
17	754	Enroll4s	81.83	0.02	0.17	8.63	0.38
27	754	Enroll4s	84.90	0.02	0.14	1.89	0.97
37	754	Enroll4s	71.05	0.04	0.29	2.80	0.95
47	754	Enroll4s	63.54	0.04	0.36	1.21	1.00
57	754	Enroll4s	75.50	0.03	0.24	5.88	0.66
67	754	Enroll4s	60.31	0.05	0.40	2.54	0.96
89	431	Enroll4s	48.55	0.03	0.25	2.42	0.97
90	209	Enroll4s	14.69	0.08	0.55	0.02	1.00
8	161	Enroll5f	65.05	0.15	0.34	4.65	0.80
18	161	Enroll5f	78.33	0.07	0.17	11.01	0.20
28	161	Enroll5f	71.72	0.11	0.25	23.21	0.00
38	161	Enroll5f	53.45	0.21	0.48	5.79	0.67
48	161	Enroll5f	43.74	0.25	0.59	3.23	0.92
58	161	Enroll5f	50.69	0.22	0.51	100.99	0.00
68	161	Enroll5f	30.69	0.31	0.72	28.02	0.00
92	93	Enroll5f	34.36	0.36	0.64	1.99	0.98
9	88	Enroll5s	48.27	0.15	0.29	6.99	0.54
19	88	Enroll5s	59.50	0.03	0.06	4.84	0.77
29	88	Enroll5s	52.17	0.11	0.22	23.46	0.00
39	88	Enroll5s	37.37	0.25	0.49	14.97	0.06
49	88	Enroll5s	39.11	0.23	0.46	4.72	0.79
59	88	Enroll5s	48.72	0.14	0.28	5.36	0.62
69	88	Enroll5s	39.58	0.23	0.45	4.67	0.79
95	46	Enroll5s	19.65	0.39	0.65	0.62	0.99
96	20	Enroll5s	8.72	0.19	0.40	1.22	1.00

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

APPENDIX B Model Results
Organized by Enrollment Period
The Practitioners' Perspective

193

Model Cut Pt.	Sensitivity			Specificity		
	Enr Pred Enr	Actual Enroll	Enr Pred NEnr	Nenr Pred NEnr	Actual Not Enroll	Nenr Pred Enr
0.04	733	733	0	0	34	34
0.04	733	733	0	0	34	34
0.04	733	733	0	0	34	34
0.04	733	733	0	0	34	34
0.04	733	733	0	0	34	34
0.04	733	733	0	0	34	34
0.04	733	733	0	0	34	34
0.43	416	418	2	3	23	20
0.70	211	216	5	8	11	3
0.03	739	739	0	0	21	21
0.03	739	739	0	0	21	21
0.03	739	739	0	0	21	21
0.03	739	739	0	0	21	21
0.03	739	739	0	0	21	21
0.03	739	739	0	0	21	21
0.03	739	739	0	0	21	21
0.44	410	413	3	5	18	13
0.73	201	202	1	1	2	1
0.01	745	745	0	0	9	9
0.01	745	745	0	0	9	9
0.01	745	745	0	0	9	9
0.01	745	745	0	0	9	9
0.01	745	745	0	0	9	9
0.01	745	745	0	0	9	9
0.01	745	745	0	0	9	9
0.43	425	425	0	0	6	6
0.72	204	206	2	1	3	2
0.07	148	148	0	0	13	13
0.07	148	148	0	0	13	13
0.07	148	148	0	0	13	13
0.07	148	148	0	1	13	12
0.07	148	148	0	2	13	11
0.07	148	148	0	1	13	12
0.07	148	148	0	4	13	9
0.42	78	80	2	5	13	8
0.11	78	78	0	0	10	10
0.11	78	78	0	0	10	10
0.11	78	78	0	0	10	10
0.11	78	78	0	1	10	9
0.11	78	78	0	0	10	10
0.11	78	78	0	0	10	10
0.11	78	78	0	2	10	8
0.48	37	38	1	6	8	2
0.77	16	18	2	1	2	1

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

APPENDIX B Model Results
Organized by Enrollment Period
The Practitioners' Perspective

194

Demographic and Pre-College Experiences											
Independent Variables											
gend	legacy	miles	rate	opahs	satv	satm	ldrship	serv	talent	xfer	ap
	X	X	X	X	X	X	X	X	X		X
	X	X	X	X	X	X	X	X	X		X
X	X	X	X	X	X	X	X	X	X		X
X	X	X	X	X	X	X	X	X	X		X
X	X	X	X	X	X	X	X	X	X		X
X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X		X
X	X	X	X	X		X	X	X	X		X
X	X	X	X	X	X	X	X	X	X		X
X	X		X	X		X	X	X	X		X
X	X	X	X	X	X	X	X	X	X		X
	X	X	X	X	X						
X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X		X	X	X	X	X
	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X
	X	X		X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X		X	X
X	X	X	X	X		X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X	X	X	X	X

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

APPENDIX B Model Results
Organized by Enrollment Period
The Practitioners' Perspective

195

Demographic and Pre-College Experiences											
Independent Variables											
athhs	dadnc	dadaa	dadba	dadoc	momnc	momaal	momba	momoc	ethnc	ethnh	ethno
X	X	X	X		X	X	X		X	X	
X	X	X	X		X	X	X		X	X	
X	X	X	X		X	X	X		X	X	
X	X	X	X		X	X	X		X	X	
X	X	X	X		X	X	X		X	X	
					X	X	X				
X	X	X	X		X	X	X		X	X	
X	X	X	X		X	X	X		X	X	
X	X	X	X		X	X	X		X	X	
X	X		X		X	X	X		X	X	
X	X	X	X		X	X	X		X	X	
X	X	X	X		X	X	X		X	X	
X	X		X		X	X	X		X	X	
X	X		X		X	X	X		X	X	
X	X		X		X	X	X		X	X	
X	X		X		X	X	X		X	X	
X					X	X	X		X	X	
X					X	X	X		X	X	
X					X	X	X		X	X	
X									X	X	
X	X		X	X					X		X
X											
X					X	X	X				
X					X	X	X				
X					X	X	X				

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

APPENDIX B Model Results
Organized by Enrollment Period
The Practitioners' Perspective

196

College Experiences Independent Variables							
maibis	mailib	maioth	declared	extra	res	units	gpa
X	X		X	X	3	3F	3F
X	X		X	X	3	3F	3F
X	X		X	X	3		3F
X	X		X	X	3	3F	3F
X	X			X	3	3F	3F
X		X			3		3F
X	X		X	X	3		
X	X		X	X	3		
X	X		X	X			3S
X	X		X	X		3S	3S
X	X		X	X		3S	3S
					3	3S	3S
X	X		X		4	4F	4F
X	X		X		4	4F	4F
X	X		X		4	4F	4F
X	X		X		4	4F	4F
	X	X	X		4	4F	4F
					4	4F	4F
X	X		X	X	4	4S	
X	X			X	4	4S	
X	X		X	X	4	4S	
X	X		X	X	4	4S	
X	X		X	X	4	4S	4S
X	X		X	X	5	5F	5F
X	X		X		5	5F	5F
X	X		X		5	5F	5F
X	X		X		5	5F	5F
					5	5F	5F
					5	5F	5F

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

APPENDIX B Model Results
Organized by Enrollment Period
The Practitioners' Perspective

197

Financial Factors Independent Variables							
cumpoi	decpi	decno	cumno	nofn	lofn	hifn	fnsem
3F	3S			3S	3S	3S	
3F				3S	3S	3S	
3F	3S			3S	3S	3S	
3F				3S	3S	3S	
	3S	3S					
		3S					
3S	4F	4F		4F	4F	4F	
3S	4F	4F		4F	4F	4F	
3S	4F	4F			4F	4F	
3S		4F			4F	4F	
3S	4F	4F					
3S	4F	4F					
4F	4S			4S	4S	4S	
	4S			4S	4S	4S	
4F	4S	4S		4S	4S	4S	
	4S	4S		4S	4S	4S	
4F	4S	4S					
4F	4S	4S					
4S	5F			5F	5F	5F	
4S	5F			5F	5F	5F	
4S				5F	5F	5F	
4S				5F	5F	5F	
4S	5F	5F					
5F	5S	5S		5S	5S	5S	
5F	5S	5S		5S	5S	5S	
5F	5S	5S		5S	5S	5S	
5F	5S	5S		5S	5S	5S	
5F	5S	5S					
5F	5S	5S					

Blue = IV positive influence.
Red = IV negative influence.
Black = IV no influence.
Green Shade = $p \leq .05$.
Gray Shade = omitted IV.
Orange Shade = model not run.

APPENDIX D
Logistic Regression
Cut Point Calculations

199

Logistic Regression Model	Model Cut Point	Logistic Regression Model	Model Cut Point
1	0.03	53	0.05
2	0.12	54	0.11
3	0.05	55	0.04
4	0.11	56	0.03
5	0.04	57	0.01
6	0.03	58	0.07
7	0.01	59	0.11
8	0.07	60	0.29
9	0.11	61	0.03
10	0.29	62	0.12
11	0.03	63	0.05
12	0.12	64	0.11
13	0.05	65	0.04
14	0.11	66	0.03
15	0.04	67	0.01
16	0.03	68	0.07
17	0.01	69	0.11
18	0.07	70	0.29
19	0.11	71	0.53
20	0.29	72	0.61
21	0.03	73	0.86
22	0.12	74	0.40
23	0.05	75	0.74
24	0.11	76	0.86
25	0.04	77	0.44
26	0.03	78	0.70
27	0.01	79	0.86
28	0.07	80	0.39
29	0.11	81	0.75
30	0.29	82	0.86
31	0.03	83	0.43
32	0.12	84	0.70
33	0.05	85	0.87
34	0.11	86	0.44
35	0.04	87	0.73
36	0.03	88	0.84
37	0.01	89	0.43
38	0.07	90	0.72
39	0.11	91	0.85
40	0.29	92	0.42
41	0.03	93	0.70
42	0.12	94	0.88
43	0.05	95	0.48
44	0.11	96	0.77
45	0.04	97	0.75
46	0.03	98	0.05
47	0.01	99	0.97
48	0.07	100	0.99
49	0.11	101	0.27
50	0.29	102	0.81
51	0.03	103	0.92
52	0.12		

Appendix D
Logistic Regression
Cut Point Calculations

200

No.	Formula and Calculations
1	$1 - (\text{enroll1s} - \text{stopoutrtn1s}) / (\text{enroll1f}) = 1 - [(1004 - 0) / (1030)] = 0.03$
2	$1 - (\text{enroll2f} - \text{stopoutrtn2f}) / (\text{enroll1s}) = 1 - [(888 - 1) / (1004)] = 0.12$
3	$1 - (\text{enroll2s} - \text{stopoutrtn2s}) / (\text{enroll2f}) = 1 - [(849 - 6) / (888)] = 0.05$
4	$1 - (\text{enroll3f} - \text{stopoutrtn3f}) / (\text{enroll2s}) = 1 - [(767 - 10) / (849)] = 0.11$
5	$1 - (\text{enroll3s} - \text{stopoutrtn3s}) / (\text{enroll3f}) = 1 - [(765 - 32) / (767)] = 0.04$
6	$1 - (\text{enroll4f} - \text{stopoutrtn4f}) / (\text{enroll3s} - \text{grad3s}) = 1 - [(772 - 33) / (765 - 5)] = 0.03$
7	$1 - (\text{enroll4s} - \text{stopoutrtn4s}) / (\text{enroll4f} - \text{grad4f}) = 1 - [(752 - 7) / (772 - 18)] = 0.01$
8	$1 - (\text{enroll5f} - \text{stopoutrtn5f}) / (\text{enroll4s} - \text{grad4s} - \text{grad4ss}) = 1 - [(157 - 7) / (752 - 588 - 3)] = 0.07$
9	$1 - (\text{enroll5s} - \text{stopoutrtn5s}) / (\text{enroll5f} - \text{grad5f}) = 1 - [(80 - 2) / (157 - 69)] = 0.11$
10	$1 - \text{degree} / \text{enroll1f} = 1 - (734 / 1030) = 0.29$
11	$1 - (\text{enroll1s} - \text{stopoutrtn1s}) / (\text{enroll1f}) = 1 - [(1004 - 0) / (1030)] = 0.03$
12	$1 - (\text{enroll2f} - \text{stopoutrtn2f}) / (\text{enroll1s}) = 1 - [(888 - 1) / (1004)] = 0.12$
13	$1 - (\text{enroll2s} - \text{stopoutrtn2s}) / (\text{enroll2f}) = 1 - [(849 - 6) / (888)] = 0.05$
14	$1 - (\text{enroll3f} - \text{stopoutrtn3f}) / (\text{enroll2s}) = 1 - [(767 - 10) / (849)] = 0.11$
15	$1 - (\text{enroll3s} - \text{stopoutrtn3s}) / (\text{enroll3f}) = 1 - [(765 - 32) / (767)] = 0.04$
16	$1 - (\text{enroll4f} - \text{stopoutrtn4f}) / (\text{enroll3s} - \text{grad3s}) = 1 - [(772 - 33) / (765 - 5)] = 0.03$
17	$1 - (\text{enroll4s} - \text{stopoutrtn4s}) / (\text{enroll4f} - \text{grad4f}) = 1 - [(752 - 7) / (772 - 18)] = 0.01$
18	$1 - (\text{enroll5f} - \text{stopoutrtn5f}) / (\text{enroll4s} - \text{grad4s} - \text{grad4ss}) = 1 - [(157 - 7) / (752 - 588 - 3)] = 0.07$
19	$1 - (\text{enroll5s} - \text{stopoutrtn5s}) / (\text{enroll5f} - \text{grad5f}) = 1 - [(80 - 2) / (157 - 69)] = 0.11$
20	$1 - \text{degree} / \text{enroll1f} = 1 - (734 / 1030) = 0.29$
21	$1 - (\text{enroll1s} - \text{stopoutrtn1s}) / (\text{enroll1f}) = 1 - [(1004 - 0) / (1030)] = 0.03$
22	$1 - (\text{enroll2f} - \text{stopoutrtn2f}) / (\text{enroll1s}) = 1 - [(888 - 1) / (1004)] = 0.12$
23	$1 - (\text{enroll2s} - \text{stopoutrtn2s}) / (\text{enroll2f}) = 1 - [(849 - 6) / (888)] = 0.05$
24	$1 - (\text{enroll3f} - \text{stopoutrtn3f}) / (\text{enroll2s}) = 1 - [(767 - 10) / (849)] = 0.11$
25	$1 - (\text{enroll3s} - \text{stopoutrtn3s}) / (\text{enroll3f}) = 1 - [(765 - 32) / (767)] = 0.04$
26	$1 - (\text{enroll4f} - \text{stopoutrtn4f}) / (\text{enroll3s} - \text{grad3s}) = 1 - [(772 - 33) / (765 - 5)] = 0.03$
27	$1 - (\text{enroll4s} - \text{stopoutrtn4s}) / (\text{enroll4f} - \text{grad4f}) = 1 - [(752 - 7) / (772 - 18)] = 0.01$
28	$1 - (\text{enroll5f} - \text{stopoutrtn5f}) / (\text{enroll4s} - \text{grad4s} - \text{grad4ss}) = 1 - [(157 - 7) / (752 - 588 - 3)] = 0.07$
29	$1 - (\text{enroll5s} - \text{stopoutrtn5s}) / (\text{enroll5f} - \text{grad5f}) = 1 - [(80 - 2) / (157 - 69)] = 0.11$
30	$1 - \text{degree} / \text{enroll1f} = 1 - (734 / 1030) = 0.29$
31	$1 - (\text{enroll1s} - \text{stopoutrtn1s}) / (\text{enroll1f}) = 1 - [(1004 - 0) / (1030)] = 0.03$
32	$1 - (\text{enroll2f} - \text{stopoutrtn2f}) / (\text{enroll1s}) = 1 - [(888 - 1) / (1004)] = 0.12$
33	$1 - (\text{enroll2s} - \text{stopoutrtn2s}) / (\text{enroll2f}) = 1 - [(849 - 6) / (888)] = 0.05$
34	$1 - (\text{enroll3f} - \text{stopoutrtn3f}) / (\text{enroll2s}) = 1 - [(767 - 10) / (849)] = 0.11$
35	$1 - (\text{enroll3s} - \text{stopoutrtn3s}) / (\text{enroll3f}) = 1 - [(765 - 32) / (767)] = 0.04$
36	$1 - (\text{enroll4f} - \text{stopoutrtn4f}) / (\text{enroll3s} - \text{grad3s}) = 1 - [(772 - 33) / (765 - 5)] = 0.03$
37	$1 - (\text{enroll4s} - \text{stopoutrtn4s}) / (\text{enroll4f} - \text{grad4f}) = 1 - [(752 - 7) / (772 - 18)] = 0.01$
38	$1 - (\text{enroll5f} - \text{stopoutrtn5f}) / (\text{enroll4s} - \text{grad4s} - \text{grad4ss}) = 1 - [(157 - 7) / (752 - 588 - 3)] = 0.07$
39	$1 - (\text{enroll5s} - \text{stopoutrtn5s}) / (\text{enroll5f} - \text{grad5f}) = 1 - [(80 - 2) / (157 - 69)] = 0.11$
40	$1 - \text{degree} / \text{enroll1f} = 1 - (734 / 1030) = 0.29$
41	$1 - (\text{enroll1s} - \text{stopoutrtn1s}) / (\text{enroll1f}) = 1 - [(1004 - 0) / (1030)] = 0.03$
42	$1 - (\text{enroll2f} - \text{stopoutrtn2f}) / (\text{enroll1s}) = 1 - [(888 - 1) / (1004)] = 0.12$
43	$1 - (\text{enroll2s} - \text{stopoutrtn2s}) / (\text{enroll2f}) = 1 - [(849 - 6) / (888)] = 0.05$
44	$1 - (\text{enroll3f} - \text{stopoutrtn3f}) / (\text{enroll2s}) = 1 - [(767 - 10) / (849)] = 0.11$
45	$1 - (\text{enroll3s} - \text{stopoutrtn3s}) / (\text{enroll3f}) = 1 - [(765 - 32) / (767)] = 0.04$
46	$1 - (\text{enroll4f} - \text{stopoutrtn4f}) / (\text{enroll3s} - \text{grad3s}) = 1 - [(772 - 33) / (765 - 5)] = 0.03$
47	$1 - (\text{enroll4s} - \text{stopoutrtn4s}) / (\text{enroll4f} - \text{grad4f}) = 1 - [(752 - 7) / (772 - 18)] = 0.01$

No.	Formula and Calculations
48	$1 - (\text{enroll5f} - \text{stopoutrtn5f}) / (\text{enroll4s} - \text{grad4s} - \text{grad4ss}) = 1 - [(157 - 7) / (752 - 588 - 3)] = 0.07$
49	$1 - (\text{enroll5s} - \text{stopoutrtn5s}) / (\text{enroll5f} - \text{grad5f}) = 1 - [(80 - 2) / (157 - 69)] = 0.11$
50	$1 - \text{degree} / \text{enroll1f} = 1 - (734 / 1030) = 0.29$
51	$1 - (\text{enroll1s} - \text{stopoutrtn1s}) / (\text{enroll1f}) = 1 - [(1004 - 0) / (1030)] = 0.03$
52	$1 - (\text{enroll2f} - \text{stopoutrtn2f}) / (\text{enroll1s}) = 1 - [(888 - 1) / (1004)] = 0.12$
53	$1 - (\text{enroll2s} - \text{stopoutrtn2s}) / (\text{enroll2f}) = 1 - [(849 - 6) / (888)] = 0.05$
54	$1 - (\text{enroll3f} - \text{stopoutrtn3f}) / (\text{enroll2s}) = 1 - [(767 - 10) / (849)] = 0.11$
55	$1 - (\text{enroll3s} - \text{stopoutrtn3s}) / (\text{enroll3f}) = 1 - [(765 - 32) / (767)] = 0.04$
56	$1 - (\text{enroll4f} - \text{stopoutrtn4f}) / (\text{enroll3s} - \text{grad3s}) = 1 - [(772 - 33) / (765 - 5)] = 0.03$
57	$1 - (\text{enroll4s} - \text{stopoutrtn4s}) / (\text{enroll4f} - \text{grad4f}) = 1 - [(752 - 7) / (772 - 18)] = 0.01$
58	$1 - (\text{enroll5f} - \text{stopoutrtn5f}) / (\text{enroll4s} - \text{grad4s} - \text{grad4ss}) = 1 - [(157 - 7) / (752 - 588 - 3)] = 0.07$
59	$1 - (\text{enroll5s} - \text{stopoutrtn5s}) / (\text{enroll5f} - \text{grad5f}) = 1 - [(80 - 2) / (157 - 69)] = 0.11$
60	$1 - \text{degree} / \text{enroll1f} = 1 - (734 / 1030) = 0.29$
61	$1 - (\text{enroll1s} - \text{stopoutrtn1s}) / (\text{enroll1f}) = 1 - [(1004 - 0) / (1030)] = 0.03$
62	$1 - (\text{enroll2f} - \text{stopoutrtn2f}) / (\text{enroll1s}) = 1 - [(888 - 1) / (1004)] = 0.12$
63	$1 - (\text{enroll2s} - \text{stopoutrtn2s}) / (\text{enroll2f}) = 1 - [(849 - 6) / (888)] = 0.05$
64	$1 - (\text{enroll3f} - \text{stopoutrtn3f}) / (\text{enroll2s}) = 1 - [(767 - 10) / (849)] = 0.11$
65	$1 - (\text{enroll3s} - \text{stopoutrtn3s}) / (\text{enroll3f}) = 1 - [(765 - 32) / (767)] = 0.04$
66	$1 - (\text{enroll4f} - \text{stopoutrtn4f}) / (\text{enroll3s} - \text{grad3s}) = 1 - [(772 - 33) / (765 - 5)] = 0.03$
67	$1 - (\text{enroll4s} - \text{stopoutrtn4s}) / (\text{enroll4f} - \text{grad4f}) = 1 - [(752 - 7) / (772 - 18)] = 0.01$
68	$1 - (\text{enroll5f} - \text{stopoutrtn5f}) / (\text{enroll4s} - \text{grad4s} - \text{grad4ss}) = 1 - [(157 - 7) / (752 - 588 - 3)] = 0.07$
69	$1 - (\text{enroll5s} - \text{stopoutrtn5s}) / (\text{enroll5f} - \text{grad5f}) = 1 - [(80 - 2) / (157 - 69)] = 0.11$
70	$1 - \text{degree} / \text{enroll1f} = 1 - (734 / 1030) = 0.29$
71	$1 - \text{enroll1f with no fin need 1s} / \text{enroll1f} = 1 - (483 / 1030) = 0.53$
72	$1 - \text{enroll1f with low fin need 1s} / \text{enroll1f} = 1 - (399 / 1030) = 0.61$
73	$1 - \text{enroll1f with hi fin need 1s} / \text{enroll1f} = 1 - (148 / 1030) = 0.86$
74	$1 - \text{enroll1s with no fin need 2f} / \text{enroll1s} = 1 - (599 / 1004) = 0.40$
75	$1 - \text{enroll1s with low fin need 2f} / \text{enroll1s} = 1 - (264 / 1004) = 0.74$
76	$1 - \text{enroll1s with hi fin need 2f} / \text{enroll1s} = 1 - (141 / 1004) = 0.86$
77	$1 - \text{enroll2f with no fin need 2s} / \text{enroll2f} = 1 - (495 / 888) = 0.44$
78	$1 - \text{enroll2f with low fin need 2s} / \text{enroll2f} = 1 - (269 / 888) = 0.70$
79	$1 - \text{enroll2f with hi fin need 2s} / \text{enroll2f} = 1 - (124 / 888) = 0.86$
80	$1 - \text{enroll2s with no fin need 3f} / \text{enroll2s} = 1 - (520 / 849) = 0.39$
81	$1 - \text{enroll2s with low fin need 3f} / \text{enroll2s} = 1 - (211 / 849) = .075$
82	$1 - \text{enroll2s with hi fin need 3f} / \text{enroll2s} = 1 - (118 / 849) = 0.86$
83	$1 - \text{enroll3f with no fin need 3s} / \text{enroll3f} = 1 - (441 / 767) = 0.43$
84	$1 - \text{enroll3f with low fin need 3s} / \text{enroll3f} = 1 - (227 / 767) = 0.70$
85	$1 - \text{enroll3f with hi fin need 3s} / \text{enroll3f} = 1 - (99 / 767) = 0.87$
86	$1 - \text{enroll3s \& not grad 3s with no fin need 4f} / \text{enroll3s} = 1 - (431 / 765) = 0.44$
87	$1 - \text{enroll3s \& not grad3s with low fin need 4f} / \text{enroll3s} = 1 - (204 / 765) = 0.73$
88	$1 - \text{enroll3s \& not grad3s with hi fin need 4f} / \text{enroll3s} = 1 - (125 / 765) = 0.84$
89	$1 - \text{enroll4f \& not grad 4f with no fin need 4s} / \text{enroll4f \& not grad 4f} = 1 - [431 / (772 - 18)] = 0.43$
90	$1 - \text{enroll4f \& not grad 4f with low fin need 4s} / \text{enroll4f \& not grad 4f} = 1 - [209 / (772 - 18)] = 0.72$
91	$1 - \text{enroll4f \& not grad 4f with hi fin need 4s} / \text{enroll4f and not grad4f} = 1 - [114 / ((772 - 18))] = 0.85$
92	$1 - \text{enroll4s not grad 4s or 4ss \& no fin need 5f} / \text{enroll4s not grad 4s or 4ss} = 1 - (93 / 161) = 0.42$
93	$1 - \text{enroll4s not grad 4s or 4ss \& lo fin need 5f} / \text{enroll4s not grad 4s or 4ss} = 1 - (48 / 161) = 0.70$
94	$1 - \text{enroll4s not grad 4s or 4ss \& hi fin need 5f} / \text{enroll4s not grad 4s or 4ss} = 1 - (20 / 161) = 0.88$

Appendix D
Logistic Regression
Cut Point Calculations

202

No.	Formula and Calculations
95	1 - enroll5f & not grad 5f with no fin need 5s / enroll5f & not grad 5f = $1 - [46 / (157 - 69)] = 0.48$
96	1 - enroll5f & not grad 5f with low fin need 5s / enroll5f & not grad 5f = $1 - [20 / (157 - 69)] = 0.77$
97	1 - enroll5f & not grad 5f with hi fin need 5s / enroll5f & not grad5f = $1 - [22 / (157 - 69)] = 0.75$
98	1 - sum of all reporting no financial need all 10 semesters / sum of all reporting no, low, or high financial need all 10 semesters = $1 - (451 / 473) = 0.05$
99	1 - sum of all reporting low financial need all 10 semesters / sum of all reporting no, low, or high financial need all 10 semesters = $1 - (16 / 473) = 0.97$
100	1 - sum of all reporting high financial need all 10 semesters / sum of all reporting no, low, or high financial need all 10 semesters = $1 - (6 / 473) = 0.99$
101	1 - sum of all reporting no financial need first 8 semesters / sum of all reporting no, low, or high financial need first 8 semesters = $1 - (453 / 622) = 0.27$
102	1 - sum of all reporting low financial need first 8 semesters / sum of all reporting no, low, or high financial need first 8 semesters = $1 - (121 / 622) = 0.81$
103	1 - sum of all reporting high financial need first 8 semesters / sum of all reporting no, low, or high financial need first 8 semesters = $1 - (48 / 622) = 0.92$

APPENDIX E
Degree Attainment
By Financial Need Categories

203

Prior Enrollment Description	Prior Enr	FN	Sem Enroll	Enroll	Degree	Enroll	Degree
enroll1f=1 & hifn1s=1	148	High	Enroll1s	146	89		
enroll1s=1 & hifn2f=1	141	High	Enroll2f	141	106		
enroll2f=1 & hifn2s=1	124	High	Enroll2s	121	96		
enroll2s=1 & hifn3f=1	118	High	Enroll3f	117	105		
enroll3f=1 & hifn3s=1	99	High	Enroll3s	99	85		
enroll3s=1 & grad3s=0 & hifn4f=1	125	High	Enroll4f	124	112		
enroll4f=1 & grad4f=0 & hifn4s=1	114	High	Enroll4s	114	103		
enroll4s=1 & grad4s=0 & grad4ss=0 & hifn5f=1	20	High	Enroll5f	20	13		
enroll5f=1 & grad5f=0 & hifn5s=1	22	High	Enroll5s	22	13		
enroll1f=1 & lofn1s=1	399	Low	Enroll1s	386	276		71.50%
enroll1s=1 & lofn2f=1	264	Low	Enroll2f	251	206	95.08%	82.07%
enroll2f=1 & lofn2s=1	269	Low	Enroll2s	247	216		87.45%
enroll2s=1 & lofn3f=1	211	Low	Enroll3f	203	193	96.21%	95.07%
enroll3f=1 & lofn3s=1	227	Low	Enroll3s	216	210	95.15%	
enroll3s=1 & grad3s=0 & lofn4f=1	204	Low	Enroll4f	202	196	99.02%	
enroll4f=1 & grad4f=0 & lofn4s=1	209	Low	Enroll4s	206	198		
enroll4s=1 & grad4s=0 & grad4ss=0 & lofn5f=1	48	Low	Enroll5f	48	42		
enroll5f=1 & grad5f=0 & lofn5s=1	20	Low	Enroll5s	18	14	90.00%	
enroll1f=1 & nofn1s=1	483		Enroll1s	472	369	97.72%	
enroll1s=1 & nofn2f=1	599		Enroll2f	495	421		
enroll2f=1 & nofn2s=1	495		Enroll2s	475	417	95.96%	
enroll2s=1 & nofn3f=1	520		Enroll3f	437	428		
enroll3f=1 & nofn3s=1	441		Enroll3s	418	405		96.89%
enroll3s=1 & grad3s=0 & nofn4f=1	431		Enroll4f	413	395		95.64%
enroll4f=1 & grad4f=0 & nofn4s=1	431		Enroll4s	425	407	98.61%	95.76%
enroll4s=1 & grad4s=0 & grad4ss=0 & nofn5f=1	93		Enroll5f	80	63		78.75%
enroll5f=1 & grad5f=0 & nofn5s=1	46		Enroll5s	38	25		65.79%

No Need
Low Need
High Need

Best
Middle
Worst