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The Impact of Institutional Merit Aid on Student Enrollment and Persistence

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THE IMPACT OF INSTITUTIONAL MERIT AID ON STUDENT ENROLLMENT AND PERSISTENCE

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DEDICATION

To my parents, Barbara and Chuck Verzyl, for raising me in a house where learning was made fun and engaging for as far back as I can remember and valued and as the path to a bright future and successful life. To my family, for supporting me throughout this journey and understanding the importance of furthering my educational goals. And especially to my wife, Holly Verzyl, for encouraging me at every turn and getting me across the finish line.

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ABSTRACT

Institutional merit-based financial aid awards are widely utilized by enrollment management practitioners to attract and retain students desired by the institution and to increase net tuition revenue. While much research has been conducted on federal need-based aid and statewide merit aid, relatively few studies have been conducted on merit aid awarded at the institutional level. This study sought to contribute to the literature by examining the effect of institutional merit aid on initial enrollment as well as student persistence at a large public research university located in the Southeastern United States. A quasi-experimental design was used to study two nearly identical cohorts of students at a large, public research university; one cohort received a small "vanity" scholarship while the other cohort did not. Binary logistic regression models were run to determine the impact of these scholarships on initial enrollment and retention. Academic, biodemographic, and financial variables were retrieved from institutional admissions, financial aid, and enrolled student databases to create the regression models. The results of this study found institutional merit aid has a statistically significant impact on initial enrollment but failed to increase net tuition revenue or improve the academic profile of the entering class. The study also found that the scholarships went to students who were already likely to enroll at the institution, that it encouraged enrollment of females and majority students, and deterred enrollment of low-income Pell students. This study also found that institutional merit aid has a statistically significant positive impact on student persistence, but the gains in retention do not increase net tuition revenue. While overall

retention improved for scholarship recipients, retention of males and first-generation students were negatively impacted by the scholarship. Lastly, institutional merit aid appears to have a positive impact on retention even for students who lost their scholarship after the first year of enrollment.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Prospects for a bright future are more dependent on earning a degree than ever before, as most new jobs created in America require bachelor's degrees as minimum qualifications. Sixty-five percent of all jobs in the US required postsecondary education (Carnevale, et al, 2013). As the need for a college degree is more important than ever, postsecondary enrollments have risen in response as high school graduates pursue the American dream of a better life (Hussar & Bailey, 2016). However, the ability to afford college is declining as the cost of a college degree, especially at public colleges and universities, has risen dramatically, largely driven by decreases in state support for higher education. Adjusted for inflation, state funding for higher education has dropped by nearly $9 billion over the ten-year period following the Great Recession of 2008 (Mitchell, et al, 2017). Thirty-two states across the country spent less on public higher education in 2020 than they did in 2008, with an average decrease of nearly $1500 per student (NEA,2022).

Almost all states have shifted the cost of college away from taxpayers and onto students and families. Net tuition revenue accounted for 20.9% of funding for public higher education in 1980, which by 2021 rose to 42.1%, with twenty states having a student share above 50% (SHEEO, 2022). Tuition now accounts for nearly half of total educational revenue, having doubled over the past twenty-five years and replaced state support as the primary funding source for public higher education (Mitchell, 2017,

SHEEO, 2019). Tuition increases have outpaced the rate of inflation and increases in median family income, making college less affordable for families and students (Ma, et al, 2016). As a result, more students are dependent on financial aid than ever before and, while federal funding for student aid has increased, it has not kept pace with increases in college cost (Baum, 2109; Mitchell, et al 2017). Even after accounting for temporary increases in state funding made possible by federal stimulus funding related to the COVID pandemic, most states continue to fund higher education at lower levels than prior to the Great Recession (SHEEO, 2022).

Yet state and federal governments demand greater accountability from higher education even as public funding declines. Retention and graduation of students are important indicators of institutional success, and volumes of research have been produced on these topics, as researchers and practitioners attempt to discover new and actionable insights on these institutional outcomes, as they have for many years (Braxton, 2000). Rankings organizations such as US News and World report emphasize retention in their rankings, and the U.S. Department of Education's National Center for Education Statistics maintains and publishes retention data on every college and university in the United States in its Integrated Postsecondary Education Data System.

Retention is not only important as a public accountability measure, but also to institutional fiscal viability. Colleges and schools desire high retention rates and steady enrollments for a variety of self-serving reasons: more favorable credit worthiness and bond borrowing rates, net tuition revenue, and fiscal stability. Public higher education has become more tuition driven as government subsidies have declined, therefore schools increasingly rely on enrollment growth to create positive net tuition revenue streams. As

state support has declined, net cost of attendance has increased faster than inflation, making college less affordable, especially for low-income students.

Academic Affairs, Student Affairs, and Enrollment Managers are often charged with increasing student enrollments, which can be accomplished by recruiting more students as well as by improving student retention. Complicating the enrollment landscape, demographers are projecting fewer college-going students in the coming years as well as changes in the socioeconomic makeup of high school graduates, which will increase competition for traditional freshmen and put additional pressure on college admissions officers charged with recruiting new students (Grawe, 2017; Bransberger & Michelau, 2016). Enrollment managers will need to adapt financial aid policies and practices to entice future students, who are more likely to be low-income, first in their families to attend college, and underrepresented minority students.

Universities have employed sophisticated marketing and recruiting techniques under the guise of Enrollment Management to increase the number of new enrollees, and one tool that is increasingly employed to manage university enrollments is the awarding of merit aid grants in the form of scholarships (Monks, 2009). Over the past twenty-five years the percentage of undergraduate students receiving merit aid has increased more than 300% (Clark, 2014). Nationally, institutional grant funding, most of which is awarded in the form of merit scholarships, has increased from $36 million in 2008-09 to nearly $65 million in 2018-19, a 78% increase (Baum, 2019). The average total grant per full time enrolled undergraduate has increased by sixty percent over this same time, putting pressure on institutional aid budgets and net tuition revenue while driving up

competition for students, who are increasingly making enrollment decisions based on affordability rather than institutional reputation.

Providing students with financial aid increases student enrollment, persistence, and graduation (Castleman & Long, 2016; Deming & Dynarski, 2010; Page & Scott-Clayton, 2016). And, as college cost increases have outpaced public funding for higher education and the ability for families to afford college, merit scholarships have become a more significant factor in the college selection process (Ehrenberg, 2000). Universities create aid programs based on financial need as well as academic merit and use these programs to attract strong students to improve the academic profile of their student bodies. Aid dollars are limited and therefore must also be leveraged strategically and cost-effectively to maximize enrollment as well as net tuition revenue.

The strategic use of financial aid is employed to entice desirable students to enroll and to improve student persistence. An effective aid leveraging strategy attempts to identify the optimum amount of financial aid, often in the form of tuition discounts, that will incentivize enrollment without over awarding additional aid that does not increase the likelihood of enrollment (Day, 2007). This discounting approach is usually based on the academic merits and desirability of the student rather than their demonstrated need and is offered in the form of merit scholarships instead of need-based grants.

Colleges and universities often use sophisticated statistical models, either developed internally or contracted from a third party, to design their merit financial aid leveraging approach. These models, while useful, are based on analysis of prior year data and historical enrollment patterns and are not able to account for rapidly changing and unanticipated environmental factors that may impact a student's enrollment decision.

Such tools should include a disclaimer much like what the Securities and Exchange Commission requires of financial investment prospectuses: “past performance does not necessarily predict future results.”

Purpose of this Study

The purpose of this study is to assess merit scholarship programs in two general areas of inquiry: do merit scholarships affect initial enrollment, and do merit scholarships impact persistence? The primary enrollment management outcomes to be assessed are attracting and enrolling new students, retaining current students, and impacting the makeup of the student body by various student characteristics.

The use of financial aid has become a primary component of enrollment management strategy, which enrollment managers seek to refine and improve upon to achieve maximum effectiveness. Studying the effectiveness and identifying ways to improve aid programs helps enrollment and financial aid managers justify aid budgets, make the case for additional aid, and demonstrate the return on investment of student aid programs.

Enrollment managers often utilize research and statistical models to predict the impact of various aid treatments on student enrollment and persistence, however there are challenges using predictive models for financial aid optimization, including that such models often rely on constrained variables such as standardized test scores such as SAT and ACT scores, as well as high school GPA. Also, models are built based on prior years’ data and student behaviors and cannot account for shifting environmental conditions that

may impact future behaviors, such as sudden economic downturns, social and political unrest, pandemics, and natural disasters, as well as unforeseen changes in admission and aid policy implemented by competitor institutions, and the proliferation of test-optional admissions policies.

Enrollment managers are tasked with efficiently awarding financial aid that results in the optimum price at which the student's ability to pay and willingness to pay converge. Merit aid models that do not consider financial need, or the student's ability to pay, focus primarily on the student's willingness rather than ability to pay. However, while merit aid is not designed to directly address financial need, academically meritorious students may in fact have demonstrated need and therefore rely on merit aid to make college more affordable.

Research Questions

The researcher of this study seeks to answer the following research questions:

1) What impact does merit aid have on initial enrollment? How effective is merit aid in raising the overall academic quality of the incoming class? How does it impact yield by various student characteristics?

2) What impact does merit aid have on student persistence? Do students remain enrolled even if they do not retain merit aid? Does persistence vary by demographic characteristics?

These questions will be addressed in the context of a large, public research university located in the Southeastern United States.

What impact does merit aid have on initial enrollment? As explained in the literature review, the primary reason to award merit scholarships is to entice applicants to enroll at the institution because they are: 1) high ability or otherwise meritorious students who have offers from multiple institutions, some of which may be more prestigious; 2) offered higher scholarships from less prestigious institutions; and 3) drawn to another institution for other reasons, such as value perception, legacy or proximity. Therefore, for the merit scholarship program to be considered successful, students offered merit scholarships should attend at higher rates than students who were not offered a scholarship. In addition, merit scholarships are intended to improve the academic quality as well as shape the overall bio-demographic characteristics of the freshman class.

a. Does merit aid increase overall yield for those who receive it?

b. How effective is merit aid in raising the overall academic quality of the incoming class?

c. How does merit aid impact yield by various student characteristics?

What impact does merit aid have on student persistence? It is well documented that need-based financial aid impacts student persistence (St. John, Paulsen, & Starkey, 1996; Cabrera, Nora, & Castañeda, 1992; Astin, 1975). While merit aid is not typically awarded based on a student's financial need, merit aid award recipients often have unmet need toward which merit aid awards apply, making college more affordable. Additionally, merit awards often come with more stringent retention requirements, such as minimum annual earned hours and GPA requirements, which may be motivating factors for student academic performance.

d. What impact does merit aid have on student persistence?

e. Does losing a merit scholarship affect persistence?

f. Does the impact of merit aid on persistence vary by student characteristics?

Significance of the Study

The significance of the study is to examine the effectiveness of and provide insight into merit aid on initial enrollment as well as student persistence. Understanding the impact of merit aid on enrollment and persistence by various student characteristics, including race, sex, and academic ability, is critical to designing a successful enrollment management strategy for postsecondary institutions. This study informs merit aid practice and aid policies, including the use of demographic variables, high school grades, class rank, test scores, and other measures if test scores are not available. This study adds to the body of knowledge on the effective use of merit aid to effect desired enrollment management outcomes and offers policy and practice implications around this sometimes-controversial approach.

Postsecondary institutions often utilize predictive models for the purpose of financial aid award optimization, which should result in awarding the ideal amount of aid to increase the likelihood of enrollment without over-awarding students or exceeding aid budgets. Optimizing the effectiveness of aid dollars is necessary to ensure meeting enrollment goals as well as maintaining institutional fiscal health and viability. However, these models typically consider total gift aid awards and the resulting net cost of attendance for students, regardless of whether the aid was awarded primarily based on the

students' demonstrated need or based on academic merit. This study focuses on the impact of gift aid based on merit rather than need-based aid. Gift aid based on merit usually includes expectations for above average academic performance, such as maintaining a 3.0 GPA, and continued full time enrollment as continuing eligibility requirements, where need-based gift aid such as Pell grants usually requires a lower expectation of "satisfactory academic performance" as defined in federal student aid policy.

There is a great deal of national research on the impact of need-based aid on enrollment and persistence, but less on the impact of merit aid. Unlike need determination, merit aid strategies are not standardized according to a federal methodology. Approaches to awarding merit aid are closely guarded by institutions to maintain a competitive advantage, and therefore data is less available for effective study. In addition, financial aid leveraging strategies and predictive models are typically designed to identify aid awards that maximize the likelihood of initial enrollment rather than persistence.

This study examines the effect of an initial merit aid award on freshman enrollment as well as the effect on first year persistence at a large public flagship university in the Southeastern United States. Data was gathered from the institution's Admissions, Financial Aid, and Enrollment Management Analytics data sets for new freshmen entering the institution in Fall 2018 and Fall 2019 who received or were eligible to receive a merit scholarship award. The study compares initial enrollment and persistence outcomes for the two cohorts, the first of which met eligibility requirements but did not receive a $500 merit scholarship, referred to as the "Garnet LIFE" award, and

the second cohort which met eligibility requirements and did receive the Garnet LIFE award.

Research Design

This study was conducted at the University of South Carolina – Columbia, a large public research university. The study was limited to a single institution's student data because institutional merit aid practices are often carefully guarded, and practices vary widely from institution to institution. The researcher had access to the institution's student data and was able to take advantage of a natural, quasi-experimental design for two cohorts of similar new freshmen students, one of which received institutional scholarships and one that did not. Data sets on resident freshmen for the Fall 2018 and Fall 2019 entering cohorts were compiled from existing databases maintained by the Office of Undergraduate Admissions, the Office of Student Financial Aid and Scholarships, and the Office of Enrollment Analytics.

For research question 1, the researcher constructed binary logistic regression models as well as data visualizations and utilized chi-square test and t-test analyses to examine the effectiveness of merit aid award amount on the probability of student enrollment and the resulting impact on the characteristics of the freshman class at the University of South Carolina, a large public university in the Southeastern United States.

For research question 2, the researcher constructed data visualizations and utilized chi-square test and t-test analyses to determine the relationship between retention rates of merit aid versus non-merit aid recipients, as well as to compare student retention for who

lose their merit scholarship with those who do not lose their scholarship. The researcher constructed binary logistic regression models to predict the probability of first to second year retention and utilized descriptive statistics to gain a better understanding of the impact of merit aid on first to second year retention by various student characteristics.

The researcher chose binary logistic regression analysis as the primary statistical method for this study because the outcomes for this study are categorical variables with yes or no response. Binary logistical regression analysis allows the researcher to assess how well the available independent variables predict the categorical outcome variables of enrolled/not enrolled for the first research question, and the retained/not retained categorical outcome variable for the second research question. Logistic regression also helps determine the "goodness-of-fit" of the models constructed. Regular linear regression is not appropriate for binary outcome responses (Fritz & Berger, 2015). This analysis provides insights into the utility and effectiveness of the merit aid program and whether it provided a good return on institutional investment. The study is limited to resident students with initial enrollment of Fall 2019, compared to the prior Fall 2018 entering freshman cohort.

Predictor variables were selected from available institutional data based on a review of the literature as well as the researcher's professional expertise. Many examples in the literature address the process by which colleges and universities select students, however there is comparatively less research on how students choose which college to attend (Nurnberg, Schapiro, & Zimmerman, 2010). For student persistence and retention, high school academic credentials, primarily standardized college entrance test scores (SAT and ACT) combined with high school grade point average are the most significant

predictors (Astin & Oseguera, 2012; Bradburn, 2002), along with state of residence, intended college major, race, gender, and family financial capacity to afford college as measured by the expected family contribution (EFC) determined in the financial aid application process.

Terms and Definitions

For the purpose of this study, the following terms and definitions used are as follows:

- *Demonstrated Need* exists when a student's Expected Family Contribution (EFC) is less than the institution's Total Cost of Attendance budget (TCA).
- *Enrollment Management* is the structure and data-driven practice of using recruiting, retention, and financial aid strategies to meet overall institutional enrollment goals and shape the characteristics of the student body.
- *FAFSA* is the Free Application for Federal Student Aid, the application students submit to the Department of Education in order to qualify for federal financial aid. Students indicate on the FAFSA which colleges and universities should receive their applications, and institutions use the data on the FAFSA to make financial aid awards.
- *Financial Aid Leveraging* and *Financial Aid Optimization* are used interchangeably and are defined as the practice of using statistical analysis to identify the optimal aid award amount on a per student basis in order to entice students to enroll, thereby optimizing the effectiveness of the overall institutional financial aid budget.

- *First Generation Students* are students whose parents do not have a college degree and are usually the first in their families to attend college.
- *Grants* and *Gift Aid* are financial aid in the form of a gift that does not have to be repaid. Grants can be merit-based or need-based financial aid and may include ongoing eligibility or progression requirements. In this study these terms are used interchangeably.
- *IPEDS* is the Integrated Postsecondary Education Data System that contains data used to analyze and report on the condition of American higher education. Institutions provide enrollment data to IPEDS on an annual basis. IPEDS is maintained by the maintained by the Department of Education's National Center for Educational Statistics.
- *Loans* are financial aid programs that are expected to be repaid, typically when the student is no longer enrolled. Loans can be underwritten and subsidized or unsubsidized by the federal government, or they can be issued by private lending institutions.
- *Scholarships* are a form of gift financial aid awarded based on academic merit rather than ability to pay. Scholarships usually include academic performance expectations for continued eligibility.
- *Garnet LIFE Scholarship* is the $500/year institutional merit scholarship awarded to entering freshmen in Fall 2019 who met the requirements for the state lottery-funded LIFE scholarship, but who did not receive any other institutional merit aid.
- *LIFE Scholarships* are state lottery-funded merit scholarships that are awarded to incoming full-time freshmen who are residents of the State of South Carolina.

Students who meet two of three initial eligibility requirements of graduating in the top thirty percent of their high school class, obtaining a minimum SAT score of 1100 or ACT score of 24, and graduating with a minimum 3.0 high school GPA may receive a LIFE scholarship of $2500 per semester for a total of eight semesters as long as they maintain full-time enrollment and a minimum 3.0 collegiate GPA.

- *Merit Aid* is financial aid in the form of scholarships, grants, or discounts and awarded based on desirable student characteristics and academic achievement, including high school grades and test scores, rather than ability to pay.
- *Need-based Aid* is financial aid in the form of scholarships, grants, loans, or discounts awarded on demonstrated financial need and ability to pay. Eligibility for need-based aid is based on comparing the institution's Total Cost of Attendance with the student's Expected Family Contribution (EFC), which is determined by completing the Free Application for Federal Student Aid (FAFSA).
- *Net Tuition Revenue* is the amount of tuition and fees the institution receives minus institutional grants and discounts.
- *Cost of Attendance* is the estimated total cost for a student to attend college on an annual basis. Cost of attendance budgets include estimates for tuition, required fees, room and board, books and supplies, travel, and miscellaneous expenses associated with pursuing a college degree. Cost of attendance budgets may vary depending on residency, level, program of study, and whether students live on or off campus.

- *Tuition Discounting* is defined by the Association of Governing Boards as the process by which institutions offset their published tuition price, or "sticker price" with institutional grants to incentivize students to enroll.
- *Retention* and *Persistence* are used interchangeably and are defined as students maintaining enrollment at the institution from the initial term of acceptance to the next academic year, graduation, or dropping out of the institution.
- *Retention Rate* is defined as the percentage of first-time, full-time students that initially enrolled at the institution in the fall semester following high school graduation who continue to be enrolled at the institution in the fall of their second year.
- *Graduation Rate* is defined as the percentage of first-time, full-time students that earn a bachelor's degree from the institution in six years or less.
- *Resident Students* are those students who are classified as in-state students, who are legal residents of the State of South Carolina for the purpose of charging in-state tuition rates.
- *Yield* is defined as the rate at which students admitted for a given term of entry enroll at the institution for that term.

Delimitations

Merit aid practice is often closely guarded by institutions who, in order to maintain a competitive advantage, are reluctant to share details of their strategy and associated student data, which makes it difficult to compare merit aid programs across

multiple institutions. This study is limited in scope in that it uses data on undergraduate students from a single institution, the University of South Carolina, Columbia, a large public research university located in the Southeastern United States. This limitation reduces the ability to apply findings to other institutional types with different student characteristics, institutional mission and scope, higher education sector, funding levels, and financial aid strategies. The utility of this study is to better understand aid effectiveness at a single institution.

A second limitation is that the study focuses on a single cohort of resident students that initially enrolled in Fall 2019. This was the first year the institution enacted an aid strategy of making merit aid awards for nearly every entering resident freshman student. This is the only cohort available for studying the impact of initial enrollment as well as second-year persistence because of this aid award. Future study would benefit from analyzing several cohorts over time.

A third limitation is that the study is likely impacted by the COVID-19 virus pandemic that led the institution to move to discontinue in-person classes and campus activities and move to virtual on-line learning for the second half of the Spring 2020 semester. In addition, the university modified several academic policies and practices during the Spring 2020 semester, including implementing a temporary pass/fail grading option and temporarily suspending the academic standing policy that normally places students on academic probation or suspension for poor academic performance. This limitation does not impact initial enrollment for the cohort in question, but it may impact student persistence, specifically the first to second year retention rate for the fall 2019 cohort.

Summary

State support for public higher education has fallen over time, putting pressure on institutional budgets and driving up the cost of education for students. Colleges and universities are under increasing pressure to maximize net tuition revenue for budget purposes. At the same time, the public is demanding greater accountability of higher education on several enrollment measures, including overall enrollment, persistence, and student success. Universities are using sophisticated merit aid leveraging and awarding strategies in order to increase enrollment at the lowest possible institutional cost. It is important for higher education institutions to periodically evaluate the effectiveness of these strategies, both on initial enrollment and persistence. For this purpose, this study sought to evaluate the effectiveness of merit aid programs and to develop a prediction model for new student enrollment and persistence.

CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

More students are enrolled in postsecondary education than at any prior point in our nation's history, and college enrollment is projected to increase 14% from 2013 to 2024, building on the 37% enrollment increase since 1999 (Hussar & Bailey, 2016). US Census Bureau data from 2009 indicate total postsecondary enrollment grew from 12 million enrolled students in 1980 to over 20.4 million in 2009. However, retention and graduation rates have not improved. From 1989 to 2010, the percentage of four-year college students who earn a degree within five years has declined from 55.1% to 52.3%, and the percentage of first-year students at four-year colleges who return for the sophomore year declined from 74.7% to 72.9% (ACT, 2012).

While college enrollments have grown, so has participation in the Pell Grant Program, the primary federal need-based grant financial aid program for low-income students. The number of Pell Grant recipients has grown 400 percent since 1977. This growth can be attributed to a near doubling of families living in poverty, and therefore students qualifying for the program, and changing attitudes and expectations about high school graduation and college attendance (Robinson & Cheston, 2012). However, Pell Grants have not kept pace with the rising cost of higher education, and for students in the

bottom income quartile, less than 20 percent complete a college degree by age twenty-four (Mortensen, 2011).

University administrators, particularly enrollment managers, are focusing their efforts on improving student retention and graduation rates in response to national policymakers' growing concerns about whether funding for the sake of access alone is sustainable, and whether the outcomes justify the public investment. Pressure from the Obama administration's completion agenda and the Lumina Foundation's Goal 2025 to expand access to higher education and to increase the percentage of Americans with college degrees have helped change the conversation from access to persistence and graduation rates. While the benefits of higher education are still viewed as both individual and societal, there has been a shift in public opinion towards the perspective that it is the individual that enjoys the greater benefit, and therefore should bear the primary burden of paying for college (National Association of Student Financial Aid Administrators, 2011).

Since 1980, college attendance costs have risen much faster than inflation and family incomes. This is largely due to cutbacks in state support for public higher education (Mortensen, 2011). This public de-funding of higher education negatively impacts low income and first-generation students, whose families have the lowest ability to pay for college, making financial aid for individuals more important than ever. In a study of first-generation college students, Ishitani (2006) found that first-generation students have a higher risk of not completing their degrees and are less likely to complete their degrees in a timely manner. However, students who received grants or work-study were less likely to drop out after the first year than students who received no aid.

Institutions of higher education are under pressure to improve access, affordability, and degree attainment in an environment of increased cost of education and limited resources for need-based aid. Therefore, colleges and universities cannot rely solely on federal financial aid programs such as Pell Grants, and many have employed enrollment management strategies, including using predictive models to optimize the effectiveness of their institutional financial aid dollars, to address the issues of access and affordability, and to shape their enrollment to meet institutional goals and objectives.

A review of the literature has identified several studies on federal and state-funded financial aid, such as the Pell Grant program and the many lottery-funded statewide merit aid programs. However, there are comparatively very few studies of institutional merit-aid programs. This is largely due to the proprietary and highly competitive nature of institutional scholarship programs and the lack of willingness to share enrollment strategies that give an institution a competitive advantage over peer institutions. The history and impact of the Pell grants, while federally funded and based on need rather than merit, are another form of gift aid and as such provide a backdrop and useful insights into the proliferation and utility of institutional merit scholarships.

This review of literature is organized in four sections: 1) background and history of the Pell Grant program - the primary form of need-based federal gift aid, 2) history, types, and objectives of merit aid programs, 3) factors influencing a student's college choice, and 4) effectiveness of institutional merit aid programs on enrollment and retention.

Background and History on Federal Pell Grant Program

Access to public education has always been a national concern and widely supported as a matter of public policy for the benefit of American society. From the very beginnings of American history, when the Continental Congress stated in the Northwest Ordinance of 1787 that "knowledge being necessary to good government and happiness of mankind, schools and the means of education shall forever be encouraged", the pursuit of higher education has been encouraged. Throughout its history, the United States has viewed access to higher education as a matter of national security and economic driver (NASFAA, 2011).

Federal support for higher education increased substantially with the Morrill Act of 1862, which established land grants for the founding and support of public colleges offering education in agriculture and the mechanical arts, and again with the National Defense Education Act (NDEA) of 1958, in which Congress declared "the security of the Nation requires the fullest development of the mental and technical skills of its young men and women". The NDEA was primarily a national defense response to Soviet brinksmanship in the Cold War (NASFAA, 2011). Finally, the Higher Education Act of 1965 launched the Basic Education Opportunity Grant Program that would eventually evolve into the Pell Grant Program with the reauthorization Act of 1972.

The Pell Grant Program has contributed to making higher education accessible to segments of the American public who could not otherwise afford to go to college and has expanded and contracted over time as the political climate and national fiscal health has shifted. The government experimented with a blend of merit (based on academic performance) and need (based on family income) as well as targeted programs of study

with the now defunct Academic Competitiveness and SMART Grant Programs (NASFAA, 2011). In an attempt to help reduce time to degree and accommodate changing enrollment patterns, the ill-conceived and expensive year-round Pell Grant plan was short lived. Libby Nelson pointed out in a 2012 Inside Higher Ed article that the Pell Grant has repeatedly been under pressure in tight budgets, and the White House and members of Congress have preferred changes to eligibility requirements and other restrictions as a way to cut costs rather than reductions in the amount of Pell Grant awards. Nelson goes on to point out that the changes that limit eligibility to twelve semesters, regardless of hours attempted or size of the grant received, negatively impacts part time and transfer students. These students are more likely to exhaust their eligibility before completing their degrees (Nelson, 2012).

Even with changes in eligibility and largely flat awards in real dollars adjusted for inflation over the program's four decades of existence, the Pell Grant Program is one of the fastest growing federal aid programs. The number of students participating in the Pell Grant program more than doubled from 2000 to 2010 and by 2011 58 percent of all undergraduates received Pell Grants. Perhaps more significantly, the cost of the program roughly doubled from 2008 to 2010 and stood at $42 billion for 2012. Pell Grants are the largest expenditure of the Department of Education (Robinson & Cheston, 2012).

Even so, the relative value of the Maximum Pell Grant, currently at $6895 for 2022-23, has declined since 1970-1980, making it more difficult for low income students to afford college (Mortensen, 2011). Between 2008-09 and 2018-19 the published tuition and fees at four-year public universities increased by 3.1 percent per year while the maximum Pell Grant increased by 1.2 percent per year, adjusted for inflation, and from

1998-99 to 2018-19 the purchasing power of a maximum Pell Grant decreased from covering an average of 92 percent of published in-state tuition and fees at four-year public universities to covering only 62 percent (Baum et al, 2019).

While access to a college education has been the dominant theme and purpose for the Pell Grant program, persistence and degree attainment have not been neglected in Pell Grant regulations (NASFAA, 2011). There are limits on the duration of Pell Grant eligibility, and students must make satisfactory academic progress to remain eligible. In this way, Pell Grants are similar to state and institutional merit scholarships, which typically have time limits, continuous enrollment requirements, and minimum performance criteria, such as minimum earned hours and GPA. These measures are intended to encourage students to stay on track to timely degree completion. However, it does not appear that these expectations are effective enough to protect the Pell Grant program from scrutiny. The Spellings Commission on the Future of Education questioned the value of an access-based posture by pointing out that "only 36 percent of college-qualified low-income students complete bachelor's degrees within eight and a half years, compared with 81 percent of high-income students" (NASFAA, 2011, p. 9). Robinson and Cheston also question whether taxpayers are receiving an appropriate return on this public investment, stating that Pell grants have been somewhat effective in getting low-income students into college, but are not effective in helping them to graduate. They go on to suggest funding should be based on college completion rates, but the Department of Education does not track graduation rates of Pell Grant recipients (Robinson and Cheston, 2012**).** Income levels of bachelor's degree recipients are tracked, and the share of degrees awarded to students in the bottom quartile of family income has declined from

over 10% in 1970 to 7.3% in 2008; students from the top quartile of family income is about ten times more likely to earn a bachelor's degree by age 24 than students in the bottom quartile of family income (Mortensen, 2011).

Other financial aid programs are also subject to scrutiny and criticism. More than 44 million Americans are burdened by outstanding student loans totaling over $1.5 trillion as of 2018, leading many to suggest there is a student loan debt crisis and the next financial bubble debt in danger of bursting (Farrington, 2018). With a per capita balance of $4,920, student loan debt is second only to mortgage debt and exceeds other forms of consumer debt, including automobile loans and credit card debt, according to the Federal Reserve Bank of New York's Center for Microeconomic Data. Borrowing has become the predominant method for students to pay for their college education, and sixty-five percent of students who left college in 2016 did so with some amount of student debt and averaged $37,172 in outstanding debt, the highest average debt in history (The Institute for College Access & Success, 2019).

Income disparities are growing and NAFSAA intimates that financial support for low-income students is not adequate. The Advisory Committee on Student Financial Assistance (ACSFA) reported that low-and moderate-income students have significantly lower rates of enrollment and completion than their equally academically prepared middle and high-income peers. As the net price of four-year colleges increases as a percentage of family income, low-income students are less likely to enroll in four-year institutions. This has consequences because where students begin college impacts their likelihood of success (NASFAA, 2011).

Some researchers have suggested the process for applying for federal financial aid is overly burdensome, especially for low-income students who most need aid to afford college. The FAFSA (free application for federal student aid) is five pages long and contains 127 questions, making it longer and more cumbersome to complete (estimated at a minimum of ten hours) than federal income tax forms 1040, 1040A, and 1040EZ (Dynarski & Scott-Clayton, 2008). Further complicating the process, the US Department of Education requires colleges and universities to audit at least 30 percent of all financial aid applications each year through the verification process at an estimated cost of over two billion dollars each year in staff time and salaries (Dynarski & Scott-Clayton, 2008).

Similarly, Dynarksi (2000) points out the discrepancy between the Department of Education FAFSA verification requirement of 30% compared to the Internal Revenue Service audit rate of only 1.5% of personal income tax returns, and the time cost FAFSA audits add to the financial aid application process. While the Department of Education does not release its criteria for inclusion in verification, financial aid professionals have observed that low-income students are more likely to be selected for verification and are less likely to complete the process, (Income Verification for Federal Aid Hinders Low-Income Students, 2018).

Despite the obstacles of burdensome application procedures and compliance hurdles, Pell Grants provide greater access to higher education for low-income students, and are also positively impacting persistence and graduation, and their importance should not be overlooked. This is supported in a July 2009 report issued by the US Department of Education, *A Profile of Successful Pell Grant Recipients*, which shows Pell Grant recipients had an overall longer time to degree than students who did not receive Pell.

However, when controlled for several related variables (parents not attending college, working full time, taking classes part time, and having dependent children), Pell recipients actually had a shorter time to degree (Wei & Horn, 2009). Factors such as parent education, type of institution attended, and risk factors including having dependents, working full time, and being financially independent were present in greater degree for Pell recipients, impacting their progress toward degree. When these are considered, the study suggests that Pell can positively impact time to degree. One limitation of the Wei & Horn study is that it only considered successful Pell recipients and did not consider those who failed to earn a degree. It is evident in this study that Pell recipients have more challenges, risk factors, and barriers to degree attainment.

The Pell Grant program is not without its detractors and has been criticized as costly to taxpayers, inefficient and a contributor to rising college costs. In 1987, Secretary of Education William Bennett formulated the "Bennett Hypothesis" which claims that federal aid programs lead to higher tuition costs by encouraging colleges and universities to raise prices in order to capture a greater percentage of federal grant aid dollars (Robinson & Cheston, 2012). However, this assertion that more generous federal aid results in higher tuition prices has only been proven to be the case at for-profit institutions (Celini & Golden, 2014), while public colleges and universities have been shown to return most of the federal aid increases back to students in the form of lower net price (Turner, 2017).

Students who are first-generation (first in the immediate family to attend college), and often from low income families as well, have a high risk for dropping out of college (Choy, 2001), and the Spellings Commission concluded that access to a college degree

"is unduly limited by the complex interplay of inadequate preparation, lack of information about college opportunities, and persistent financial barriers" and "unmet financial need is a growing problem for students from low income families, who need aid the most" (NASFAA, 2011).

The Pell Grant program has been successful in making college accessible and more affordable for many low-income students, however the percentage of total grant aid made up of federal Pell Grants has been declining since 2010-2011 and as of 2018 Pell Grants account for only thirty percent of total grant aid awarded to students. (Baum, Ma, Pender & Libassi, 2019). Institutional grants, often in the form of merit aid, now make up the largest percentage of grant funding, surpassing Pell as the primary form of gift aid, and are an important part of institutional aid strategy for access, affordability, and persistence.

History, Types, and Objectives of Merit Aid Programs

Scholarship awards to "needy and deserving" students have been a component of American higher education since its earliest days as a mechanism to recognize and reward highly meritorious students and thereby encourage them to further their education, especially so that the talents of the less advantaged do not go to waste (McPherson & Schapiro, 1998). John Brademas (1983) noted that the first known example of an institutional scholarship fund dates back to a 1643 gift of £100 to Harvard College to support the education of a needy student (Fenskie & Huff, 1983). Student aid programs expanded after the Civil War, with state legislatures creating more scholarship opportunities at state universities and land-grant colleges, but the key criterion remained

neediness rather than academic merit (McPherson & Schapiro, 1998). The process of awarding institutional aid has evolved over time, from students making formal applications which were periodically reviewed and awarded by faculty committees to the more common contemporary approach of institutions proactively offering merit scholarship awards to institutionally desirable students based on pre-established criteria.

Merit scholarships programs, or grants awarded based on academic merit, are primarily funded at the state level, institutional level, or by private entities such as non-profit charitable foundations, civic organizations, and employers. For example, the National Merit Scholarship program, a private scholarship program established in 1955, has awarded scholarships to entering college freshmen who have scored exceptionally on the PSAT/NMSQT standardized test administered by the College Board, and private colleges and universities have long utilized institutional merit scholarships to entice academically talented students (Dynarski, 2004).

States have had historically had some form of merit aid, but these programs were typically small and only available to the most elite students, such as New York's Regent's Exam scholarship (Dynarski, 2004). In an effort to increase the number of state residents who hold bachelor's degrees, to attract business and industry, and to encourage a net in migration of high-skilled workers, many states have implemented statewide scholarship programs over the last two decades (Groen, 2011). Additional objectives of state-funded merit aid programs include promoting college access and attainment, reducing "brain drain" by encouraging students to attend college in their home states (Heller, 2006), and to improve effort and academic performance in high school and reward students who work hard (Dynarski, 2004; Heller 2006).

These programs are often funded by lottery proceeds and are awarded to state residents who meet broader and more modest academic eligibility requirements. For example, the State of South Carolina LIFE scholarship program is funded by the South Carolina Education Lottery, and students may qualify by meeting two of three criteria: a high school GPA of at least 3.0, an SAT of 1100, or be ranked in the top thirty percent of their high school class. Since 1993, Georgia's HOPE scholarship provides a full tuition scholarship to state residents who graduate from a Georgia high school with a 3.0 GPA and, in Arkansas, the GPA requirement is 2.5, which is achieved by sixty percent of the state's high school graduates (Dynarski, 2004). Programs often also have continuing eligibility requirements once students are enrolled at the collegiate level, such as maintaining a 3.0 collegiate GPA, enrolling full time, and completing a minimum number of credit hours each year (CHE, 2015).

State grant programs, such as South Carolina's LIFE and Georgia's HOPE programs, have had mixed results. A study of the HOPE scholarship program found that recipients were more likely to accumulate more college credits, maintain higher grade point averages, and graduate within four years than students who did not receive the scholarship. The study also found that most HOPE recipients lost their scholarships, and meaningful differences in persistence and degree attainment existed only for students who retained their awards (Henry, Rubenstein & Bugler, 2004). Broad-based state-funded merit aid programs differ from programs like National Merit in both availability to a larger number of students and the effect on student's decisions. The old form of merit aid was aimed at top students whose decision on whether or not to attend college was not

contingent on a scholarship. Rather, their decision on which elite four-year college or university to choose might be impacted by merit aid (Dynarski, 2004).

Newer state merit aid programs, available to students with solid but not necessarily exceptional credentials, may encourage students to attend a four-year school rather than a two-year school, or encourage those who are unsure about attending college at all to give it a try. Dynarski (2004) found that Georgia's HOPE scholarship program substantially increases the probability of attendance at four-year public institutions, as well as attendance at two and four-year private institutions, although less substantially. Dynarski also found more modest increases in attendance at two-year schools and concluded that the HOPE program has been successful in both pulling students who may not have attended college at all into two-year institutions while pushing more students out of two-year schools into four-year institutions. Finally, Dynarski also found that the HOPE scholarship program has been successful in encouraging Georgia residents to attend one of the state's public four-year colleges, reducing the out migration of students to border states.

One goal of merit aid is to encourage individuals to work harder in high school and in college in order to qualify for and retain scholarships (Heller, 2006). However, other unintended reasons may impact student performance increases, such as pressure on teachers and professors to give higher grades so that students may qualify for merit aid, resulting in grade inflation (Dynarski, 2004). Henry and Rubenstein (2002) found the average GPA of entering freshmen in Georgia public colleges and universities rose after the inception of the HOPE scholarship, and Binder and Ganderton (2002) found a similar

increase in New Mexico due to students taking fewer courses per semester as well as less demanding courses in order to retain scholarship awards.

Other unintended consequences of state merit aid programs include decreases in institutional financial aid and increases in tuition and the total cost of attendance, which have risen more quickly than had these programs not existed (Dynarski, 2000). These outcomes support the "Bennett hypothesis", which maintains that increases in financial aid are offset by price increases, making college less affordable over time (Gillen, 2009).

Another goal of state merit aid is to increase access and affordability. However, studies suggest state merit aid programs may not achieve these goals and instead contribute to social and racial inequality (Heller, 2006). Dynarski (2004) concluded that Georgia's HOPE scholarship program increased racial and ethnic gaps in college attendance in Georgia. Through the Civil Rights Project at Harvard University, Heller and Merin (2002, 2004) found a very strong relationship between socioeconomic characteristics and the rate at which students qualify for state-based merit scholarships in Florida and Michigan. In both states, African Americans and Hispanics qualify for the scholarships at rates as much as five times lower than those of Asian and White students (Heller & Marin, 2002). Heller and Marin also found low-income students qualified for state lottery scholarships at lower rates than more affluent students. Students in the top income quintile in Florida and Michigan qualified for state merit aid at three times the rate as students in the lowest income quartile. St. John and Chung (2004) concluded the Michigan Merit Scholarship Program discriminates against low-income students, asserting the awarding methodology penalizes low-income minority students for attending weak high schools. Ehrenberg, et al (2005) found a tradeoff between increased

merit aid scholarships and low-income student enrollments: an increase in institutionally funded National Merit Scholars is associated with a reduction in the number of Pell Grant recipients.

Paradoxically, African American and low-income students are more likely to believe their eligibility for merit aid has an impact on whether or not they will attend college, therefore more liberal eligibility requirements may positively influence college participation for these students (Ness & Tucker, 2008). Heller (2003) concluded merit aid predominantly benefits students who historically had the highest college participation rates, especially white and upper-income students, and that state merit aid programs exacerbate rather than help eliminate participation gaps.

A similar study of New Mexico's state merit program found little evidence the program improved access to higher education and that beneficiaries tended to be white students and students from higher-income families (Binder & Ganderton, 2002). A study of Georgia's HOPE scholarship found that only ten percent of the state's expenditures on the HOPE program resulted in increased college access and, while there was some improvement in college-going rates for African American and low-income students, participation rates at the state's highly selective institutions did not increase (Cornwell & Mustard, 2002). Ness (2010) points out the opacity in the political process which determines eligibility criteria for state aid and the political expediency of using the promise of merit aid to manipulate public opinion as a means to advance pet projects through the legislative process, despite the resulting negative social consequences of these state aid programs (Ness, 2008; Hillman & Hossler, 2008). Dynarski (2000) notes that state merit aid programs are preferred by voters over other kinds of state subsidies

that fund higher education since students "earn" these awards by their own merit, even though these programs compete with state need-based programs. These studies all focus on state-funded merit aid programs rather than institutionally funded programs, yet the implications for institutional policymakers are clear as they design institutional merit aid programs.

Institutionally funded grant awards have been increasing for decades as institutions have come to rely on this form of merit aid to effect enrollment outcomes. Institutional grants now account for nearly half of all grant aid awarded as of 2018-2019. Expenditures on institutional grants rose by $12.5 billion between 2013-2014 and 2018-19, while federal grants declined by $6.3 billion. State grants, private grants, and employer grants have remained flat since 2011 and now make up twenty-two percent of all grant awards (Baum, et al, 2019). Funding for institutional grants can come from a variety of sources, including gift and endowment income, auxiliary revenues, and recurring baseline budgets funded by tuition or state appropriation. However, as merit aid programs have grown, schools have increasingly used tuition discounts to fund merit scholarships, and this practice of discounting has the potential to impact institutional financial stability if not carefully managed (Goral, 2003). The practice of using tuition discounts as a way to fund merit scholarships became widespread during the 1980s, when the number of high school graduates declined, creating an "arms race" in college admissions (Goral, 2003), and in the 1990s discounting rates rose sharply as colleges and universities embraced this new tool in their enrollment management practices (June, 2006).

Institutional merit aid has become an important enrollment management tool to increase yield, as competition for students has increased. Merit scholarships are also used to attract stronger students, who are generally more likely to arrive on campus academically prepared, more likely to persist, and have the added benefit of raising an institution's profile as measured by average SAT scores and high school grade point averages of the freshman class. Further, state flagship institutions within states that offer statewide aid programs often leverage the existence of these programs in their marketing efforts (Ness & Lipps, 2011). For these reasons, the strategic use of merit scholarships can be considered a "competitive weapon" (McPherson & Schapiro, 1998) in the enrollment management arsenal.

McPherson and Schapiro (1998) offer competitive forces that compel institutions to resort to institutionally funded merit aid, both of which address the institutional value proposition and the student's willingness to pay. The first is by schools that are perceived in the market as having a lower quality or reputation using merit aid to lure students away from more prestigious institutions, effectively redistributing high ability students and raising the institution's profile and prestige. The other force at work is head-to-head competition among schools of similar reputation and prestige for students applying to each institution. This force has the effect of lowering the net price paid by academically high-ability students.

The nation's most highly selective private institutions rely less on merit aid and are more committed to need-based aid programs, allocating roughly 90% of institutional grants to meet need (Baum & Pavea, 2011). Less selective institutions, however, devote a

higher percentage of institutional grants to merit aid; more than 50% of all institutional grants at nonselective public 4-year institutions are merit-based.

Institutional merit aid programs may have societal impacts and institutional tradeoffs worth nothing. McPherson and Schapiro (1998) note that merit award winners tend to come from affluent families who benefit from a reduced price, but at the cost of redistribution of institutional resources away from need-based aid, which does not serve an equity purpose. They also note that the prospect of merit aid may encourage students to improve high school performance and engage in academic and extracurricular pursuits that college admissions committees value in the admission process. Critics of merit aid point out that it favors wealthy students and growth in merit scholarship programs have outpaced growth in need-based aid programs (Redd 2000). Finally, some doubt the effectiveness of tuition discounts in the form of merit aid are effective in meeting enrollment management goals (Kurz & Scannell, 2005).

Factors Influencing College Choice

Several theoretical and conceptual models have been developed across a variety of disciplines to explain and understand student college choice; however these models often fail to provide sufficient practical and applicable insights for effective institutional decision-making (Park & Hossler, 2014), especially regarding merit aid policy. Park and Hossler identify three theoretical models that are most widely used and, in combination, form the foundation for understanding student college choice and in designing institutional strategies and practices: the Economic Approach, Sociological Approach, and Information Processing Approach.

The economic approach to explaining college choice focuses primarily on financial factors, including financial aid and cost of attendance. The sociological approach emphasizes the influences of social and cultural capital and how one's social status factors into one's educational aspirations and college choice. The information processing approach focuses on the differential access to college information and how students gather, process, and make decisions. Park and Hossler (2014) offer evidence of overlap among these models and suggest many students utilize a muti-stage, combined approach.

Several combined models have been developed (Jackson, 1982; Litten, 1984; Chapman, 1984; Hossler & Gallager, 1987) which include various stages that describe early college aspiration and preference formation as students explore college options, information gathering, evaluation, and refining options to a narrow list of potential schools, and then the final decision to enroll. Hossler and Gallager's three-phase model of *predisposition* (based on aspiration as well as socioeconomic factors), *search* (the process of gathering and considering relevant information) and *choice* (submitting applications for admission and making the decision on where to enroll) is the simplest and most widely adopted model as the foundation for college choice (Park & Hossler, 2014).

Key predictors of college choice include personal characteristics such as gender; race; academic ability and preparation; social and cultural capital; high school attended; distance from home; availability of information sources; peer effects; cost of attendance and financial aid; and family income and socioeconomic status (Park & Hossler, 2014). Cost of attendance, amount of financial aid, and the resulting net price are the strongest

factors (Park & Hossler, 2014), with the amount and type of financial aid playing a significant role (Alon, 2005; Avery & Hoxby, 2003). Avery and Hoxby (2003) found that institutional quality, prestige, and selectivity are also considerable factors, and also found that while high ability students are concerned about cost and are attracted by merit aid, they prefer to attend the most prestigious school to which they are admitted, therefore gift aid becomes less important in their final decision.

Literature addressing the impact of institutional grant aid, particularly in the form of merit scholarships, is limited. Since institutional merit scholarships are institutionally specific, meaning the student can only utilize the scholarship at the institution offering the award, studies across institutions are difficult to conduct. But there is a small body of literature on the impact of institutional grant aid and the probability of attending the institution offering the aid (Monks, 2009; Linsenmeier et al, 2006; van der Klaauw, 2002). The researchers in each of these studies only had access to admissions and financial aid data for a single institution, therefore the applicability of their findings to other institutions is questionable. Avery and Hoxby (2003) found little evidence of research supporting the overall effectiveness of merit aid and posit the inherit difficulty in conducting useful analysis is due to data limitations and the impracticality of gathering sufficient student survey data across multiple institutions, but they did find that grants being called scholarships are attractive to students in every socio-economic group except students in high-income families. Monks (2009) found merit aid has a positive impact on initial enrollment even if the net price is not affected by creating a “price illusion”. Students receiving a scholarship view it as a benefit independent from actual price and enroll at higher rates even if the net price is the same as those without a scholarship.

Singel and Stone (2002) found that merit aid has a larger effect on enrollment than need-based aid, especially for more affluent students.

One challenge in attempting to determine if merit aid influences a student's college choice is differentiating the impact among students who are likely to enroll compared to those who unlikely to enroll regardless of any aid award, and those who are truly undecided. A study by Birch and Rosenman (2018) found that approximately 27% of the students in their study would have enrolled anyway, regardless of a scholarship, but that merit aid awards positively influenced approximately 20% of undecided students. Similarly, Dynarski (2003) found some evidence that the impact of institutional grants and scholarships when choosing between colleges is similar to the effect of grants and scholarships on the decision to attend college at all.

The Effectiveness of Merit Aid on Enrollment and Persistence

It is well documented that affordability is a major contributing factor to student enrollment and persistence, and merit aid has become an important tool for attracting high ability students (Doyle, 2010). A review of the literature on merit aid identified studies that examine various impacts of merit aid, such as the positive impact of state-funded merit aid programs on enrollment (Cornwell, et al, 2006; St. John & Musoba, 2010; Heller, 2003), the impact on the racial composition of a student body (Dynarski, 2003), student retention and persistence (Singell, 2003), and degree completion (Sjoquist & Winters, 2015). Bagnoli (2016) found that merit aid can serve as a motivating factor for students who are not eligible for need-based financial aid.

However, many factors other than financial aid impact college participation and retention rates. Archibald and Feldman (2010) concluded there are several hurdles to initial college enrollment in addition to, and often before financial aid concerns (Archibald & Feldman, 2010). Students with low socio-economic status (SES) are often at a disadvantage in completing a college preparatory curriculum, researching colleges, making college visits, taking standardized tests like the SAT or ACT, and completing college applications. Low-income students can get derailed at any of these steps, and financial aid, or the lack thereof, may never come into play (NASSFA, 2011). Also, inadequate preparation in high school is a contributing factor, and the Spellings Commission noted that "substandard preparation results in remediation at the college level" and that "forty percent of all college students take at least one remedial course at a cost to the taxpayers of $1 billion." (U.S. Dept. of Education, 2006, p.8).

Appropriate high school preparation is critical to college readiness, and many students graduate from high school ill prepared for college level work. ACT defines college readiness as having the knowledge and skills needed to succeed in credit-bearing first year courses at a postsecondary institution without the need for remediation (ACT, 2012b). Of the ACT tested high school graduates in 2012, only 25 percent met college readiness benchmarks in all four subject areas of reading, math, English and science, and 28 percent met no benchmarks in any areas (ACT, 2012b). Students who are not adequately prepared usually need remedial or developmental courses in college, however students who require remediation in college, especially in reading, are less likely to persist and complete a bachelor's degree (Adelman, 1999).

According to Tom Mortensen, Senior Scholar and Higher Education Policy Analyst with the Pell Institute for the Study of Opportunity in Higher Education, barriers to higher education are growing and can be measured by a) unmet need, b) student work & loan burden, c) net price to family, and d) net price to family as a share of family income. All of these have grown since 1980 and have greatly diminished college access, choice, persistence, completion, and attainment from students from low and lower-middle income families. Mortensen points out the growing income disparity in America and argues for increased Pell Grant funding as a solution to this national crisis. Federal grants for low-income college students form the foundation of moving these students from social dependency to independent, self-supporting, tax-paying, contributing members of society, democracy, and the economy. (Mortensen, 2011). Mortensen's research, however, focuses on affordability and does not address other factors that have been shown to impact retention, persistence, and degree attainment, such as high school grades, which are the single best predictor of college readiness and persistence (Adelman, 1999; Astin, 1975; Tinto, 1997). In addition, Mortensen does not address programs and services that can impact persistence and completion, including academic support and enrichment programs, advising and counseling programs, and support services offered by federal TRIO programs (Pascarella & Terenzini, 2005).

Student's chances of degree attainment are to a substantial degree a function of their own individual backgrounds and, although the predictive power of traditional admissions criteria may be subject to debate, standardized test scores and high school grades have consistently been shown to be among the strongest predictors of degree attainment among undergraduates (Astin & Osegueara, 2012). Alexander Astin (1975)

was one of the earliest scholars to study retention and he found two general groupings of student retention predictive factors: personal and experiential (Morrison and Silverman, 2012). Astin found in his 1975 longitudinal study that these personal factors were predictive of retention, in descending order of impact:

1. Past academic grades – those with stronger past academic performance were more likely to persist.
2. Educational aspiration – students aspiring to higher degrees were more likely to persist.
3. Study habits – those who turned in assignments on time and who did homework at the same time each day were more likely to persist.
4. Parent's education – those with more educated parents were more likely to persist.
5. Marital status – married males and single females were more likely to persist.

In addition to these personal factors, Astin also found experiential factors upon entering college that can enhance student retention. These factors in descending order of impact are:

1. Grades – those with better grades were more likely to persist.
2. Marital status – women who remained single were more likely to persist.
3. Children – those without children were more likely to persist.
4. Residency – those who lived on campus were more likely to persist.
5. Work – those who had part time jobs on campus were more likely to persist.

6. Extracurricular activity – those who participated in activities like sports, fraternities and sororities, ROTC, and other clubs and organizations were more likely to persist.

These experiential factors support Astin's involvement theory, which suggests the more directly involved the student is in the academic and social life of the college, the more likely the student will persist (Astin, 1985a). Astin's theory is supported by Vincent Tinto's Student Departure Theory (1975, 1987, 1993), a widely cited theory on why students leave college. His theory claims that prior educational experience, family background, academic skills, and social skills influence attrition. Tinto goes on to suggest that the level of a student's commitment was influenced by interactions with the social and academic systems of the university. His newer "interactive model of student departure" (1987 or 1993) examines additional factors affecting student attrition: finances, adjustment, isolation, learning, incongruence. In explaining his model, Tinto states:

> *Persistence requires that individuals make the transition to college and become incorporated into the ongoing social and intellectual life of the college. A sizable proportion of very early institutional departures mirror the inability of new students to make the adjustment to the new world of the college. Beyond the transition to college, persistence entails the incorporation, which is integration, of the individual as a competent member in the social and intellectual communities of the college (p. 126).*

The idea of integration into the college as a key factor in student retention is reinforced by Astin (1985b), and also Terenzini and Wright (1987), who identify the

importance of early, strong integration and "Student involvement", or the amount of physical and psychological energy that a student devotes to the academic experience. Astin (1985b) believes that the highly involved student who devotes considerable energy to studying, participates in student organizations, and interacts frequently with faculty members is more committed to the institution, and the more committed to the institution, the higher likelihood of success. This suggests that it may be in the best interests of colleges and universities to develop institutional programs and activities that help students build a strong commitment to the institution. Such programs should lead to greater student success and higher retention and graduation rates.

Existing literature also suggests that types of aid have an impact on retention and attrition rates. Student loans are negatively associated with retention (Hochstein & Butler, 1983) and grants, even if offered in partnership with a loan, are positively correlated to student retention. Academic merit-based aid has also been cited as a positive predictor of retention (Stampen & Cabrera, 1988). There are many studies that examine the effect of student aid types on college attrition and retention (Ishitani, 2006), although few studies have investigated the impact of financial aid on time to degree. Several studies have looked at credit hours and degree completion (Knight, 1994; Knight & Arnold, 2000; Noxel & Katunich, 1998). Family finances and financial aid also predict degree completion, particularly grant aid for Latino and Black students (Cabrera et al., 1992; Perna, 2006; St. John & Musoba, 2010).

Literature is limited on the effects of merit aid on college attainment, and the handful of studies that have been conducted provide mixed results (Sjoquist & Winters, 2015; St. John & Chung, 2004). Sjoquist and Winters analyzed twenty-five state merit

aid programs and found these programs had little meaningful impact on college attendance or degree completion. Their findings were not unexpected since recipients of these awards are above average students and therefore more likely to attend college and persist regardless of merit aid. This notion is supported by the fact that large percentages of recipients do not retain their awards after the initial year of enrollment, yet they remain enrolled. Sjoquist and Winters hypothesized that state aid programs are either not of sufficient value to provide a strong enough incentive to encourage enrollment, or they are not targeted at lower income students who might be more motivated by these awards to enroll and persist.

Dynarski (2003) and Monks (2009) found that state merit aid programs lead to increased enrollment, Monks found that these programs result in a shift to four-year institutions and away from two-year schools, and Bruce and Carruthers (2014) found no impact of state merit aid on enrollments in the State of Tennessee. Small scholarships, such as those examined in this study, may have some effect but going from a large scholarship to a substantially larger scholarship doesn't have a reliably positive effect on yield for graduate students (Porter, 2014). While there is little research on the impact of institutional merit aid on retention, one study found that students receiving grants as the only form of financial aid are less likely to transfer to other institutions than students receiving no aid, and are more likely to graduate (St.John & Musoba, 2010).

Summary

This chapter provided an in-depth review of literature relevant to the research questions addressed in this study. This review revealed a gap in the literature related to

institutional merit-based aid programs and the impact of these programs on initial enrollment and retention of students, which supports the pursuit of this study. There is also a lack of studies that examine the impact of merit aid on specific student groups, such as race and gender. Most financial aid studies focus on federal and state programs that are available to students at multiple institutions, and for which data is readily available, such as through IPEDS or statewide data systems. Institutional merit aid practices are often difficult to study due to the proprietary nature of these programs and the limited access to institutional data. The researcher sought to contribute to the literature by studying the impact of institutional merit aid on enrollment outcomes as defined in the research questions.

CHAPTER 3

RESEARCH METHODS

The purpose of this study is to assess institutional merit scholarship program effectiveness in achieving desired enrollment outcomes of increasing yield on accepted students, improving the academic qualifications and demographics of the freshman class, and improving student retention. Additionally, the researcher explores whether the impact of institutional merit aid varies by student characteristics. Throughout this study, the researcher sought for better understanding of the impact of merit aid, and to determine if merit aid programs provide a good return on institutional investment. As outlined in Chapter One, this study addressed the following research questions:

1) What impact does merit aid have on initial enrollment? How effective is merit aid in raising the overall academic quality of the incoming class? How does it impact yield by various student characteristics?

2) What impact does merit aid have on student persistence? Do students remain enrolled even if they do not retain merit aid? Does persistence vary by demographic characteristics?

This chapter is comprised of four sections. The first of these describes the population of students studied and the setting used for the research. The next section describes the process used to create the data file required to conduct the analysis and address the research questions. The third section describes variable selection and the

rationale for their inclusion in the study. The fourth section describes the data analysis procedures used for each research question.

Population and Setting

This study was conducted at the University of South Carolina – Columbia, a large public research university. Founded in 1801, the university is the flagship institution of the eight-campus University of South Carolina system of the State of South Carolina, located in the Southeastern United States. While the university is comprised of seven additional satellite and regional campuses, only students from the main campus in Columbia were included in this study.

The university has been designated by the Carnegie Foundation for the Advancement of Teaching and Learning as an institution of Very High Research Activity, its highest rating. The university is the largest higher education institution in the State of South Carolina, enrolling over 35,000 total students, of which more than 27,500 are undergraduates pursuing degrees in over 100 majors from one of the institution's sixteen colleges and schools (USC, 2019a). Classified by the Carnegie Foundation as a "more selective" institution, the university admitted approximately sixty-eight percent of freshman applicants for fall 2019 (USC, 2019a). The university is comprised of a traditional student body and enrolled a record number 6,279 first-time, full-time freshmen in fall 2019, of which fifty-nine percent were ranked in the top twenty-five percent of their high school graduating class (USC, 2019a). The freshman class was made up of 78.4% students classified as white, non-Hispanic, 5.8% classified as black, non-Hispanic, 5.5% were Hispanic or Latino, 4% Asian, and 4 % two or more races. Students come

from all fifty states and more than 95 countries, and more than fifty-one percent of incoming freshman are residents of the State of South Carolina (USC, 2019b). Resident tuition for Fall 2019 was $12,288 per year, less than 1% more than Fall 2018. The freshman-to-sophomore persistence rate for the fall 2019 entering class was 89.9% (USC, 2019a). The university is consistently recognized as having the best first-year student experience program by US News and World Report.

This study was limited to a single institution's student data for several reasons. Institutional merit aid practices are often carefully guarded in order to maintain a competitive advantage, therefore institutions are reluctant to share this information and related data. It is unlikely that additional institutions would have created the exact same experimental design scenarios for a similar population of students in the years being compared. Also, while many independent variables are likely to be very similar at other institutions, some variables may differ due to institutional data collection practices and student demographics. In order to create the best possible regression models and to take advantage of a quasi-experimental design, the researcher determined it best to limit the study to a single institution of which he was completely familiar with its data and aid practices.

The primary focus of the research questions is to determine the effect of merit aid on yield and retention. Yield is defined as the percentage of students admitted that enroll. Retention is defined as students maintaining enrollment at the institution from the initial term of admission to the next academic year. Higher Education institutions most commonly track and measure yield and retention rates for their annual first-time, full-time fall freshman cohorts, which are reported annually to the Department of Education

as required. For these reasons, only new first-time, full-time freshmen who applied and were admitted the University of South Carolina Columbia were included in this study.

The study was further restricted to students from the state of South Carolina due to the institution's bifurcated approach to merit aid and outcomes based on residency. Merit scholarship awarding practices, eligibility profiles, and yield rates vary greatly between instate and out-of-state students. The true net value of non-resident merit aid is further complicated because students may qualify for various tuition rates in addition to the dollar amount of the award. Finally, the Garnet Scholarship award and LIFE Scholarship program are available only to residents of South Carolina. Therefore, only in-state applicants are included in the datasets.

As noted in the summary of Chapter Three, one limitation of this study is that it focuses on a single institution, which may limit widespread applicability across all sectors of higher education. However, given the lack of existing literature on institutional merit aid, especially how it may impact students by race and gender, this study affords a deep dive on a single institution that shares similarities with other large, public, flagship institutions. Therefore, this study provides valuable insights, adds to the literature, and is relevant to enrollment management practitioners.

Data Collection

The researcher compiled institutional data maintained in existing databases managed by the Office of Undergraduate Admissions, the Office of Student Financial Aid and Scholarships, and the Office of Enrollment Analytics. All data were encrypted and maintained on a secure, password-protected computer accessible only by the

researcher. Variables were selected from pre-enrollment admission and financial aid applications as well as enrolled student data, including academic and biographic variables available at the time of initial enrollment that are commonly found to impact initial enrollment and persistence. The variables are described in greater detail in the next section of this chapter, and a list of variables along with their operational definitions and source can be found in Appendix A.

Students that applied for admission as first-time, full-time resident freshmen to either fall 2018 or fall 2019 were included in the data set. These semesters were chosen for three reasons. First, these were the most recent semesters possible at the time of the study for which initial enrollment decisions were not impacted by the COVID pandemic. Second, because the institution's overall enrollment objectives and approach to making admissions decisions for these two cohort years were very similar. The third and most significant reason for including these semesters is because the institution altered its approach to merit aid for incoming resident freshmen students admitted for fall 2019, creating the conditions for a natural quasi-experimental study design. The fall 2018 group served as the control group while the fall 2019 group is the experimental group.

For both groups, the researcher focused on in-state students who were eligible to receive the state of South Carolina lottery-funded LIFE scholarship but not initially eligible to receive an institutional merit award. The LIFE scholarship is awarded to resident freshmen who meet two of three eligibility requirements defined in statute: a minimum 3.0 high school GPA, ranked in the top 30% of their graduating class, and minimum SAT score of 1100 or equivalent ACT (CHE, 2015).

The Garnet scholarship criteria for fall 2018 was based solely on the combination of minimum grade point average, class rank, and standardized test scores as established by the Office of Admissions. The university modified the Garnet eligibility requirements for fall 2019 by adding an additional criterion, so that students who received the LIFE scholarship were also eligible for the $500 Garnet award if they did not otherwise qualify for any other merit award from the university. These students were referred to as "Garnet LIFE" recipients for Fall 2019. The impact of the Garnet LIFE scholarship award is the focus of this study. The awarding process for the Garnet LIFE award for the Fall 2019 cohort is depicted in Figure 3.1.

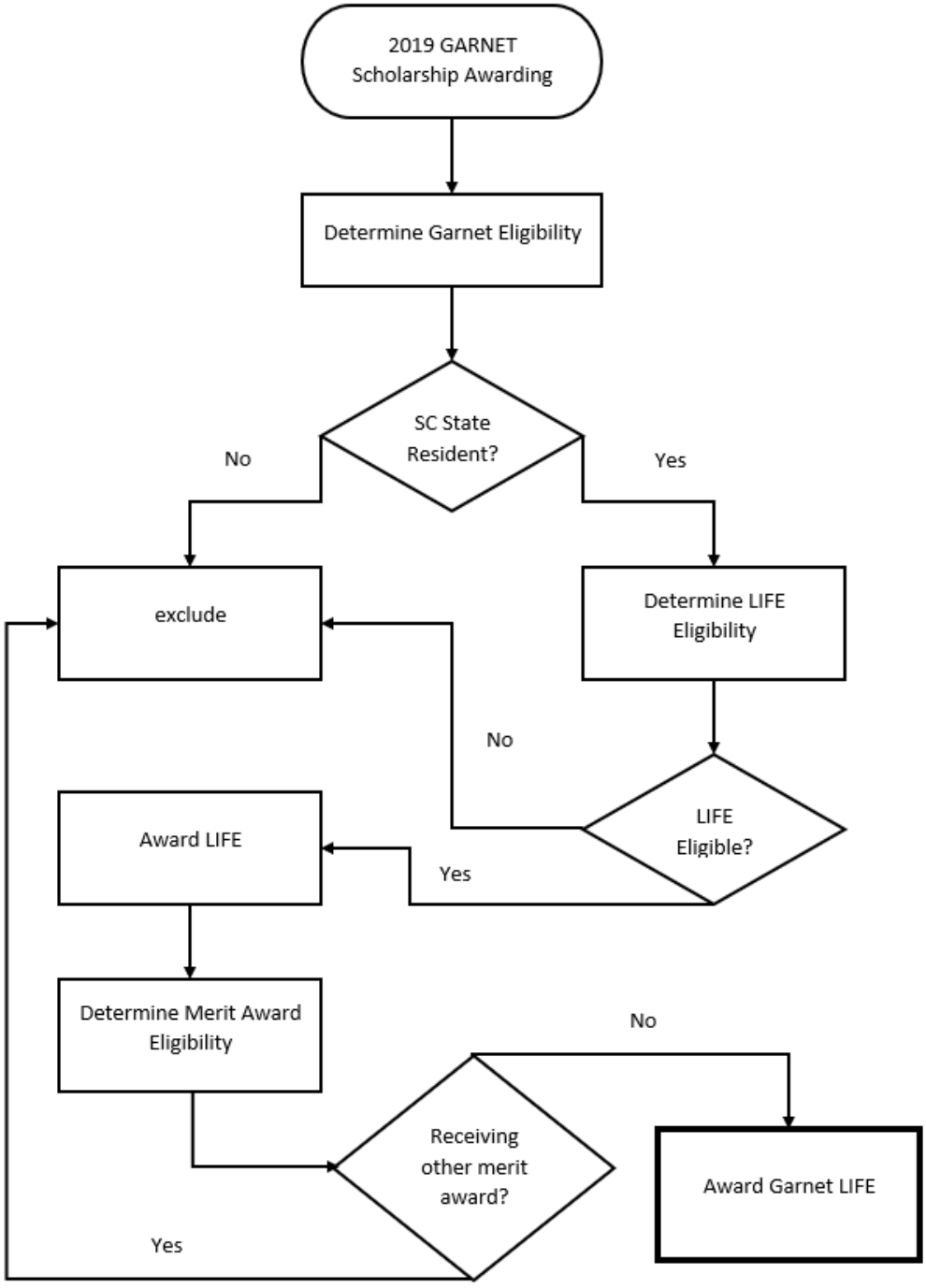

Figure 3.1: 2019 Garnet LIFE Scholarship Awarding Process

The researcher analyzed yield and retention rates for the fall 2018 cohort of LIFE recipients who did not receive an additional merit award from the university and compared with yield and retention rates for comparable students in the entering fall 2019 cohort of first-time, full-time freshmen who received the Garnet LIFE award but who would not have received the award using the 2018 eligibility criteria. As the academic and demographic qualities of the two cohorts of accepted applicants are very similar as indicated in Table 3.1, the differences in the two years observed in the analysis of the research questions can be attributed to the Garnet LIFE scholarship treatment. While some of the differences between years were statistically significant, in real world terms the differences were negligible. For instance, ACTConv was found to statistically differ between the two years. However, the difference was only 0.08 ACT points, and ACT averages for groups of students are usually only reported out to the first decimal place. In addition, using logistic regression to predict yield and retention will control for the effect of the other variables in the model and can therefore isolate the effects of the Garnet LIFE scholarship on yield and retention.

Most of the data for this study were collected by combining various research data sets created each semester by the Office of Enrollment Analytics. The data were extracted from the university's student academic and financial aid data systems and then cleansed to remove duplicate records, correct data errors and missing values, and create new variables. The data were combined into a single dataset in which the identity of each student record was masked with the use of a unique record identifier. The final dataset included 5,998 records: 2,873 in the 2018 cohort that were admitted and would have

qualified for the scholarship in 2019, and 3,125 in the 2019 cohort who were admitted and received the scholarship offer.

Table 3.1

Variable Values and 2018-2019 Comparisons

		Year			
Variable	Value	2018	2019	Mantel-Haenszel Chi-Square	p-value
First Generation	No	84.00%	82.73%		
	Yes	16.00%	17.27%	9.4670	0.0021
Gender	Female	57.41%	58.09%		
	Male	42.59%	41.91%	1.9459	0.1630
Legacy	No	90.84%	92.58%		
	Yes	9.16%	7.42%	40.8424	<0.0001
Pell	No	92.07%	91.40%		
	Yes	7.93%	8.60%	5.919	0.0150
Race	American Indian or Alaska Native	0.18%	0.15%		
	Asian	3.36%	3.79%		
	Black or African American	4.63%	4.10%		
	Hispanic	5.66%	6.14%		
	Native Hawaiian or Other Pacific Islander	0.07%	0.04%		
	Non-resident Alien	0.62%	0.87%		
	Race/Ethnicity Unknown	0.82%	1.16%		
	Two or More Races	4.05%	3.88%		
	White	80.60%	79.90%	2.3887	0.1222
		Mean			
Variable		2018	2019	t Value	p-value
ACTConv		28.69	28.61	2.40	0.0162
HSGPA		4.22	4.20	4.58	<0.0001
WCGPA		4.20	4.21	-1.14	0.2537

Data Set and Variable Selection

As noted above, a research dataset was created to address the research questions. The data set was comprised of independent predictor variables available at the time of initial enrollment collected from the institution's undergraduate admissions and financial aid offices, as well as outcome variables gathered from the institutions' enrollment analytics database. Additional variables were created from these data elements for the purpose of this study. Independent variables known to be factors in enrollment outcomes as referenced in students discussed in Chapter Two were selected and can be grouped into the general categories of academic preparedness, financial characteristics, and student bio-demographic characteristics.

The primary treatment variable for both research questions is "Scholarship", whether or not the student received the Garnet LIFE scholarship award. The outcome variable for research question one is "Enrollment", whether or not the student enrolled, and the outcome variable for research question two is "Retention", whether or not the student returned to the institution for the second year. A listing of the variables along with a brief description and data source is included in Appendix A.

Before beginning the statistical analysis to address the research questions, the variables were evaluated for inclusion using statistical analysis as well as the researcher's professional expertise. The following is a detailed description and discussion of the variables, including efforts used to achieve parsimony and reduce the number of models evaluated.

Academic Preparedness Variables

ACTCOMP

ACTCOMP is the highest ACT Composite college admissions test score submitted by the student. The range of valid scores is 12 – 36. If the student did not submit ACT scores, ACTCOMP will be null.

SATT

SATT is the highest combined SAT college admissions test score submitted by the student. The range of valid scores is 400 – 1600. If the student did not submit SAT scores, SATT will be null.

ACTConv

ACTConv is the highest ACT or equivalent converted SAT submitted by the applicant. The institution accepts either SAT or ACT scores for the purposes of making admissions decisions and scholarship awards. The range of valid scores is 12 -36 and there are no null values in the dataset.

It is common admission and financial aid practice to concord one test to the other in order to fairly evaluate students for admissions and aid awards. When both ACT and SAT scores are submitted to the institution, the concordance table located at https://collegereadiness.collegeboard.org/pdf/guide-2018-act-sat-concordance.pdf is used to convert SAT to ACT scores. If an SAT score prior to 2016 was submitted, it was converted to the new SAT score using the concordance table located at https://collegereadiness.collegeboard.org/pdf/higher-ed-brief-sat-concordance.pdf. Once

the SAT score is converted to the ACT scale, the higher of the ACT score and the concorded SAT score is used in the admissions and merit scholarship decisions. If the ACT score is higher, it is used as the value for ACTConv. If the concorded SAT score is higher, it will be used as the value for ACTConv. The range of possible values is 12-36 in whole numbers.

When performing statistical tests involving two different admissions test score types, there will be an unacceptable number of records eliminated from the analysis due to missing values for one test or the other. This is particularly troubling when building models and can result in a need for two separate models. ACTConv eliminates this issue.

HSGPA

HSGPA is the student's high school grade point average reported by the high school on the student's high school transcript. The HSGPA is calculated using the South Carolina Uniform Grading Policy, which is calculated on a ten-point scale (90-100 = A, 80-89 = B, 70-79 = C, 60-69 = D, and 59 or lower = F). Letter grade equivalents are determined and weighted to compensate for course rigor with honors level, Dual Credit, Advanced Placement, and International Baccalaureate classes receiving additional quality points. For example, a grade of 90 in a standard class equals an A grade with no additional weighting and would result in a 4.0 GPA, an honors class with a grade of 90 would receive half a letter grade weight, resulting in a 4.5 GPA, and an AP course with a grade of 90 would receive a full letter grade weight, resulting in a 5.0 GPA. Additional weights apply for higher numeric grades such that a maximum GPA of 6.0 is

theoretically possible if all courses taken were advanced courses and the student earned all 100 numeric grades.

WCGPA

WCPGA is the weighted core grade point average calculated by the institution for the purpose of having a standardized high school GPA on all applicants regardless of high school grading scale. The WCGPA calculation is based on letter grades earned in nineteen required high school courses. Courses taken at the honors, Advanced Placement, International Baccalaureate, or Dual Credit level are weighted with an additional letter-grade so that the maximum possible WCGPA is 5.0.

AWEval

AWEval is a measure of academic work ethic created by the institution, which is an indicator of potential for academic success at the collegiate level. This statistical measure was created by the institution's Office of Enrollment Analytics to identify applicants with a strong work ethic when their high school grade point averages are considered in relation to their standardized test scores, which represent academic potential. For instance, a student with a low SAT or ACT but a high GPA in high school may have a strong work ethic, resulting in better high school grades than their SAT or ACT scores would suggest.

To create this statistic, SAT and ACT scores were used to predict the high school GPA and any variation between the predicted GPA and actual GPA that can be attributed to the SAT or ACT was removed. Any remaining positive variation (residual) in actual GPA can be attributed to positive academic work ethic:

Actual GPA – Predicted GPA = Residual

If the actual and predicted GPAs are equal, the residual will be zero. A positive residual indicates that the student earned a high school GPA higher than expected based on potential and therefore has an above average academic work ethic, and a negative residual indicates that the student earned a GPA lower than expected and therefore has a below average academic work ethic. The range of values for AWEval is -1.20 to 1.38.

AWE

AWE is used by the institution to categorize students based on AWEval. Students with residuals one-half standard deviation or more below the average AWE Score are classified as "Non-AWE" and students above the cutoff are classified as "AWE." One-half standard deviation was used as the cutoff in order to identify a large enough group of students who may be at risk but not to the point of negatively impacting their admission decision. This cut score has been validated against multiple institutional cohorts as well as data from other institutions. It should be noted that weighted core high school GPA was used to represent high school GPA in an attempt to standardize the measure in terms of scale and curriculum.

The research dataset contains six measures of high school academic preparedness, ability, and performance: ACTCOMP, SATT, ACTConv, WCGPA, HSGPA and AWEval. ACTCOMP and SATT are problematic in that many students only take one of the two tests. Therefore, when building a model, either two models must be used or there will be an unacceptable number of missing values and too many records omitted from the analysis. ACTConv circumvents this problem by using concordance tables to convert

SATT to ACTCOMP. While this is a common practice in higher education, testing professionals may balk at the idea of using an equating method on unlike tests. For the purpose of this study, converting SAT to ACT is useful to avoid missing values and allowed the researcher to have a single continuous standardized test score value for each record, making it possible to remove SATT and ACTCOMP from further consideration.

HSGPA and WCGPA are two very similar measures of high school performance. Since they are highly correlated (Pearson Correlation = 0.88, $p < 0.0001$), there is no need to include both variables in the model. While WCGPA might better represent high school GPA for out-of-state students, all students in this study are in-state students, and HSGPA is available directly from the high school transcript and does not require additional computation. Therefore, HSGPA appears to be the better measure for this study and WCGPA was removed from further consideration.

The last academic measure variable, AWEval, combines both admissions test scores and high school GPA in a single variable. AWEval is created by taking the residual from predicting high school GPA from admissions test scores and is used by the institution in the admission process. The researcher examined bivariate correlations between all the independent academic preparedness variables. As can be seen in Table 3.2, AWEval has the highest correlation with the other academic variables, therefore AWEval will be used in the model build process to represent high school performance and academic preparedness.

Table 3.2

Correlation Comparisons Between Academic Predictor Variables

Variable	*n*	*Mean*	*SD*	AWEval	HSGPA	WCGPA	ACTConv
AWEval	5992	0.14628	0.44533	-			
HSGPA	5992	4.19853	0.37101	0.84258**	-		
WCGPA	5991	3.96825	0.41717	0.94607**	0.88088**	-	
ACTConv	5992	22.95744	1.97793	-0.22786**	-0.06971**	-0.04799*	-

*$p < .001$. **$p < .0001$.

Financial Variables

The cost of higher education and student indebtedness are often cited as deterrents to enrolling in and graduating from college (Ark, n.d.), and this study seeks to examine the impact of a specific financial variable, merit aid, on enrollment and retention. It is likely there may be some interaction between these variables. Therefore, several financial variables were compiled or created for possible inclusion in the models.

AnyFinAid

This variable is used to indicate whether or not a student received any institutional scholarships, grants, or loans during the academic year. A numeric value of "1" is assigned for students who received any type of financial aid, and a numeric value of "0" is assigned for students who did not receive any type of financial aid.

AnyFinAid_Amt

This variable is the total dollar amount of financial aid, including any scholarships, grants or loans, received by the student for the given academic year. The range of possible values is zero to $32,005.

The variables Any FinAid and AnyFinAid_Amt include all scholarships, grants, and loans the student received. These variables were excluded from the model building process because loans, grants and scholarships have different eligibility requirements as well as effects on enrollment and, therefore, including all of them in one variable makes little sense for this study. Likewise, scholarships are not included because participants in this study all have similar scholarships amounts excluding the Garnet award, which is the primary scholarship of interest.

AnyStudLoan

This variable is used to indicate whether or not a student received any student loans during the academic year. A numeric value of "1" is assigned for students who received any student loans, and a numeric value of "0" is assigned for students who did not receive any student loans.

AnyStudLoan_Amt

This variable is the total amount of student loans accepted by the student for the students' initial year of enrollment. The range of possible values is from zero to $9,500. The effects of loans on college enrollment and persistence are complicated because while

many students require a loan to be able to attend college, some students choose student loans over other forms of payment due to favorable borrowing terms.

HighLoan

Excessive loans are considered to be detrimental to enrollment and persistence, therefore, the variable HighLoan was created to identify students who took out greater than average loan amounts. The researcher determined that students with higher-than-average loans were of greater interest than smaller or undefined loan values, therefore HighLoan was included in the model build process instead of AnyStudLoan and AnyStudLoan_Amt. Students with loans equal to or less than the median loan amount of students in the cohort were assigned a value of "0", and students with loans in excess of the median loan amount were coded as "1".

FM_Gross_Need

FM_Gross_Need is an indication of how much money a student needs from outside sources in order to be able to pay for college. For students who submit a FAFSA, gross need is calculated by subtracting a student's expected family contribution (EFC) as determined by the federal methodology for calculating what a student and their family should be able to contribute toward their educational expenses from the Total Cost of Attendance (TCA) as determined by the institution's budgeted cost of attendance for in-state residents. For students who did not complete the FAFSA, this value is null.

One would expect there to be a relationship between FM_Gross_Need and HighLoan. However, the correlation between these two variables is weak (Pearson Correlation Coefficient = 0.20, $p < 0.0001$). Therefore, the inclusion of these two

variables in the model building process seems appropriate. However, further examination of FM_Gross_Need uncovered a large number of zero values, which led the researcher to convert this variable to binary variable where zero indicated no loan and any loan value = 1. The wald chi-square p-value for the binary FM_Gross_Need variable is greater than .015, indicating the variable is less reliable. Therefore, this variable was excluded from the model build process.

PELL

PELL indicates if the student is eligible to receive a federal Pell grant. Pell eligibility is determined by data provided on the FAFSA and is an indicator of low-income status. Institutions are often measured on the number of Pell recipients they serve; therefore the researcher was interested in studying the impact of merit aid on Pell recipients' enrollment behaviors. If a student is eligible for a Pell Grant, a numeric value of "1" is assigned to PELL. If the student is not Pell-eligible, a value of "0" is assigned. The amount of Pell was not considered in this study because the amount of Pell received is roughly equivalent for all recipients.

Lost_scholarship

Lost_scholarship indicates whether or not the student retained the Garnet scholarship award the second year of enrollment. In order to retain the award students must maintain full-time enrollment and a 3.0 grade point average. If the student retained the award the value will be "0"; if the student lost the scholarship the value will be "1". This variable is of interest for research question two.

Student Bio-demographic Characteristic Variables

Institutions are increasingly interested in understanding how various institutional policies, programs, and services impact students across a variety of student characteristics, particularly race, gender, and socio-economic status. The following variables were extracted or created in order to examine the impact of the scholarship award by various student bio-demographic characteristics.

ID

The ID is the unique identifier assigned to each applicant and is used when joining files. The ID is randomly generated and protects the anonymity of the unit record.

FirstGen

FirstGen indicates whether or not the student is a first-generation college student as reported on the application for admission. If neither parent attended college, the applicant is considered a first-generation college student, and FirstGen is therefore assigned a value of "1." If either parent attended college, a value of "0" is assigned.

Legacy

Legacy indicates if the student has a parent that attended the institution. If at least one parent attended, the applicant is considered to be a legacy, and a numeric value of "1" is assigned to Legacy. If neither parent attended UofSC, a numeric value of "0" is assigned to Legacy.

Legacy is an indicator of whether or not a parent attended this institution. This measure should indicate a student's interest in and familial support for the decision to

attend this college. FirstGen indicates whether or not a parent attended college. Legacy and first generation are related in some manner since one cannot be a legacy and first generation. However, including these two variables in models predicting enrollment and graduation has been successful in building predictive models at this institution, therefore the researcher was interested in including both variables in the model selection process.

Gender

Gender indicates the sex of the student. If the applicant self-reports as being female, a numeric value of "1" is assigned. If the applicant self-reports as being male, a numeric value of "0" is assigned to Gender. Gender is of particular concern lately due to the decrease in percentage of males who enroll in college. In addition, males generally have lower retention and graduation rates than females (Thompson, 2021). Therefore, the researcher was interested in examining the impact of scholarship by gender on enrollment and retention.

Race

Race indicates the student's racial category according to the federal IPEDS definition. IPEDS Calculated Race was developed in 2007 and implemented in 2010 to create unduplicated headcounts for race and ethnicity. There are 9 race/ethnicity categories for reporting to IPEDS: Hispanic (regardless of race); and for non-Hispanics: American Indian or Alaska Native; Asian; Black or African American; Native Hawaiian or Other Pacific Islander; White; Two or more races; Nonresident Alien (for non-US citizens); and Race and ethnicity unknown. Students may identify with more than one racial group on the application for admissions, but for the purpose of IPEDS reporting

each student is placed into only one category. If the student specifies Hispanic, race will equal Hispanic. If the student is not a citizen, race will be designated as Nonresident Alien. For all other instances, if a student identifies with a single race, that race is assigned to the student. However, if the student indicates more than one race, they will be placed into the race category "Two or more Races".

HistoricURM

Given the concerns identified in the literature review around merit aid and race, it was important to the researcher to carefully consider race in his analysis. The institution tracks student race according to federal IPEDS definitions which classifies race in eight categories, therefore, to represent this variable would require seven dummy variables, which would be unwieldly (Lund, 2017). Several methods can be used to reduce the number of categories for race. First, a dichotomous variable can be created designated as white/non-white. The problem with this method is the fact that all non-white ethnicities are not equivalent. For example, Asian students in higher education resemble white students more so than any other category. Another possible method is to only consider white and African American categories. This would have resulted in eliminating 1,022 students from the analysis, which was not desirable.

To address the issues with the Race variable, a variable called HistoricURM was created to combine the race categories of interest into a single dichotomous variable. As defined by the National Science Foundation, underrepresented minorities include Black or African American, Hispanic, and American Indian or Alaska Natives. All other non-white race categories will be designated as non-historic URM. This measure will not only

assist with data reduction but also emphasize the effects of scholarship on underrepresented minorities, which are races of particular interest, in enrollment and retention. Therefore, HistoricURM was included in the model selection and Race was removed from further consideration.

The final set of independent variables included in the best subsets analysis model build process described in the next section are: AweVal, HighLoan, Pell, FM_Gross_Need, Gender, Legacy, FirstGen, and HistoricURM for research question one, with the addition of Lost_scholarship for research question two.

Treatment and Outcome Variables

Scholarship

Scholarship is the treatment variable of interest and indicates whether or not the student received the Garnet LIFE scholarship award. As explained in the Data File Creation section, the dataset contains applicants who would have received the Garnet LIFE scholarship if it had been available in 2018, and applicants in 2019 who received the Garnet LIFE scholarship under the revised eligibility criteria. Those receiving the scholarship were assigned a numeric value of "1", and those not receiving a scholarship were assigned a value of "0" to Scholarship. This variable is used to determine the effects of the new scholarship on the probability of initial enrollment and retention.

First_Yr_Cum_GPA

This continuous independent variable used for research question two shows the cumulative first year GPA for those students that enrolled. The range of values is 0 to 4.0.

This variable is used to demonstrate the impact of the merit scholarship on academic performance as measured by first year GPA, which is also a criterion for continuing scholarship eligibility.

First_Yr_Cum_HE

This continuous independent variable used for research question two shows the cumulative first year credit hours earned for those students that enrolled. The range of values is 0 to 71. This variable is used to demonstrate the impact of the merit scholarship on academic performance as measured by credit hours earned, which is also a criterion for continuing scholarship eligibility.

LostSchl

This categorical independent variable used for research question two indicates whether or not students who enrolled met the conditions to retain their scholarship at the end of the first year of enrollment. Those who satisfied requirements to retain the Garnet scholarship were assigned a value of "0". Those who did not meet conditions to retain the Garnet scholarship were assigned a value of "1". This variable is used to examine the impact of losing the scholarship on retention.

Enrolled

This is the dependent variable for research question one and is used to indicate whether or not an applicant enrolled. A numeric value of "1" is assigned for applicants who enrolled, and a numeric value of "0" is assigned for applicants who did not enroll.

Retention

Retention is the dependent variable for research question two and indicates whether or not the student persisted to the second year. If the student who first enrolled in 2018 subsequently enrolled in the fall 2019, then retention will equal "1". Otherwise, retention will equal "0". Likewise, if the student who first enrolled in 2019 subsequently enrolled in the fall 2020, then retention will equal "1". Otherwise, retention will equal "0".

Data Analysis

To answer the two research questions: 1) determine the impact of merit aid on initial enrollment, and 2) determine the impact of merit aid on retention, binary logistic regression models were built using pertinent academic, financial, and student characteristic variables. Logistic regression is commonly used in higher education research (Peng, So, Stage, & St. John, 2002). Logistic regression was decided upon because the dependent variables "Enrolled" and "Retention" are both dichotomous, therefore logistic regression can explain how much variance in the dependent variables is caused by a set of independent variables (Weunsch, 2012). In addition, logistic regression allows for continuous and categorical predictor variables, both of which will be used for prediction. The logistic regression model is defined as (Hosmer, Lemeshow, & Sturdivant, 2013):

$$\mu_{\gamma|x} = \exp(\beta_0 + \beta_1 x) / (1 + \exp(\beta_0 + \beta_1 x))$$

In situations where there are many variables under consideration, a main purpose of regression analysis is to identify models which fit the data well and, since this may require large amounts of computations, stepwise procedures have often been used to find good fitting models. The key benefit of stepwise is the simplicity of identifying a single model, but stepwise generally cannot pick the true model (Oljenik, et al., 2000). Stepwise procedures also have several undesirable features, especially that they produce only a fraction of models that fit the data well (Lawless & Singhal, 1978).

An alternative to stepwise variable selection is the best subsets selection method. This method uses an algorithm to find a specified number of best models containing one, two, or three variables, and so on, up to the single model that contains all explanatory variables being considered (Furnival &Wilson, 1974). Best subsets does not pick a final model, but does present multiple possible models along with information to help choose the final model, therefore best subsets procedures place variable selection in the hands of the researcher who understands the underlying theory, variables, and resources involved (King, 2003).

Due to the large number of variables under consideration and the limitations associated with the stepwise approach, the best subsets selection method was used to create the final model. The best subsets methodology allows for the inclusion of more predictor variables to be considered without overwhelming the researcher with hundreds of models to evaluate. Because there are $2^p - 1$ possible models that can be constructed from a given set of variables, where p equals the number of predictor variables, it is not feasible to model every combination of predictors (King, 2003). Therefore, a limit of twenty possible subset combinations for each n number of variables per model was

imposed. Twenty subsets per each group of n variables proved sufficient to screen and rank potential models by the global chi-square statistic. The researcher created the best one variable models, the best two variable models, etc. up to the best n variable models, where n is the number of variables in the data set.

The variables under consideration were examined for multicollinearity. Multicollinearity exists when two or more variables are highly correlated with each other, which can introduce error in the model. When a multicollinearity diagnostic is considered, pairwise correlation coefficients between predictors and VIF are the most common tools for inspection used by statisticians (Vatcheva, et al., 2016). To test for collinearity, correlation matrices were created showing Pearson correlation coefficients. The typical correlation coefficient cutoff is 0.80.

In addition, Variance Inflation Factors (VIF) were examined. VIF is a measure of collinearity; a value of 1 indicates no collinearity and a value approaching infinity indicates the exact value of a dependent variable can be predicted by other independent variables in the model. There is no consensus among researchers concerning what value of VIF indicates a level of collinearity that must be addressed (Obrien, 2007). However, VIF values of 10, or even as low as 4, are often used by social science researchers (Menard, 1995). For the purpose of this study a conservative value of 2.5 was used.

Variable combination subsets were evaluated based on score values of the global chi-square statistic. The “best fitting” models are generally the ones with the highest score chi-square (Lund, 2007). Hosmer, et al (2013) recommend using this statistic in model evaluation. The score chi-square statistic increases as the number of variables in the model increases. The researcher ranked the top twenty models in each subset by the

chi-square score and eliminated models from further consideration that fell below the largest observed gap in chi-square scores. One limitation of the score chi-square statistic is that it only identifies the best models within a set of models with the same number of predictors; it does not adequately compare models with different numbers of explanatory variables. Therefore, additional statistical tools must be used for model selection.

Once the best models for each subset combination were identified by chi-square score, the researcher had to determine how to identify the best models among all the subsets using one of two possible methods, the Akaike Information Criterion (AIC) or the related Bayesian (or Schwarz) Information Criterion (BIC). The BIC is more efficient, consistent, and is guaranteed to select the true model as the sample size of the data set grows to infinity, as long as the true model is among the candidate set of models being considered. However, the true model is rarely, if ever, among the candidate set (Vrieze, 2012).

When the true model is not among the candidate set, the AIC is better at minimizing risk in model selection and in predicting future observations (Vrieze, 2012), and Vrieze (2012) found in a simulation study that sometimes AIC selects a better model than BIC even when the true model is among the candidate set. This is because with a finite data set there is a risk BIC might select a very bad model. With AIC this risk is minimized, therefore for this study AIC was used to determine the best one-variable model, the best two-variable model, the best three-variable model, etc., from the previously described best model subsets.

Finally, AIC and model accuracy as measured by AUC were used to determine the overall best models for each research question. AIC determines the model with the

fewest variables with the largest sum likelihood. The AIC value in itself is not important; it is relative to the AIC of other models under consideration, and assuming all other measures are equal, the model with the lowest AIC is the best model. Therefore, AIC score was used as the primary determinant of the best model.

Accuracy will be measured using Area Under the ROC Curve (AUC) plot of sensitivity (true positive rate) and specificity (true negative rate). AUC is an accepted traditional measure of model accuracy, with values ranging from zero to 1. The higher the value, the better the accuracy and prediction capability of the model. A value of 1 indicates perfect accuracy of the model, a value of .5 indicates random chance, and a value less than .5 indicates the model predicts worse than random chance (Zou, et al, 2007). For the models with the best AIC score, AUC was also examined to ensure a reasonable and acceptable level of model accuracy.

Once the final models were established for the two research questions, the scholarship explanatory variable was added to the models and the same AIC and AUC model accuracy were compared to determine if the addition of the scholarship variable in the models improved prediction of the outcome variable “Enrolled” for question 1, and “Retention” for question 2. Lastly, the researcher checked for linearity for the continuous variables by plotting continuous variables in the logit, and then used the Hosmer-Lemeshow goodness-of-fit statistic to evaluate the model and detect interactions among the variables. The Hosmer-Lemeshow test is commonly used to evaluate logistic regression models and to determine model fit, including need for interaction terms (Boateng & Abaye, 2019). The researcher accounted for interaction between variables by adding interaction terms to the models as necessary.

The researcher chose to use Petersen's Delta-p statistic rather than odds ratios to interpret the results of the logistic regression models. The Delta-p statistic is commonly used in higher education research and is easy to understand by practitioners and those without extensive knowledge of statistics. Several higher education researchers have used Delta-p in their studies (Cabrera, 1994; Peng, et al., 2002; Hu & Hossler, 2000; St. John, et al., 2001). Delta-p is appropriate for evaluating categorical and continuous independent variables and is a measure of the change in the estimated probability of an outcome given a one-unit change in the categorical independent variable when controlling for all other variables (Cruce, 2009).

Graphs were produced depicting differences between applicants offered Garnet LIFE and those not offered Garnet LIFE for all measures of high school academic variables, student characteristics, and financial variables as covered in the above section. T-tests were also calculated for these variables. For research question one, descriptive statistics and data visualizations were produced to illustrate the impact of scholarship on yield and the demographics of the entering class.

Research question two varies from question one in that it explores the impact of the Garnet LIFE scholarship on retention rather than initial enrollment. Question two was addressed in the same manner as question one using the same logistic regression analysis procedure described previously. The researcher built a logistic regression model using the same independent variables as question one with the addition of the variables Lost_scholarship, which indicates whether or not the student met the requirements to keep the scholarship the second year of enrollment, First _Yr_Cum_GPA, the overall cumulative GPA earned at the end of the academic year, and First_Yr_Cum_HE, the

overall cumulative credit hours earned at the end of the academic year. The dependent variable for the second question is Retention, that is whether or not the student returned to the institution for their second fall semester.

Graphs were produced depicting differences between students receiving Garnet LIFE and those not receiving Garnet LIFE for all measures of high school academic variables, student characteristics, and financial variables covered in the prior section. T-tests were also calculated for these variables. Descriptive statistics and data visualizations were produced to illustrate the impact of the scholarship on overall student retention as well as by various student characteristics.

Summary

This chapter discussed in detail the population and setting for this study. The data sources were identified and the variables under consideration were described in detail. This study is unique in that it allows for a quasi-experimental design due to naturally occurring conditions created by the institution. Limitations of this study include that it focuses on data from a single institution. The statistical methodology used to address the two research questions in this study was outlined, including the rationale for using the best subsets approach for choosing the best logistic regression models.

CHAPTER 4

RESULTS

This chapter includes the analysis of the data collected to address the research questions in this study:

1) **What impact does institutional merit aid have on initial enrollment?** How effective is merit aid in raising the overall academic quality of the incoming class? How does it impact yield by various student characteristics?

2) **What impact does institutional merit aid have on student persistence?** Do students remain enrolled even if they do not retain merit aid? Does persistence vary by demographic characteristics?

Analysis Procedures for Question 1

Before possible models were constructed and evaluated, the independent variables of interest as described in Chapter Three were checked for multicollinearity. Pearson Correlation Coefficients and Variance of Inflation (VIF) statistics are shown in Tables 4.1 and 4.2, respectively. The correlation matrix in Table 4.1 shows that, while some combinations have coefficients that are statistically significant with a p-value less than .05, none of the correlation coefficients are above the 0.8 level of concern and therefore multicollinearity is not an issue.

Table 4.1

Correlation Comparisons Between Independent Variables Q1

Pearson Correlation Coefficients, N = 5992 **Prob > |r| under H0: Rho=0**							
	HighLoan	**Historic URM**	**Gender**	**Legacy**	**FirstGen**	**AWEval**	**Pell**
HighLoan	-	0.00311 0.8099	0.0181 0.1613	-0.02234 0.0838	0.0438 0.0007	0.01538 0.2338	0.097 <.0001
HistoricURM	0.00311 0.8099	-	0.04146 0.0013	-0.08315 <.0001	0.12718 <.0001	0.06021 <.0001	0.17169 <.0001
Gender	0.0181 0.1613	0.04146 0.0013	-	-0.02675 0.0384	0.03501 0.0067	0.26585 <.0001	0.03755 0.0036
Legacy	-0.02234 0.0838	-0.08315 <.0001	-0.02675 0.0384	-	-0.2919 <.0001	-0.0322 0.0127	-0.11667 <.0001
FirstGen	0.0438 0.0007	0.12718 <.0001	0.03501 0.0067	-0.2919 <.0001	-	0.07618 <.0001	0.25557 <.0001
AWEval	0.01538 0.2338	0.06021 <.0001	0.26585 <.0001	-0.0322 0.0127	0.07618 <.0001	-	0.05571 <.0001
Pell	0.097 <.0001	0.17169 <.0001	0.03755 0.0036	-0.11667 <.0001	0.25557 <.0001	0.05571 <.0001	-

Additional examination of the independent variables' Variance Inflation Factor (VIF) is shown in Table 4.2, revealing all values are well below the conservative limit of 2.5 discussed in Chapter Three. This analysis addresses any concern regarding multicollinearity among the various independent variables under consideration for inclusion in the logistic regression model design for research question 1.

Table 4.2

Variance Inflation Factors for Independent Variables Q1

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	0.47559	0.01162	40.93	<.0001	0
HighLoan	1	0.06019	0.08103	0.74	0.4576	1.01043
HistoricURM	1	-0.04462	0.01611	-2.77	0.0056	1.04314
Gender	1	-0.01085	0.01321	-0.82	0.4116	1.07763
Legacy	1	0.10369	0.01677	6.18	<.0001	1.09767
FirstGen	1	-0.00825	0.01505	-0.55	0.5837	1.1662
AWEval	1	-0.05645	0.01476	-3.82	0.0001	1.08397
Pell	1	0.27934	0.01847	15.13	<.0001	1.10467

In order to address question 1, “what impact does institutional merit aid have on initial enrollment?”, binary logistic regression models were constructed from the independent variables in Table 4.2. Models were constructed using the Best Subsets approach using a combination of Chi-square score, AIC, and AUC analysis as described in Chapter Three, as well as the researcher’s experience with the data and professional expertise. Best subsets analysis reduced the number of models under consideration from a maximum possible of 128 to a more manageable number of 46, which are shown in Appendix B.

A review of the model selection statistics identified the preferred model should include the following four independent variables: HistoricURM, Legacy, AWEval, and Pell. The variables in this model seem reasonable and desirable to the researcher, as they each evaluate distinct student characteristics of interest. This model was the four-variable

model with the highest Chi-Square score (267.4763) and the highest AUC value (.6181). A plot of the ROC curve showing the AUC for the model is shown in Figure 4.1. Most importantly, it is the model with the lowest AIC score among all possible models evaluated, regardless of the number of variables in the models (8036.135).

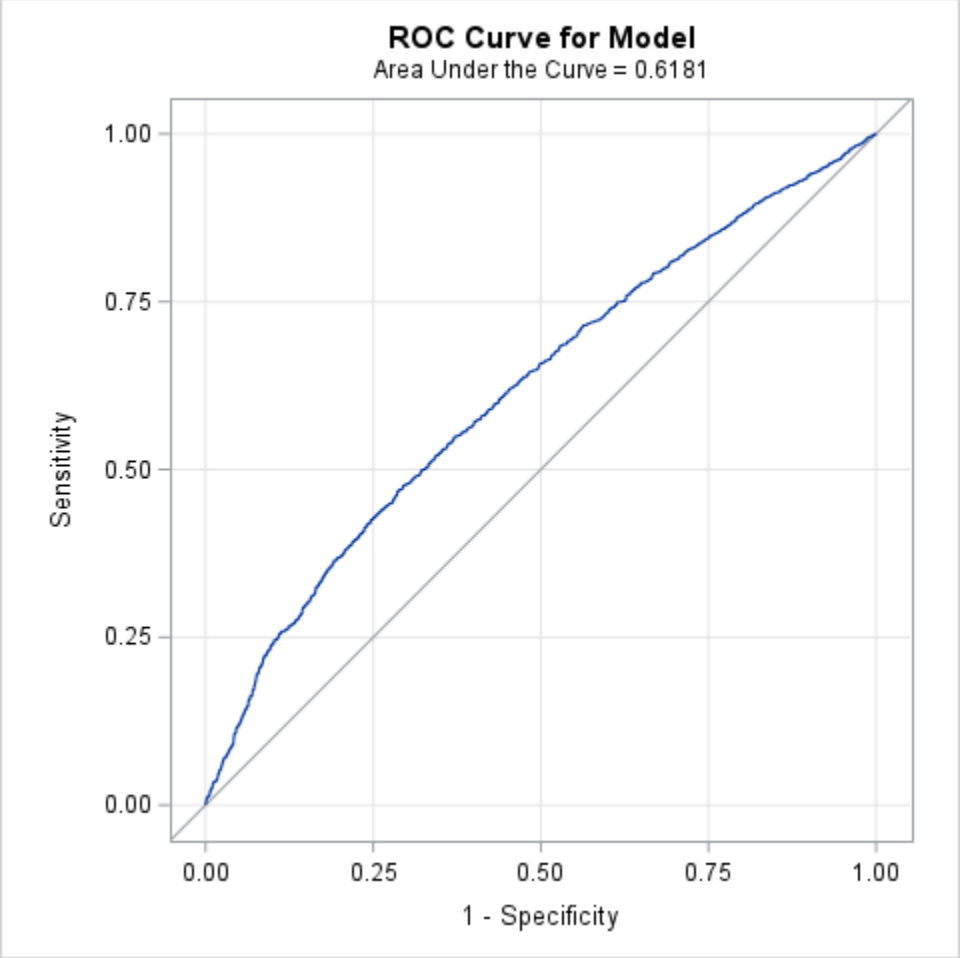

Figure 4.1: AUC Plot for Question 1 Preliminary Model.

Before determining the final model, it is necessary to address model assumptions and check for any interactions among variables. One assumption of logistic regression is linearity in the logit for continuous variables. The only continuous variable in the model

is AWEval; figure 4.2 shows the linearity plot for AWEval, which is reasonably linear, and shows that AWEval is negatively correlated with enrollment, which will be discussed in Chapter 5.

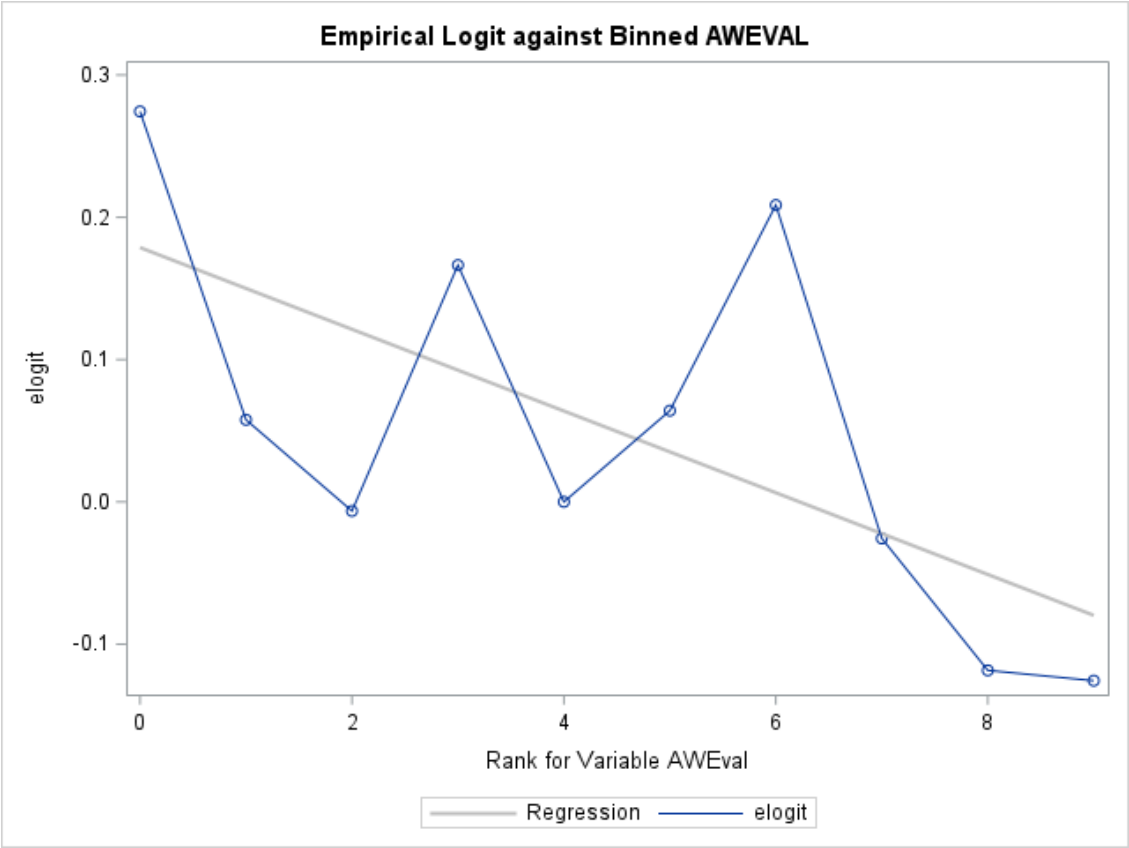

Figure 4.2: Logit plot for AWEval for Question 1.

The final step in evaluating the initial model is to check for possible interactions among the variables using the Hosmer-Lemeshow Goodness of Fit test. Table 4.3 shows the results of this test, which are not statistically significant (p-value is > .05), indicating any interactions among the independent variables have negligible effect on the model. Therefore, no interactions need to be addressed in the initial model. Table 4.4 shows initial model statistics prior to adding the treatment variable.

Table 4.3

Hosmer-Lemeshow Goodness of Fit Test Results for Question 1 Initial Model.

Hosmer and Lemeshow Goodness-of-Fit Test		
Chi-Square	**DF**	**Pr > ChiSq**
8.9377	8	0.3476

Table 4.4

Question 1 Initial Model Statistics.

Analysis of Maximum Likelihood Estimates							
Parameter		**DF**	**Estimate**	**Standard Error**	**Wald Chi-Square**	**Pr > ChiSq**	**Standardized Estimate**
Intercept		1	0.5917	0.0508	135.9190	<.0001	
HistoricURM	**1**	1	-0.0976	0.0340	8.2560	0.0041	0.0431
Legacy	**1**	1	0.2188	0.0338	41.9054	<.0001	-0.0952
AWEval		1	-0.2506	0.0596	17.6583	<.0001	-0.0615
Pell	**1**	1	0.5988	0.0408	215.1357	<.0001	-0.2373

Now that the variables which are shown to influence the decision to enroll have been determined and used to create the initial model, the treatment variable “Scholarship” was added to the model to determine the impact of receiving the institutional Garnet LIFE scholarship award on initial enrollment, controlling for all other variables in the model. The inclusion of Scholarship in the model resulted in an improved AIC score, dropping from 8036.1351 to 8033.601, as well as improved accuracy, increasing the AUC from 0.6181 to 0.6207. Therefore, the model improved with the addition of the

treatment variable. Table 4.5 shows the model statistics after the addition of the Scholarship variable to the model.

Table 4.5

Question 1 Model Statistics with Scholarship Included.

Analysis of Maximum Likelihood Estimates							
Parameter		**DF**	**Estimate**	**Standard Error**	**Wald Chi-Square**	**Pr > ChiSq**	**Standardized Estimate**
Intercept		1	0.5898	0.0508	134.9529	<.0001	
HistoricURM	**1**	1	-0.0982	0.0340	8.3511	0.0039	0.0433
Legacy	**1**	1	0.2214	0.0338	42.8270	<.0001	-0.0963
AWEval		1	-0.2483	0.0597	17.3165	<.0001	-0.0610
Pell	**1**	1	0.5981	0.0408	214.4349	<.0001	-0.2370
Scholarship	**1**	1	0.0564	0.0265	4.5324	0.0333	-0.0311

With the addition of the scholarship variable, the model was again examined for possible interactions using the Hosmer-Lemeshow Goodness of Fit test. The results of this test are shown in Table 4.6.

Table 4.6

Hosmer-Lemeshow Goodness of Fit Test Results for Question 1 Model with Scholarship.

Hosmer and Lemeshow Goodness-of-Fit Test		
Chi-Square	**DF**	**Pr > ChiSq**
16.9730	8	0.0304

The H-L statistic changed from 8.94 (p = 0.348) to 16.97 (p = 0.030), indicating there is an interaction with Scholarship and another variable in the model. Interactions between the Scholarship treatment variable and the other model variables were plotted and examined, and an interaction was found between Scholarship and Pell. These plots are shown in Appendix C.

In order to account for the interaction between Scholarship and Pell, an interaction variable PellSchl (Pell*Scholarship) was added to the model. The AIC statistic improved from 8033.6009 to 8015.5360, AUC improved from 0.6207 to 0.6222, and the H-L Goodness of Fit chi-square score dropped from 16.97 to 5.9280. The p-value is now > .05, no longer statistically significant, indicating the interaction has been addressed. Table 4.7 shows the final H-L Goodness of Fit results and table 4.8 shows the final model statistics for Question 1.

Table 4.7

Hosmer-Lemeshow Goodness of Fit Test Results for Question 1 Final Model.

Hosmer and Lemeshow Goodness-of-Fit Test		
Chi-Square	**DF**	**Pr > ChiSq**
5.9280	8	0.6553

Table 4.8

Question 1 Final Model Statistics with Scholarship.

Analysis of Maximum Likelihood Estimates							
Parameter		**DF**	**Estimate**	**Standard Error**	**Wald Chi-Square**	**Pr > ChiSq**	**Standardized Estimate**
Intercept		1	0.4301	0.0610	49.6916	<.0001	
HistoricURM	**1**	1	-0.0990	0.0341	8.4472	0.0037	0.0437
Legacy	**1**	1	0.2235	0.0339	43.5168	<.0001	-0.0973
Pell	**1**	1	0.8016	0.0636	158.8392	<.0001	-0.3177
AWEval		1	-0.2471	0.0598	17.0944	<.0001	-0.0607
Scholarship	**1**	1	0.1013	0.0284	12.7491	0.0004	-0.0558
PellSchl	**1**	1	-0.3621	0.0817	19.6415	<.0001	0.1101

Question 1 Model Interpretation

While Delta-p is a common measure used in higher education to illustrate the effects of a predictor variable on the dependent variable, interaction terms complicate model interpretation (Norton, et al, 2004; Cruce, 2009). Therefore, to determine the overall effect of Scholarship on initial enrollment while accounting for the interaction between Pell and Scholarship, four prediction equations will be used. The expected probability of success is given by the equation for the logistic regression model:

$$\rho_{(success)} = \frac{1}{(1 + e^{-(b_0 + b_1 x_1 + \ldots . b_n x_n)})}$$

Where *p* is the probably of the outcome (enrollment), b_0 is the intercept, *e* is a constant, and b_1 is the coefficient for x_1.

The below equations predict the probability of enrolling for four categories of students: those who are not Pell and did not receive a scholarship; those who are not Pell

and did receive a scholarship; those who are Pell who did not receive a scholarship; and those who are Pell and did receive a scholarship. In each group, the variables without interactions (Legacy, AWEval, and HistoricURM) are held constant.

AWEval is a continuous variable. Therefore, to hold it constant in the formula, the average AWEval score of .1463 was multiplied by the AWEval estimate value of -0.2471 to arrive at a negative exponent factor of -0.0362. The predicted probability equations for the four categories of students are:

$$\rho_{no\ Pell\ no\ Scholarship} = \frac{1}{(1 + e^{-(0.4301 - 0.0362)})} = 0.597$$

$$\rho_{no\ Pell\ Scholarship} = \frac{1}{(1 + e^{-(0.4301 + 0.1013 - 0.0362)})} = 0.621$$

$$\rho_{Pell\ no\ Scholarship} = \frac{1}{(1 + e^{-(0.4301 + 0.8016 - 0.0362)})} = 0.768$$

$$\rho_{Pell\ Scholarship} = \frac{1}{(1 + e^{-(0.4301 + 0.80161 + 0.1013 - 0.3621 - 0.0362)})} = 0.718$$

The scholarship treatment had a positive impact on initial enrollment for non-Pell students, which were 2.4 percentage points (62.1% vs 59.7%) more likely to enroll if they received the scholarship. Of the 2,627 non-Pell students for Fall 2019, the model indicates that, controlling for all other variables in the model, an additional 63 students enrolled as a result of the scholarship.

However, the scholarship treatment had a negative impact on initial enrollment for Pell recipients. Pell students who received the Scholarship treatment were five percentage points (76.8% vs 71.8%) less likely to enroll than Pell recipients who did not

receive the scholarship. Since there were 498 Pell students who received the Garnet LIFE scholarship, the model indicates that, controlling for all other variables in the model, 25 Pell students did not enroll because of Scholarship. The overall impact of the scholarship treatment is approximately 38 additional students enrolled as a result of the scholarship award.

In addition to understanding the overall impact of the Garnet LIFE Scholarship on initial enrollment numbers, this study addressed related initial enrollment questions regarding the impact on the overall academic quality of the entering class (question 1a) as well as the impact on yield by various student biodemographic characteristics (question 1b). These questions are addressed with t-tests, chi-square tests, and data visualizations. Table 4.9 addresses question 1a and shows t-test results for the various continuous academic variables, with and without the scholarship treatment.

Table 4.9

Question 1 T-tests of Continuous Variables with and without Scholarship Treatment.

Variable	Scholarship	Frequency	Mean	Std Dev	Std Err	t-Value	p-value
ACTComp	No	1914	22.90	1.95	0.0445	9.00	<0.0001
	Yes	1777	22.72	2.29	0.0544		
ACTConv	No	2873	23.17	1.85	0.0346	8.14	<0.0001
	Yes	3125	22.76	2.07	0.0370		
AWEval	No	2871	0.15	0.45	0.0084	1.36	0.1737
	Yes	3121	0.14	0.44	0.0079		
HSGPA	No	2873	4.19	0.37	0.0068	-1.74	0.0826
	Yes	3125	4.21	0.37	0.0067		
SATT	No	2400	1155.60	54.54	1.1133	5.16	<0.0001
	Yes	2470	1147.30	58.55	1.1780		
WCGPA	No	2871	3.97	0.42	0.0079	0.82	0.4103
	Yes	3120	3.96	0.41	0.0074		

The p-values for ACTComp, ACTConv, and SATT (p-value < 0.05) all indicate a statistically significant difference in the mean values when the scholarship treatment is applied, and in each case the means dropped. The mean AWEval score dropped slightly as well, although the difference was not statistically significant. The mean high school grade point average (HSGPA) increased slightly for scholarship recipients while the similar weighted core high school grade point average (WCGPA) decreased slightly, however neither were statistically significant.

The second subquestion (Question 1b) is to analyze the impact of the scholarship on yield, or the percentage of admitted students who enrolled, for subpopulations of students. Table 4.10 shows the difference in enrollment percentages between scholarship and non-scholarship recipients for subpopulations of interest.

Table 4.10

Differences in Enrollment Between Scholarship and Non-scholarship Recipients for Selected Subpopulations.

Variable	Scholarship		No Scholarship		Chi-Square	P-value
	Number	% Enrolled	Number	% Enrolled		
Female	1737	52.04	1630	48.59	4.0149	0.0456
Male	1388	53.24	1243	51.41	0.8844	0.3484
Pell	498	67.87	418	77.99	11.6682	0.0006
Non-Pell	2627	49.68	2455	45.01	11.0823	0.0009
URM	640	50.94	563	48.85	0.5243	0.4882
Non-URM	2485	53.00	2310	50.04	4.1847	0.0430
Legacy	560	60.71	597	55.28	3.5055	0.0649
Non-Legacy	2565	50.80	2276	48.37	2.8365	0.0949
First Gen	896	53.24	835	51.02	0.8526	0.3607
Not First Gen	2229	52.31	2038	49.31	3.8272	0.0535

There was a statistically significant impact (p-value < 0.05) for females, Pell, non-Pell, and non-URMs, indicating the model results are reasonably reliable. Females, non-Pell recipients and majority (non-URM) students who received the scholarship were more likely to enroll than ones who did not receive the award. However, Pell recipients who received the scholarship were less likely to enroll than if they did not receive the scholarship. Figure 4.3 shows a graphical representation of the differences in enrollment for Pell vs. non-Pell students.

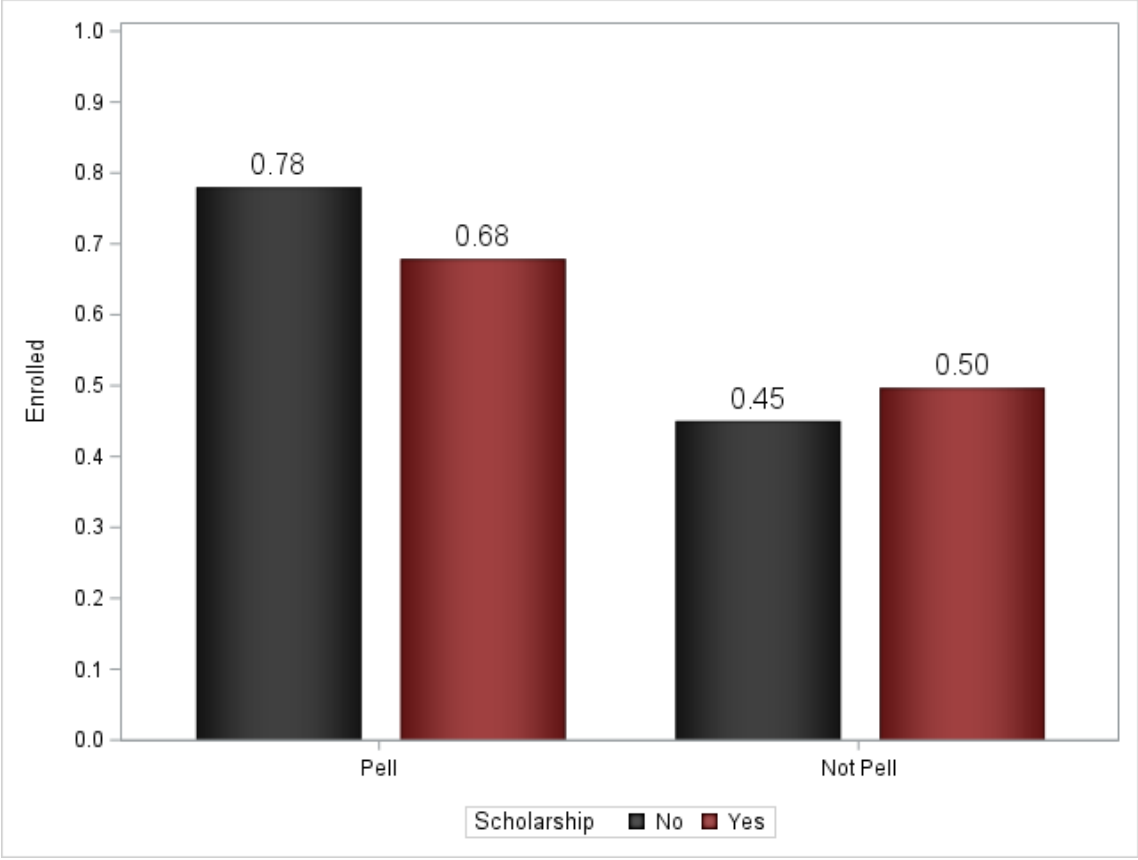

Figure 4.3 Scholarship Impact of Initial Enrollment for Pell and Non-Pell Students

Overall, Pell students were more likely to enroll than non-Pell students, regardless of scholarship. Surprisingly, however, Pell students who did not receive the scholarship

were more likely to enroll (78%), than Pell students who did receive the scholarship (68%), and the greatest difference in enrollment was between Pell and non-Pell students who did not receive the scholarship. These results will be discussed further in Chapter 5.

Statistically significant differences were also noted by sex and race, with females and non-URM students more likely to enroll if they received the scholarship than if they did not receive the scholarship. Figures 4.4 and 4.5 show graphical representations of differences by race and sex, respectively.

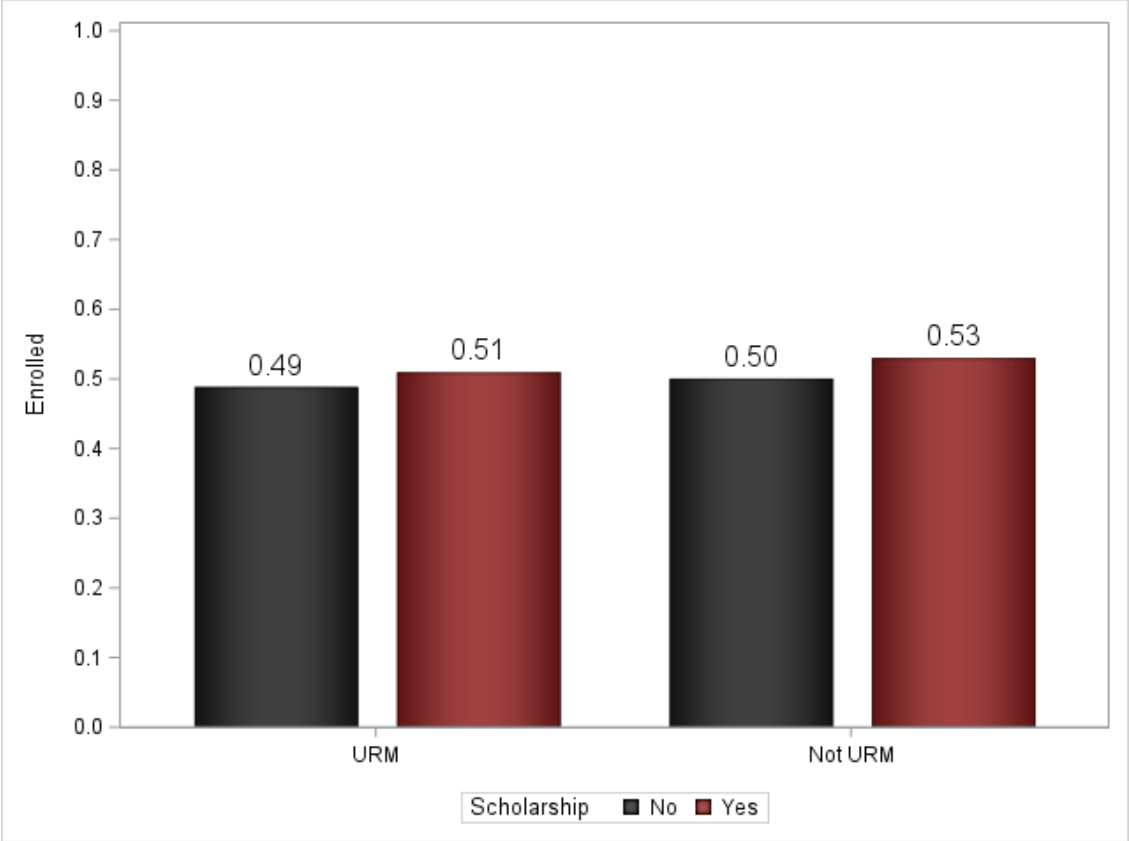

Figure 4.4 Scholarship Impact of Initial Enrollment for URM and Non-URM.

Non-URM students were more likely to enroll than URM students, regardless of scholarship, and there was a statistically significant increase in non-URM enrollment for those who received the scholarship than those who did not.

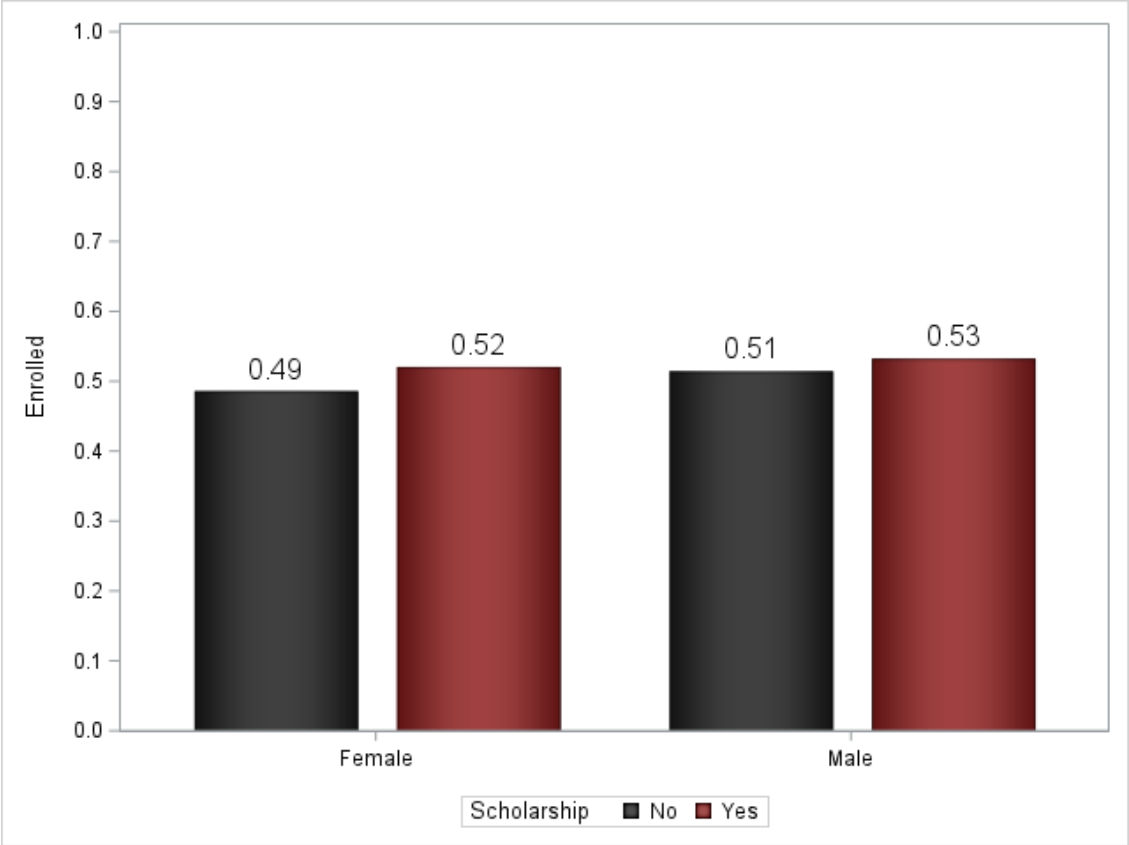

Figure 4.5 Scholarship Impact of Initial Enrollment by Gender.

Females who received the scholarship were more likely to enroll than females who did not receive the scholarship (53% vs 49%), which was found to be statistically significant. First generation and Legacy students also had slight differences in enrollment, however, these differences were not statistically significant and therefore not attributable to the scholarship treatment. Legacy students were more likely to enroll than

non-legacy students regardless of scholarship. Similarly, first generation students were slightly more likely to enroll than non-first-generation students, regardless of scholarship.

Analysis Procedures for Question 2

For question 2 three additional independent variables were considered: cumulative hours earned after the first year of enrollment (First_Yr_Cum_HE), cumulative grade point average after the first year of enrollment (First_Yr_Cum_HE), and whether or not the student retained the scholarship (LostSchl). As the outcome variable for question 2 is retention, whether or not the student persisted to the second year, only the 3,070 students who initially enrolled were examined.

Before possible models were constructed and evaluated, the independent variables of interest as described in Chapter Three were checked for multicollinearity. Pearson Correlation Coefficients and Variance of Inflation (VIF) statistics are shown in Tables 4.11 and 4.12, respectively. The correlation matrix in Table 4.11 shows that, while some combinations have coefficients that are statistically significant with a p-value less than .05, none of the correlation coefficients are above the 0.8 level of concern and therefore multicollinearity is not an issue.

Additional examination of the independent variables' Variance Inflation Factor (VIF) is shown in Table 4.12, revealing all values are well below the conservative limit of 2.5 discussed in Chapter Three. This analysis addresses any concern regarding multicollinearity among the various independent variables under consideration for inclusion in the logistic regression model design for research question 2.

Table 4.11

Correlation Comparisons Between Independent Variables for Question 2

Pearson Correlation Coefficients, N = 3070 Prob > |r| under H0: Rho=0										
	HighLoan	**Historic URM**	**Gender**	**Legacy**	**FirstGen**	**AWEval**	**Pell**	**LostSchl**	**First_Yr_ Cum_GPA**	**First_Yr_ Cum_HE**
HighLoan	1	0.01924	0.03053	-0.02155	0.02923	0.02505	0.08468	0.0011	0.01244	0.00117
		0.2867	0.0907	0.2326	0.1054	0.1653	<.0001	0.9514	0.491	0.9483
Historic URM	0.01924	1	0.03794	-0.10765	0.14754	0.09409	0.23235	0.00849	0.00006	0.04796
	0.2867		0.0355	<.0001	<.0001	<.0001	<.0001	0.6384	0.9971	0.0079
Gender	0.03053	0.03794	1	-0.01608	0.05008	0.29455	0.06416	-0.18866	0.24133	0.13502
	0.0907	0.0355		0.3732	0.0055	<.0001	0.0004	<.0001	<.0001	<.0001
Legacy	-0.02155	-0.10765	-0.01608	1	-0.32468	-0.02245	-0.17157	-0.0435	0.01698	-0.00068
	0.2326	<.0001	0.3732		<.0001	0.2136	<.0001	0.0159	0.3471	0.9701
FirstGen	0.02923	0.14754	0.05008	-0.32468	1	0.09337	0.31828	0.04937	-0.02331	-0.01875
	0.1054	<.0001	0.0055	<.0001		<.0001	<.0001	0.0062	0.1966	0.2989
AWEval	0.02505	0.09409	0.29455	-0.02245	0.09337	1	0.08687	-0.25131	0.33571	0.20511
	0.1653	<.0001	<.0001	0.2136	<.0001		<.0001	<.0001	<.0001	<.0001
Pell	0.08468	0.23235	0.06416	-0.17157	0.31828	0.08687	1	0.00674	0.02198	0.03122
	<.0001	<.0001	0.0004	<.0001	<.0001	<.0001		0.7088	0.2235	0.0837
LostSchl	0.0011	0.00849	-0.18866	-0.0435	0.04937	-0.25131	0.00674	1	-0.59566	-0.51509
	0.9514	0.6384	<.0001	0.0159	0.0062	<.0001	0.7088		<.0001	<.0001
First_Yr_ Cum_GPA	0.01244	0.00006	0.24133	0.01698	-0.02331	0.33571	0.02198	-0.59566	1	0.58323
	0.491	0.9971	<.0001	0.3471	0.1966	<.0001	0.2235	<.0001		<.0001
First_Yr_ Cum_HE	0.00117	0.04796	0.13502	-0.00068	-0.01875	0.20511	0.03122	-0.51509	0.58323	1
	0.9483	0.0079	<.0001	0.9701	0.2989	<.0001	0.0837	<.0001	<.0001	

Table 4.12

Variance Inflation Factors for Independent Variables for Question 2

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	**1**	-0.05330	0.03527	-1.51	0.1308	0
HighLoan	**1**	-0.01158	0.05537	-0.21	0.8343	1.00820
HistoricURM	**1**	0.00819	0.01296	0.63	0.5274	1.07671
Gender	**1**	-0.02666	0.01059	-2.52	0.0119	1.12914
Legacy	**1**	0.01214	0.01275	0.95	0.3409	1.12882
FirstGen	**1**	-0.03085	0.01207	-2.56	0.0107	1.22987
AWEval	**1**	0.01206	0.01218	0.99	0.3223	1.21727
Pell	**1**	0.00333	0.01306	0.25	0.7989	1.17423
LostSchl	**1**	0.01102	0.01286	0.86	0.3917	1.67913
First_Yr_Cum_GPA	**1**	0.04475	0.00995	4.50	<.0001	1.97140
First_Yr_Cum_HE	**1**	0.02729	0.00082334	33.14	<.0001	1.63173

To address question 2, “what impact does institutional merit aid have on persistence?”, binary logistic regression models were constructed from the independent variables in Table 4.12. Models were constructed using the Best Subsets approach using a combination of Chi-square score, AIC, and AUC analysis as described in Chapter Three, as well as the researcher’s experience with the data and professional expertise. Best subsets analysis reduced the number of models under consideration from a maximum possible of 1023 to a more manageable number of 85, which are shown in Appendix D.

A review of the model selection statistics identified the preferred model should include the following five independent variables: First_Yr_Cum_GPA, First_Yr_Cum_HE, Gender, LostSchl, and FirstGen. The variables in this model seem

reasonable and desirable to the researcher, as they each evaluate distinct student characteristics of interest. This model was the five-variable model with the second-highest Chi-Square score (1248.0446) and the highest AUC value (.8756). A plot of the ROC curve showing the AUC for the model is shown in Figure 4.13. Most importantly, it is the model with the lowest AIC score among all possible models evaluated, regardless of the number of variables in the models (1546.325).

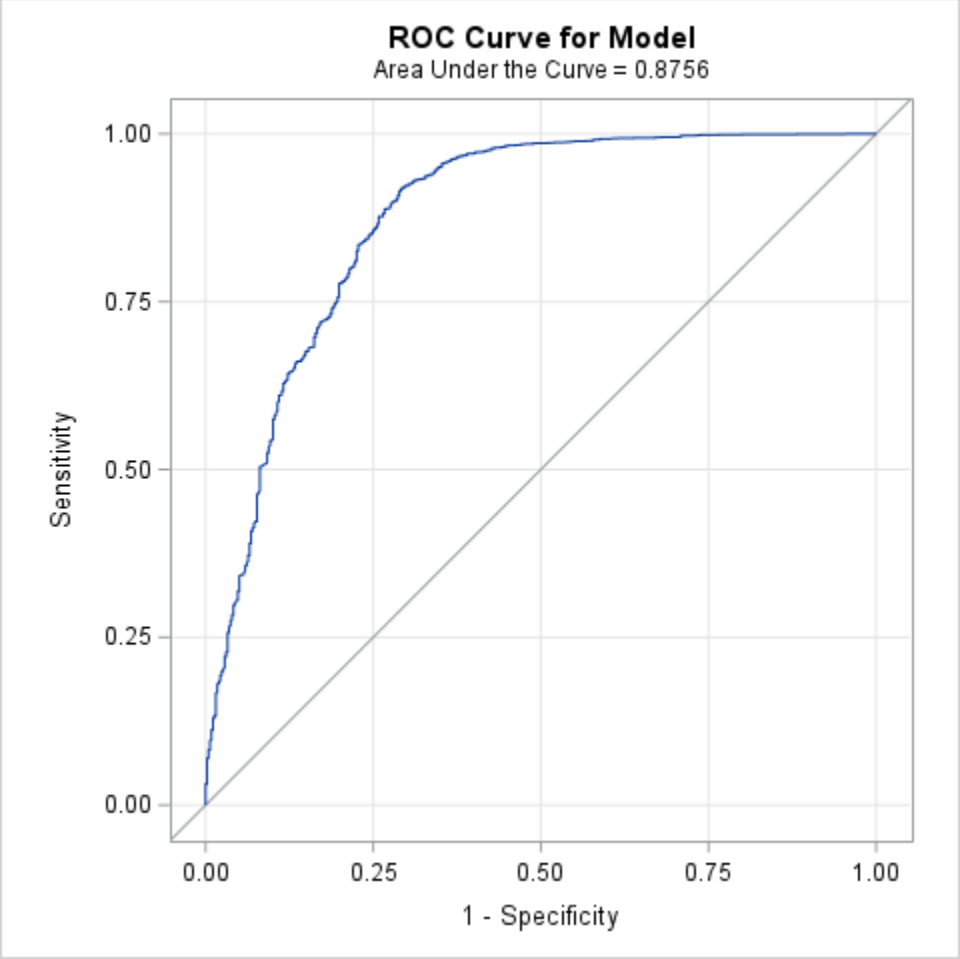

Figure 4.6: AUC Plot for Question 2 Preliminary Model.

Before determining the final model for question 2, it is necessary to address model assumptions and check for any interactions among variables. One assumption of logistic regression is linearity in the logit for continuous variables. The continuous variables in the model are First_Yr_Cum_GPA and First_Yr_Cum_HE. Figure 4.7 shows the linearity plot for First_Yr_Cum_GPA, and figure 4.8 shows the linearity plot for First_Yr_Cum_HE. Both plots are reasonably linear and show that GPA and hours earned are both positively correlated with retention, which will be discussed in Chapter 5.

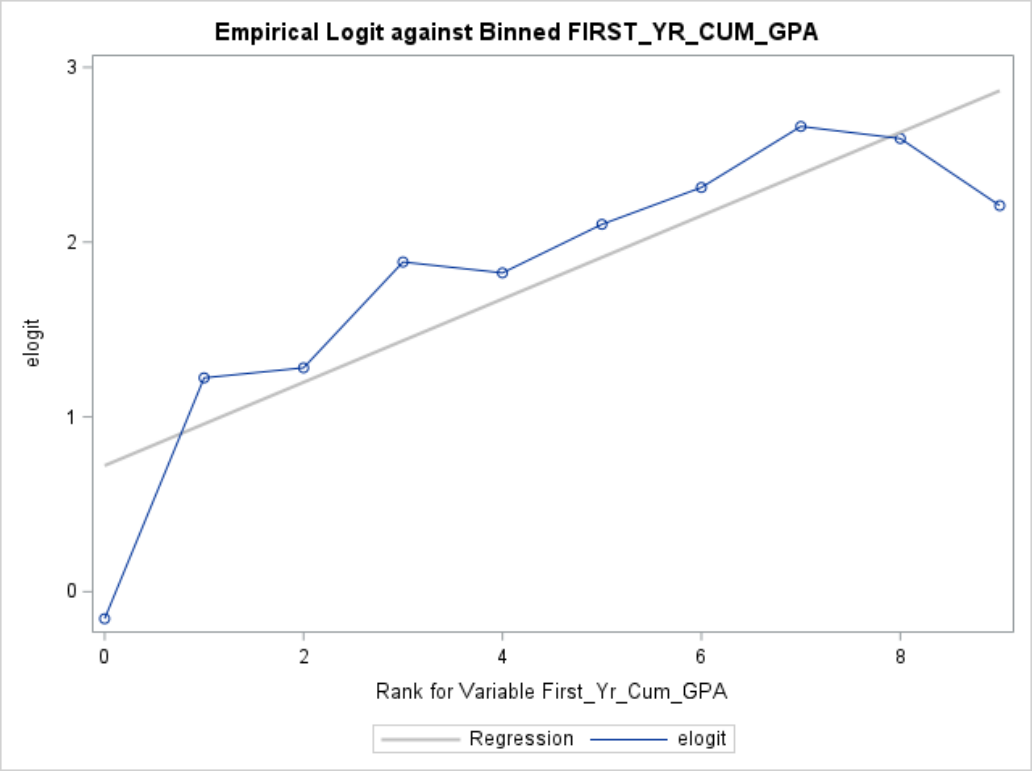

Figure 4.7: Logit Plot for First_Yr_Cum_GPA.

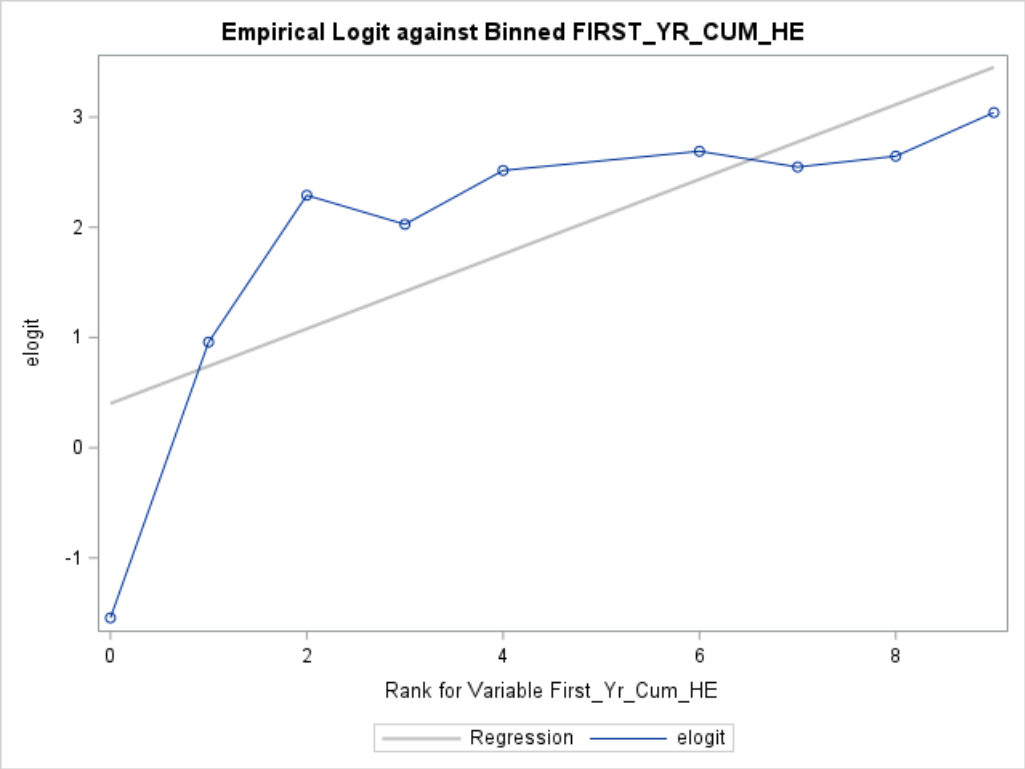

Figure 4.8: Logit Plot for First_Yr_Cum_HE.

The final step in evaluating the initial model is to check for possible interactions among the variables using the Hosmer-Lemeshow Goodness of Fit test. Table 4.13 shows the results of this test, which are not statistically significant (p-value is > .05), indicating any interactions among the independent variables have negligible effect on the model. Therefore, no interactions need to be addressed in the initial model. Table 4.14 shows initial model statistics prior to adding the treatment variable.

Table 4.13

Hosmer-Lemeshow Goodness of Fit Test Results for Question 2 Initial Model.

Hosmer and Lemeshow Goodness-of-Fit Test		
Chi-Square	**DF**	**Pr > ChiSq**
10.1863	8	0.2522

Table 4.14

Question 2 Initial Model Statistics.

Analysis of Maximum Likelihood Estimates							
Parameter		**DF**	**Estimate**	**Standard Error**	**Wald Chi-Square**	**Pr > ChiSq**	**Standardized Estimate**
Intercept		1	-4.4699	0.4849	84.9840	<.0001	
Gender	**1**	1	-0.1196	0.0710	2.8373	0.0921	0.0656
FirstGen	**1**	1	-0.1435	0.0724	3.9234	0.0476	0.0720
LostSchl	**1**	1	-0.1574	0.1021	2.3765	0.1232	0.0867
First_Yr_Cum_GPA		1	0.3469	0.1334	6.7641	0.0093	0.1337
First_Yr_Cum_HE		1	0.2023	0.0114	312.7387	<.0001	0.8577

Now that the variables which are shown to best predict persistence have been determined and used to create the initial model, the treatment variable “Scholarship” was added to the model to determine the impact of receiving the institutional Garnet scholarship award on retention, controlling for all other variables in the model. The inclusion of Scholarship in the model resulted in an improved AIC score, dropping from 1546.3246 to 1541.6578, and improving accuracy from 0.8756 to 0.8772. Therefore, the model improved with the addition of the treatment variable. Table 4.15 shows the model

statistics after the addition of the Scholarship variable to the model. Table 4.16 shows the Hosmer-Lemeshow Goodness of Fit Test results for the model after adding the Scholarship treatment variable. The H-L statistic for both models with and without scholarship do not indicate the presence of interactions and therefore no additional terms are needed for either model.

Table 4.15

Question 2 Final Model Statistics with Scholarship.

Analysis of Maximum Likelihood Estimates							
Parameter		**DF**	**Estimate**	**Standard Error**	**Wald Chi-Square**	**Pr > ChiSq**	**Standardized Estimate**
Intercept		1	-4.5055	0.4880	85.2465	<.0001	
Gender	**1**	1	-0.1163	0.0710	2.6818	0.1015	0.0638
FirstGen	**1**	1	-0.1390	0.0726	3.6653	0.0556	0.0698
LostSchl	**1**	1	-0.1635	0.1023	2.5552	0.1099	0.0901
First_Yr_Cum_GPA		1	0.3569	0.1346	7.0299	0.0080	0.1376
First_Yr_Cum_HE		1	0.2025	0.0115	311.8917	<.0001	0.8586
Scholarship	**1**	1	0.1768	0.0686	6.6338	0.0100	-0.0973

Table 4.16

Hosmer-Lemeshow Goodness of Fit Test Results for Question 2 Final Model.

Hosmer and Lemeshow Goodness-of-Fit Test		
Chi-Square	**DF**	**Pr > ChiSq**
6.2394	8	0.6204

Question Two Model Interpretation

As discussed in Chapter Three, the Delta-p statistic is useful in interpreting regression models. Delta-p is commonly used in higher education to measure the discrete change in the estimated probability of the occurrence of an outcome given a one-unit change in the independent variable of interest, with all other variables held constant at their mean values (Cruce, 2009). The Delta-p statistics are shown in Table 4.17.

Table 4.17

Delta-p Statistics for Question 2 Final Model.

variable	Class Variable Value	estimate	Delta-p
FirstGen	1	-0.1389985004	-0.0179671394
First_Yr_Cum_GPA		0.3568532803	0.0397930313
First_Yr_Cum_HE		0.2025306336	0.0238742285
Gender	1	-0.1163003616	-0.0146705566
LostSchl	1	-0.1635453976	-0.0207828861
Scholarship	1	0.176807258	0.022497238

When controlling for other variables, it is estimated that students who received the scholarship were 2.25 percentage points more likely to retain than students who did not receive the scholarship the prior year. First generation students who received the scholarship were estimated to be 1.8 percentage points less likely to persist, females were estimated to be 1.5 percentage points less likely to persist, and students who did not retain their scholarship were estimated to be 2 percentage points less likely to persist than those who did not receive the scholarship. However, it is estimated that for every

additional hour earned, students were 2.4 percentage points more likely to retain, and for every additional point of cumulative GPA, students were estimated to be 4 percentage points more likely to retain when they received the scholarship compared to those who did not.

In addition to the overall impact on retention, the researcher also sought to determine if persistence is impacted when students do not retain their merit aid (question 2a) and does persistence vary by demographic characteristics (question 2b). Chi-square tests were performed to determine if there is a relationship between receiving the Garnet award and retention in two different categories: students who received the scholarship, and students who did not receive the scholarship but would have been eligible for the scholarship. These two categories of students were examined based on whether or not they retained or would have retained the scholarship, respectively, and the results are shown in Table 4.18.

Table 4.18

Chi-square Test for Scholarship Retained and Not Retained.

Met Scholarship Retention Requirement				
Received Scholarship	**Frequency**	**Percent Retention**	**Chi-sq**	**p-value**
No	791	96.21	0.7062	0.4138
Yes	824	96.97		
Did Not Meet Scholarship Retention Requirement				
Received Scholarship	**Frequency**	**Percent Retention**	**Chi-sq**	**p-value**
No	640	69.06	6.33	0.0131
Yes	816	75.00		

Of the students who were academically eligible to keep their scholarship, the scholarship group retained at a slightly higher rate than those who did not receive the scholarship (96.97% vs 96.21%). Figure 4.9 graphically depicts the differences in persistence by scholarship retention.

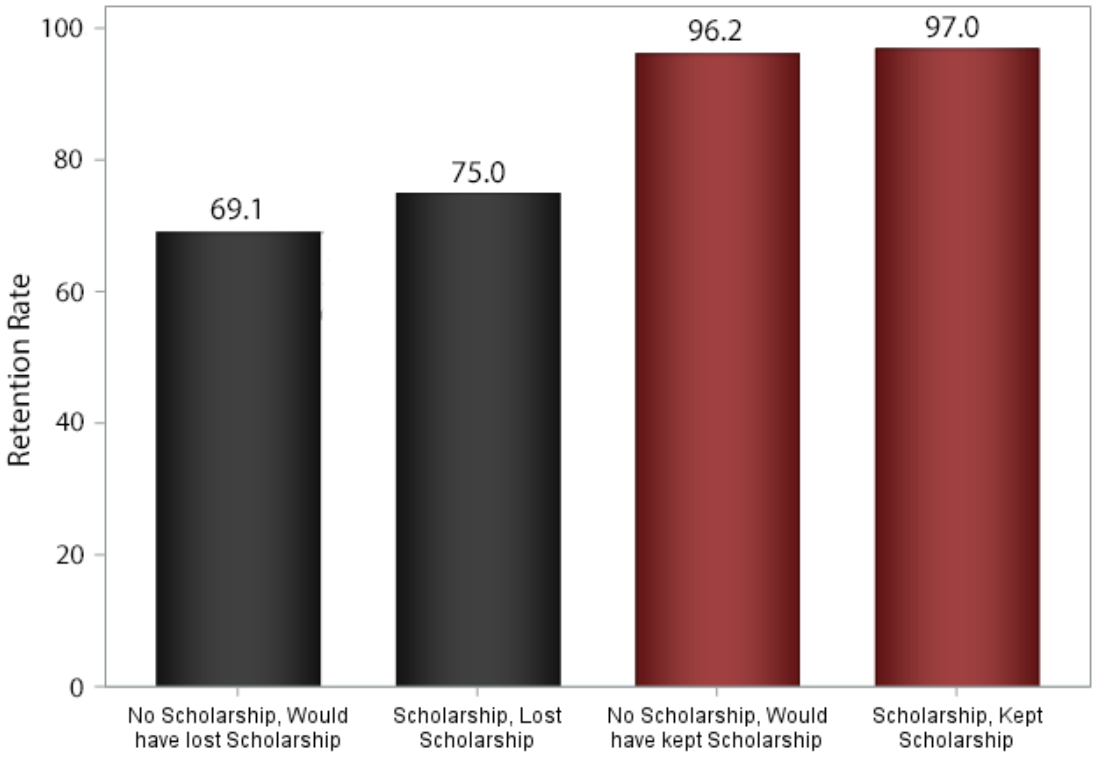

Figure 4.9. Difference in Persistence by Scholarship Retention

Perhaps most interesting is that those students who initially received the scholarship but failed to retain the award were more likely to persist than students who did not receive the scholarship and who also would not have met requirements to retain the award, had they received it initially. Of the students who were academically ineligible to keep their scholarship (i.e., earned a first year cumulative GPA less than 3.0, did not

maintain full time enrollment, or earned less than 30 credit hours), the scholarship group persisted at a 6 percentage points higher rate than students who did not receive the scholarship (75% vs 69.1%).

The second subquestion (Question 2b) is to analyze the impact of the scholarship on yield persistence for subpopulations of students by various demographic characteristics of interest: gender, race, first generation status, Pell status, and legacy status. Higher retention rates were observed for students that received the scholarship across all categories, and higher retention rates were observed for students that met the academic requirements to retain the scholarship across all categories.

Figure 4.10 depicts retention by gender, indicating relatively little estimated difference between males and females who received and retained the scholarship. Both males and females who received the scholarship but did not retain the scholarship persisted at higher rates than males and females who did not receive the scholarship and would not have retained the scholarship. Males who did not or would not have retained the scholarship persisted at lower rates than females who did not or would not have retained the scholarship. Males that received the scholarship but lost the award persisted at higher rates than males who did not receive the scholarship and would have lost the award.

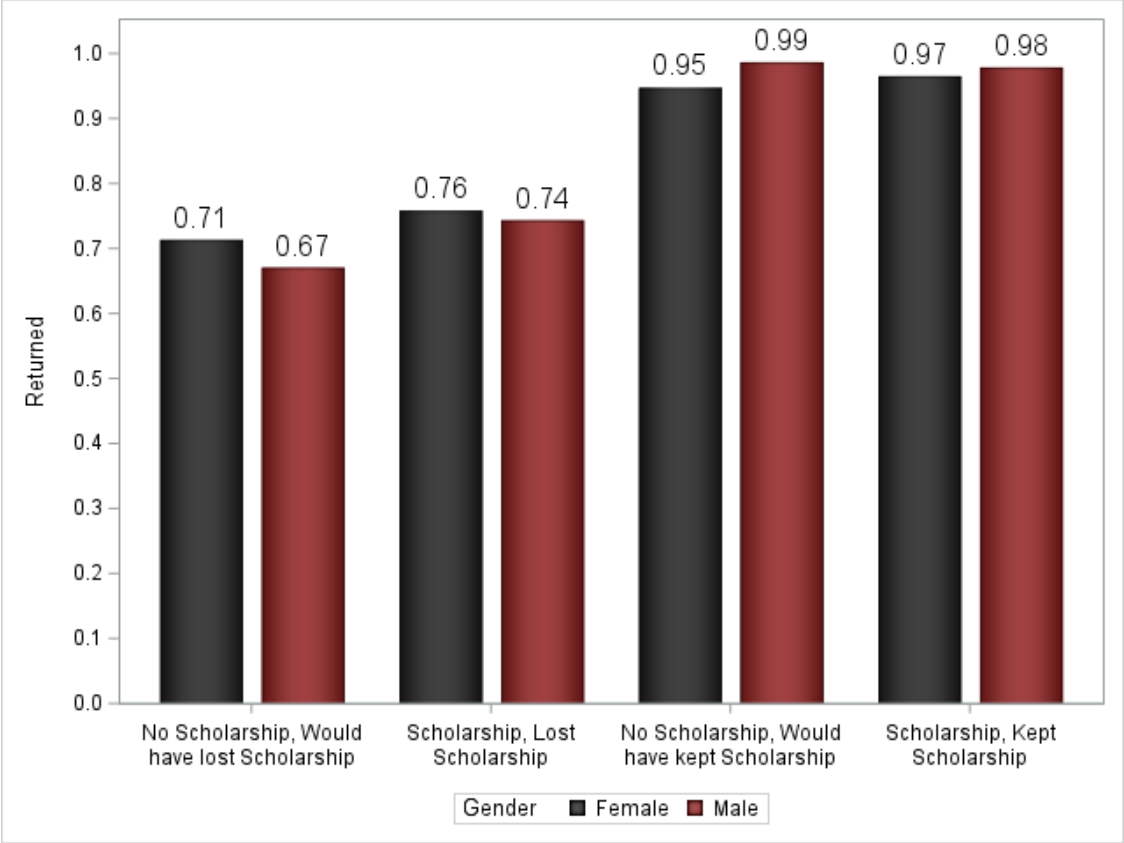

Figure 4.10. Difference in Persistence by Scholarship Retention and Gender

Figure 4.11 depicts differences in persistence for URM and non-URM students. Underrepresented minority students who kept or would have kept the scholarship persisted at the same or better rates than their majority peers. URM students who did not or would not have met the academic requirements to keep the scholarship persisted at higher rates than non-URM students who did not or would not have retained the scholarship. URMs that received the scholarship and lost it persisted at higher rates than

URM students who did not receive the scholarship and would have lost it (80% compared to 74%).

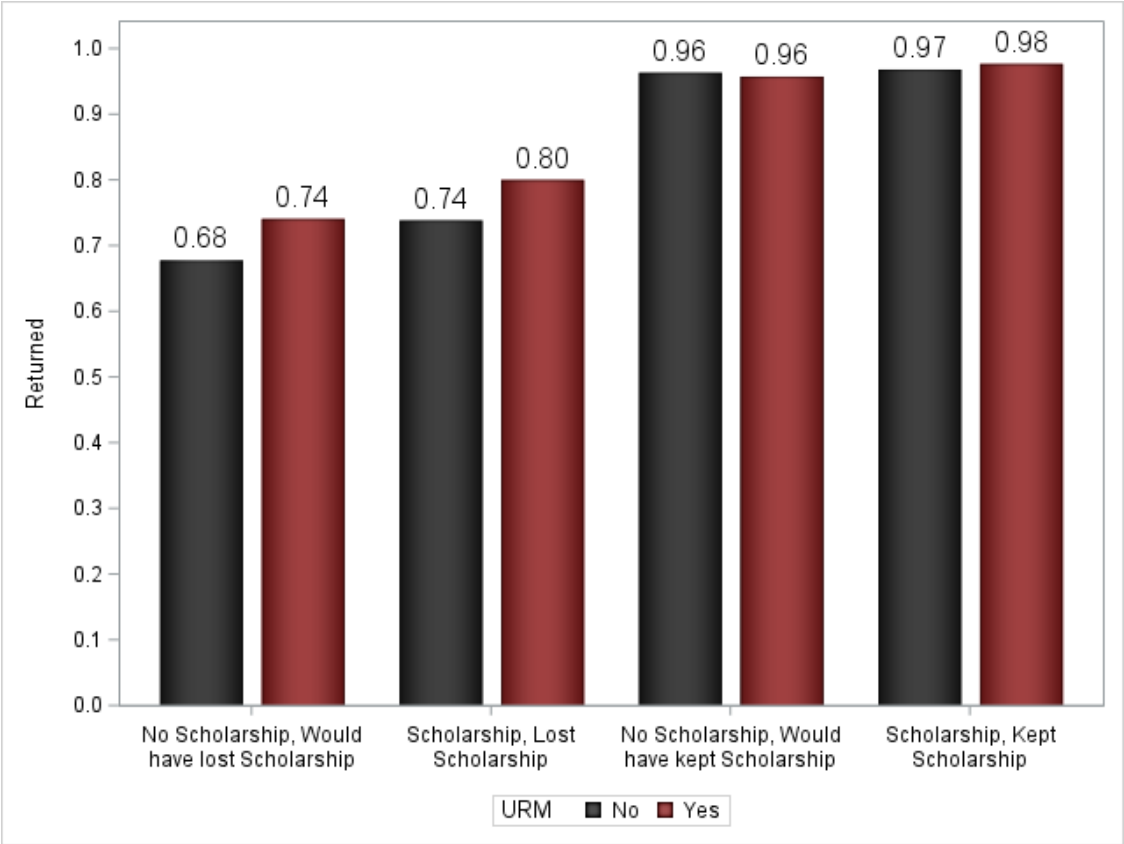

Figure 4.11. Difference in Persistence by Scholarship Retention and URM

Figure 4.12 depicts differences in persistence for first generation and non-first-generation students. First generation students who kept or would have kept the scholarship persisted at about the same rates as non-first-generation students who kept or would have kept the award. First generation students who lost or would have lost the scholarship persisted at lower rates than non-first-generation students who lost or would have lost the award. However, first generation students that received the scholarship and

lost it persisted at higher rates than first generation students who did not receive the scholarship and would have lost it (72% compared to 66%).

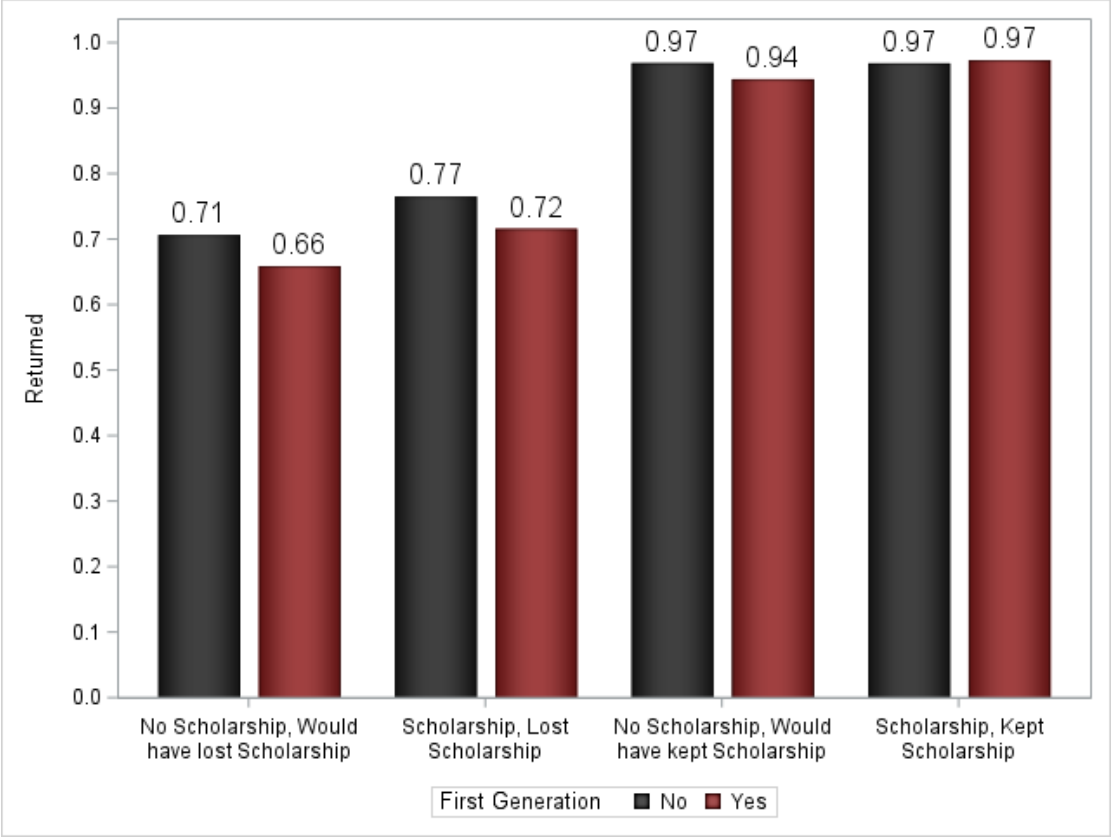

Figure 4.12. Difference in Persistence by Scholarship Retention and First Generation

Figure 4.13 depicts differences in persistence for Pell and non-Pell students. Pell student data exhibits a pattern similar to underrepresented minority students. Pell students that received the scholarship and lost it persisted at higher rates than Pell students who did not receive the scholarship but would have lost it (80% compared to 72%). Pell students who did not receive the scholarship but would have retained the scholarship persisted at lower rates than non-Pell students who did not receive the scholarship and

would have retained the award (94% vs 97%), which is the same as first generation students shown in Figure 4.12.

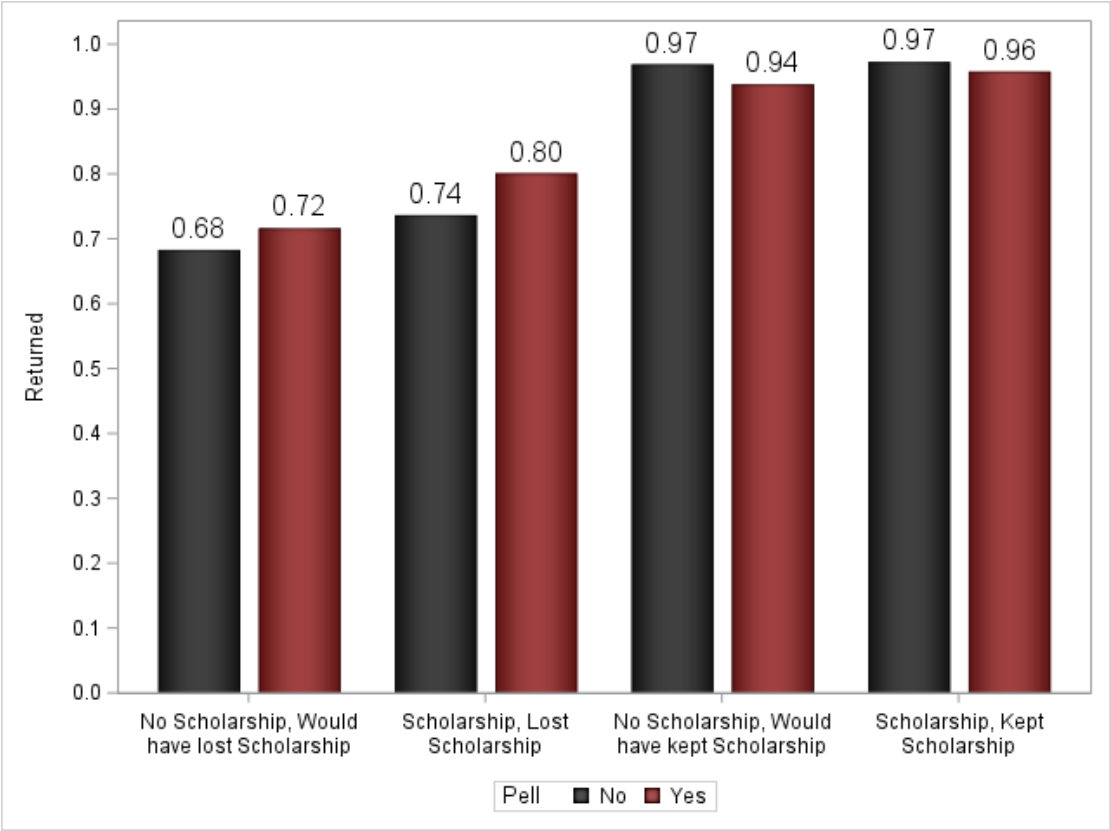

Figure 4.13. Difference in Persistence by Scholarship Retention and Pell

Figure 4.14 depicts differences in persistence for Legacy vs non-legacy students, which shows the least amount of variation of any biodemographic grouping. Legacy students are the only population of students with higher persistence rates than non-legacy students across all four categories examined: did not receive scholarship but would have lost the scholarship; received the scholarship but did not retain the scholarship; did not

receive but would have kept the scholarship; and received the scholarship and kept the award.

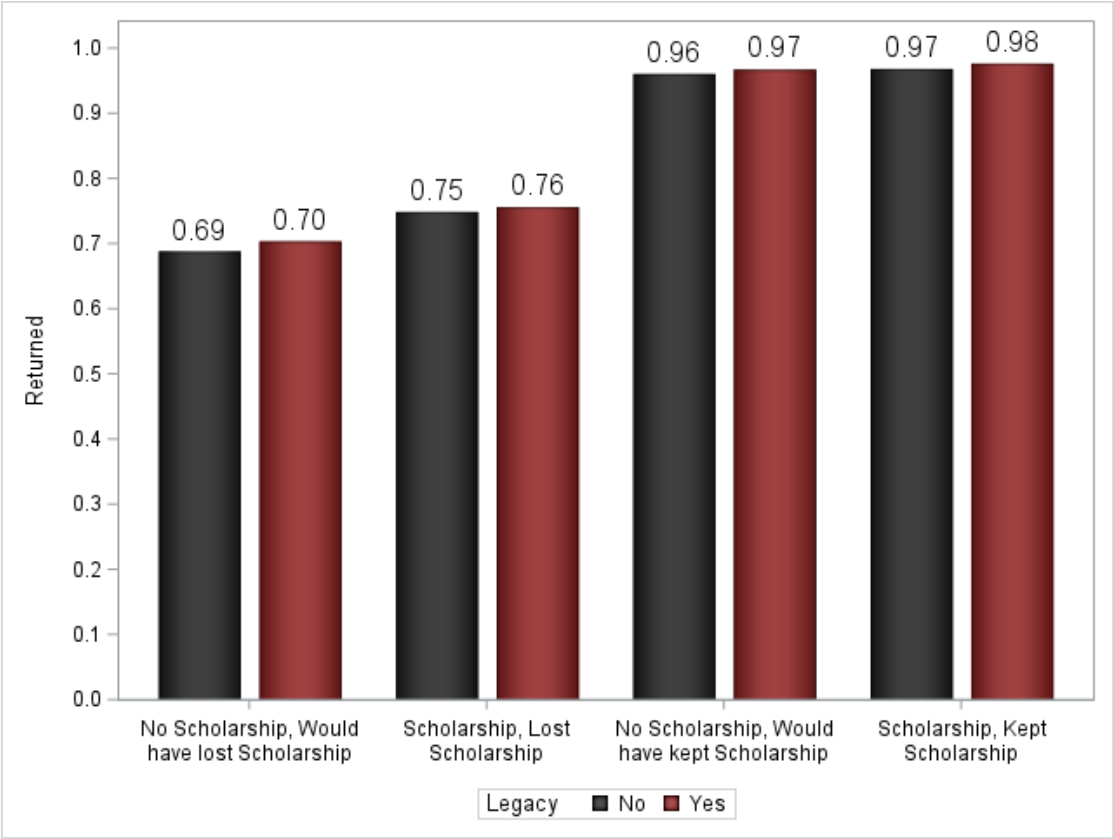

Figure 4.14. Difference in Persistence by Scholarship Retention and Legacy

Summary

A series of logistic regression models were created to examine the two primary research questions in the study: 1) what impact does institutional merit aid have on initial enrollment, and 2) what impact does institutional merit aid have on persistence?

Independent variables of interest for both questions were examined for multicollinearity, which was found to not be an issue. Models were examined and selected using the best subsets approach, with the Akaike Information Criterion (AIC) statistic serving as the primary deciding factor for choosing the single best model. Models were examined for linearity as well as interactions. An interaction was found in the model for question 1, which was addressed. The treatment variable, scholarship, was added to both models, and both models improved as a result.

For Question 1, the scholarship treatment was found to positively impact initial enrollment for non-Pell students and negatively impact initial enrollment for Pell students. The scholarship treatment also negatively impacted academic profile as measured by standardized test scores. Finally, the scholarship treatment positively impacted initial enrollment for females and non-URM students.

For Question 2, the scholarship treatment was found to positively impact overall student retention, however first-generation students, females, and students who failed to retain their scholarship were less likely to persist. Academic success as measured by first year cumulative GPA and credit hours earned were positively correlated with persistence. Finally, students who received a scholarship but did not retain the award were more likely to persist than students who did not receive it and would have lost the award.

CHAPTER 5

DISCUSSION AND CONCLUSIONS

Discussion of Research Question One

The first question to be answered is: what impact does institutional merit aid have on initial enrollment? By examining academic, financial, and biodemographic variables using logistic regression, this study found that awarding the Garnet LIFE scholarship resulted in a statistically significant positive impact on initial enrollment. An additional thirty-eight students enrolled in Fall 2019 because of the scholarship award.

However, before one can conclude that the scholarship program successfully met the objective of increasing enrollment, the scale of the increase relative to the institution's size, as well as the cost of the scholarship program relative to the results, should be considered. As the institution enrolled over six thousand freshmen in Fall 2019, this outcome represents a less than 1% increase in freshmen enrollment, which in practical terms is insignificant for an institution of this size. The institution may have been able to accomplish similar growth by simply admitting a larger percentage of its applicant pool, and instead could have used the Garnet scholarship funds for other more impactful programs that might improve enrollment, such as more targeted need-based aid, or retention-related outreach and services.

Enrollment managers and aid officers design aid programs to increase enrollment, shape the incoming class, and perhaps most importantly to maximize net tuition revenue. Therefore, the effectiveness of this program from the perspective of institutional return on investment is of particular interest. The Garnet LIFE scholarship was offered to 3,125 students for Fall 2019, of which 1,643 enrolled at a cost to the institution of $821,500 ($500 x 1,643 = $821,500). In-state tuition for the 2019-20 academic year was $12,288. The institution enrolled 234 additional resident students for Fall 2019 over Fall 2018, resulting in approximately $2.9 million dollars in additional gross revenue. However, only thirty-eight additional students can be attributed to the Garnet LIFE award, which only generated an additional $466,944 in gross tuition revenue, resulting in a financial deficit to the institution of $354,556. Therefore, while the Garnet LIFE award was effective at increasing enrollment at a modest per student cost, the additional tuition generated did not cover the overall cost of the program and is therefore a questionable institutional investment from a net tuition revenue perspective.

While return on investment from a net tuition revenue perspective is perhaps the most important institutional consideration for merit aid programs, there are other reasons institutions award merit scholarships, including raising the academic profile of the enrolled class and encouraging the enrollment of students with bio-demographic characteristics important to the institution. This study also addressed the questions of how effective merit aid is at raising the overall academic quality of the incoming class, and how does merit aid impact yield by various student characteristics.

Comparing the academic profile of the Fall 2018 class that did not receive the scholarship with the Fall 2019 class that did receive the award revealed mixed results.

The institution's average high school GPA for resident freshmen increased slightly, from 3.14 in Fall 2018 to 3.15 for Fall 2019, and the weighted core GPA (WCGPA) calculated by the institution decreased slightly, but the Garnet LIFE award was not found to have a statistically significant impact on GPA or WCGPA.

The Garnet LIFE award was found to have a statistically significant negative impact on average standardized test scores. The average ACTConv for the enrolled Fall 2018 non-scholarship recipients was 23.1 compared to 22.8 for enrolled Fall 2019 scholarship recipients, the average SAT score was 1155 for 2018 vs 1150 for 2019, and the average ACT score was 22.9 compared to 22.3. The scholarship program therefore failed to improve the academic profile of the entering class and instead caused average test scores to drop.

This result was likely expected, as the overall academic profile of the students offered the Garnet award was lower than that of other applicants. Nearly all in-state applicants received a state-funded lottery scholarship, and the best students also received other merit aid from the institution. The Garnet LIFE recipients, while generally in the top thirty percent of their respective high school graduating classes by virtue of receiving the state-funded LIFE scholarship, are academically the weakest group in the institution's freshman class. An increase in their numbers would pull down the overall institutional class average GPA and test scores.

Standardized admissions tests have become less utilized by college admissions since the COVID pandemic, as nearly 80 percent of colleges and universities have adopted test-optional or test blind policies (Churchill, 2023). Test optional policies increased during the pandemic because students were often unable to take the tests due to

lack of availability of the exam. But the movement towards test optional was underway prior to the pandemic over concerns that standardized tests impede access for low-income, first generation, and underrepresented minority students. Yet the decline in average test scores as a result of the Garnet LIFE award is a matter of concern, as test scores still are often viewed as an indicator of institutional quality and selectivity and used in rankings such as US News.

Another objective of financial aid is to increase enrollment of certain bio-demographic categories of students, such as low-income students, underrepresented minorities, and first-generation students. The Garnet LIFE award was found to have a statistically significant negative impact on initial enrollment for Pell recipients, and a positive impact on non-Pell students. Pell students who received the award were 2.4 percentage points less likely to enroll if they received the scholarship than if they did not receive the scholarship, and non-Pell students were 5 percentage points more likely to enroll if they received the scholarship than if they did not receive the scholarship. This outcome seems counter-intuitive, as financial aid in general reduces the total cost of attendance and increases affordability. For the 2019 entering class, the institution raised tuition by less than 1%, therefore the price before scholarship was practically unchanged and the award should have improved affordability, albeit slightly.

The relatively modest value of the Garnet scholarship may cause one to question the impact on affordability, and whether affordability came into play for students when considering enrollment. The Garnet LIFE scholarship in the amount of $500 per year was awarded to instate students who also received a state-funded LIFE award in the amount of $5000 per year, but no other merit aid from the institution. The LIFE scholarship

covered approximately 41% of tuition for the 2019-2020 year, and the Garnet Life award covered an additional 4.1%. Accounting for the slight increase in tuition, the net value of the Garnet LIFE scholarship was $430/year, roughly the equivalent of one semester's expenses for books and supplies, which perhaps was not meaningful enough for low-income students.

The Garnet LIFE merit award enrollment outcome supports Monks (2009) findings that when cost remains relatively unchanged, students are more likely to enroll if they receive a scholarship, although this study revealed differences between Pell and non-Pell students. Singell and Stone (2002) concluded that merit aid has a greater effect on affluent students, in this case students who are not receiving Pell grants, who are more likely to enroll when receiving a scholarship. This is consistent with the widely held believe among enrollment professionals that parents in particular like to brag about their students receiving merit scholarships to attend more prestigious institutions, even if the scholarship value is small.

The findings are also consistent with Demand Theory, which suggests that desirability for a product is a function of price of the product, income of the buyer, the price of alternative products, and buyer tastes and preferences (Leslie & Brinkman, 1987). When applied to higher education, Student Demand Theory suggests that enrollment rates are positively impacted by financial aid (Leslie & Brinkman, 1987; Heller, 1997). However, Heller (1997) further noted that the effect of aid varies by student income and race, finding that low-income students are more sensitive to aid than middle-and-upper income students, and black students are more sensitive to aid than their

white counterparts. Therefore, as aid increases, low-income and black student enrollment should increase as a result, assuming all other factors remain unchanged.

While most findings of this study support Student Demand Theory, this study found that in some cases institutional merit aid awarded to low-income students may deter enrollment. Framing the question from a slightly different angle, why did Pell students who did not receive the scholarship enroll at higher rates than Pell students who did receive the scholarship? Why doesn't Pell student behavior in this case seem consistent with student Demand Theory? This question merits further research, however the researcher can speculate about several possible reasons, including: the initial excitement and optimism low-income students may have experienced upon learning about the scholarship award faded once the net value of the award was realized and determined to be insufficient to address the students' ability to afford attending the institution. This "let down effect" could be because the small value of the award is more discouraging and insulting to students than receiving no merit award at all.

Perhaps Pell students never expected to receive a merit award in the first place and would have accepted a lack of merit aid as "just the way it is" at public schools with limited aid budgets. But, once received, the scholarship introduced the idea they are in fact deserving of merit aid and may be eligible for scholarships at other institutions, and they found institutions that would offer better merit aid packages. Perhaps they used the Garnet LIFE award to negotiate better scholarships from other less prestigious or less expensive institutions. It is also possible external factors changed, for example other institutions may have modified their aid awards the year the Garnet LIFE award was offered.

For the non-Pell students, the positive impact of the award on enrollment supports Avery & Hoxby's 2004 findings that more affluent students "irrationally" respond to aid being positioned as a "merit scholarship" rather than as a grant or need-based aid, and the amount of the scholarship is less important for these students than more needy students. The flattery of receiving a scholarship, regardless of value, is appealing to wealthier students and their parents, who may then brag about receiving the award. Therefore, merit aid of relatively small amounts, sometimes referred to as "vanity" awards, may have a benefit to some students beyond impacting net price and affordability. This supposition should be further investigated from a psychological perspective.

The Garnet LIFE award was also found to positively impact the initial enrollment of non-URM students, who were three percentage points more likely to enroll when receiving the scholarship than when they did not. A higher percentage of URM students that received the scholarship enrolled than URMs who did not receive the award, however the increase for URMs was not found to be statistically significant.

As with URM students, the Garnet LIFE award was found to have a positive impact on the initial enrollment of female students, but no significant impact on male students. Both males and females who received the award enrolled at slightly higher percentages than those who did not. The same is true for first generation, non-first generation, legacy and non-legacy populations; all categories that received the scholarship enrolled at higher rates than those who did not receive the scholarship, but these findings were not statistically significant.

One criticism of merit aid is that it often goes to those students who enroll anyway (Monks, 2009). While the findings of this study don't completely support this

criticism, neither do they refute it. The Garnet LIFE award may have enticed a few more low income, first-generation and underrepresented minority students to enroll at the institution. These students benefited from the award, as the scholarship may have given them the confidence and resources to attend the state's flagship institution rather than a less selective or prestigious institution. Perhaps their lives were changed for the better as a result. But this study was unable to confirm this in the data analysis and therefore additional research is recommended. What is clear is most of the Garnet LIFE awards went to students who would have enrolled at the institution without the scholarship.

From an institutional return on investment perspective, the Garnet LIFE award was effective at increasing enrollment, but from a practical lens the results were minor and did not justify the cost of the program. From a student perspective, a small number of low income and underrepresented students benefited, but most students who received the award did not need the scholarship to attend college.

While no interactions were found between the variables of Pell, FirstGen, and URM, there is considerable overlap in the student populations of Pell-eligible, first generation, and underrepresented minorities, none of which showed improvements in initial enrollment because of this scholarship. As this study found a negative impact on Pell students, it is reasonable to assume many first-generation students and minority students may have also been negatively impacted, or at least not positively impacted.

The groups that did enroll at significantly higher rates—non-URM, non-Pell, and females—are all student groups that are well represented in the freshman class. If an objective of the Garnet LIFE award was to encourage initial enrollment of underrepresented groups of students, this study did not find evidence the scholarship

program met that objective. Further study is recommended to examine the impact of merit aid on minority and first-generation students, which perhaps may reveal levels of merit aid that could positively impact the enrollment of underrepresented groups more significantly than need-based aid awards of the same value.

Enrollment management practitioners must balance competing objectives of access and affordability, academic profile, and net tuition revenue when crafting financial aid programs for initial enrollment. This study found the Garnet LIFE scholarship does not appear to have positively impacted any of these objectives. Adding a few students at high cost while subsequently lowering the academic profile and diversity of the freshman class is not a narrative enrollment managers want to defend. Practitioners should carefully consider these findings when constructing similar merit aid programs designed to increase initial enrollment.

Discussion of Research Question Two

The second question to be answered is: what impact does institutional merit aid have on student persistence? By examining academic, financial, and biodemographic variables using logistic regression, this study found that awarding the Garnet LIFE scholarship resulted in a statistically significant positive impact on student persistence. When controlling for other variables, students who received the scholarship were 2.25 percentage points more likely to retain than students who did not receive the scholarship. An additional thirty-seven students that enrolled in Fall 2019 were likely retained the following year because of the scholarship award. As most attrition occurs between the

first and second year of college, the Garnet LIFE award will likely result in an additional thirty students ultimately graduating from the institution, positively impacting the lives of these students. And, as all the scholarship recipients were residents of the State of South Carolina, the scholarship program has at least to some degree helped the institution fulfill its responsibility to educate more of the state's citizens.

As discussed in Question 1, institutions must be able to measure return on investment in order to justify merit aid programs. If the cost of the program exceeds the benefits, whether measured by net tuition revenue over costs, or other benefits such as the persistence of students the institution wishes to encourage, the institution may be better served by discontinuing the program and redirecting the program resources to other more impactful programs and services that improve student retention.

The institutional return on investment for this program for the second year can be determined by comparing the total cost for all students who retained the award and the gross tuition generated by the increase in retention attributable to the Garnet LIFE award. For the second year of enrollment, 824 students who received the scholarship persisted at total scholarship outlay of $412,000 (825 x $500). An additional 37 students persisted as a result of the scholarship, who generated gross tuition revenue in the amount of $466,944 (37 x $12,288.) Therefore, in financial terms, the net tuition revenue generated because of the Garnet LIFE award was $54,944, just over a 13% one-year rate of return on the institution's investment. However, this gain in net tuition revenue in year two does not overcome the first-year deficit of $354,556, nor will the additional tuition generated by these students' continued persistence to graduation.

In addition to the overall impact on retention, the researcher sought to determine if persistence is impacted when students do not retain their merit aid, and to determine if persistence varies by demographic characteristics. Differences were observed by first generation status, gender, whether the students met the academic requirements to retain the scholarship award, and by academic performance in the first year as measured by cumulative grade point average and cumulative hours earned. In general students who received the scholarship retained at 2.25 percentage points higher than students who did not receive the award, However, when controlling for other variables, first-generation students who received the scholarship were 1.8 percentage points less likely to persist than first-generation students who did not receive the award, females who received the award were 1.5 percentage points less likely to persist than females who did not receive the award, and students who did not meet the academic requirements to retain the scholarship were 2 percentage points less likely to persist than students who retained the scholarship. This is disconcerting because underserved students like these are the very students the institution would have wanted to help the most.

Similar to the initial enrollment findings of Question 1, the Garnet LIFE award was not found to significantly impact retention for students about which institutions are often most concerned: low income, first generation, and underrepresented minorities. And, in the case of females and first-generation students, the Garnet LIFE award was found to negatively impact retention. This finding is a concern for enrollment management professionals, who are often charged with increasing access for underrepresented and under-resourced students and should be explored further in future research.

Variables of academic performance in the first year of enrollment were found to be the strongest indicators of likelihood to persist, which is consistent with several other studies (Hu & St. John, 2001; Adelman, 1999; Tinto, 1975). For every additional credit hour earned, students who received the scholarship were 2.4 percentage points more likely to persist than students who did not receive the award. And for every additional point of cumulative grade point average, scholarship students were 4 percentage points more likely to persist than non-scholarship students.

This study does not include data analysis that determines why students receiving the scholarship and who also performed well academically persisted at higher rates than non-scholarship students with similar academic performance. It could be that the scholarship value provided additional motivation to remain enrolled from an affordability standpoint, however the relatively small amount of the award does not seem to support that theory.

Perhaps the most interesting finding is that students who received the scholarship but failed to meet the academic requirements to retain the award persisted at higher rates than students who failed to meet the academic requirements and did not receive the scholarship award. Of the students who were academically eligible to keep the scholarship, the scholarship group retained at slightly higher rates than those who did not receive the scholarship (96.97% vs 96.21%). But, of those students who did not meet the scholarship retention requirements, the students who received the award initially retained at much higher rates than those who did not receive the award (75% vs 69.1).

The Garnet LIFE scholarship appears to have had a positive impact on persistence even for those students who lost the scholarship after their first year of enrollment. This

phenomenon was consistent for all groups of students of interest in this study: males and females; URM and non-URM; Pell and non-Pell; legacy and non-legacy; and first generation and non-first-generation students. This is a curious contradiction with the findings that first-generation students and female students who received the scholarship were less likely to retain than those who did not receive the award.

While encouraging, these results should be interpreted with a level of caution for several reasons. First, the students' overall financial situation is not clear. Students likely had sufficient other aid or financial resources at their disposal so that the Garnet LIFE had minimal impact on affordability. Given the relatively modest value of the Garnet LIFE award, it is unlikely their ability to afford college was significantly impacted by losing the scholarship, unless they also lost their more valuable lottery-funded LIFE scholarship, which would have had a much more significant financial impact.

Second, it is not known exactly why students failed to meet their academic requirements to retain the scholarship. All students that received Garnet LIFE were expected to be academically successful, otherwise they would not have been admitted, nor would they have received a scholarship based on academic merit and potential. It is possible that these students, who were academic high-flyers in high school, found themselves no longer at the top of their classes in college. They may have encountered academic difficulty for the first time and were unprepared to adjust to a new level of rigor and expectations in the college classroom.

A third reason to exercise caution and avoid over-generalizing these results is the researcher was not able to consider as part of this study any personal circumstances or other factors known to impact retention, such as whether or not some students changed

academic majors because of a poor academic fit, if some experienced homesickness or anxiety, if the students encountered any health or personal issues during their first year, if students lived on or off campus, and whether or not the student participated in extracurricular activities.

A fourth and perhaps most significant factor is that the students receiving the scholarship started college Fall 2019 and were subject to the effects of the COVID-19 pandemic during their second semester of enrollment. The National Student Clearinghouse (n.d.) reported undergraduate enrollment declined nationally by 4.4% for Fall 2020, as many students, especially males and minority students, chose to opt out of online and hybrid learning. Like most higher education institutions, the University of South Carolina converted to on-line instruction during the Spring 2020 semester, canceled most extra-curricular activities, and implemented health precautions that limited student interaction and fundamentally changed the student experience. The institution also implemented emergency pass/fail grading and did not suspend or dismiss students for poor academic performance during Spring 2020, the first semester of COVID. This institutional action was taken to mitigate the negative impact of COVID on student retention and likely affected the results of question 2 in this study.

The institution experienced a decrease in retention during COVID as well. Yet it is possible the Garnet LIFE scholarship mitigated some of the COVID effect on retention and, had the scholarship program been implemented in a year without COVID, it may have had a stronger positive impact on student retention than what was discovered in this study. Regardless of any mitigating effect of the scholarship, it seems likely that the COVID pandemic had some effect on persistence, especially for those students who did

not meet the academic requirements to retain their Garnet LIFE award. Further research is recommended to better understand why students failed to meet the scholarship retention requirements, how that impacted their decision to persist or drop out of college, and if the effects of the COVID pandemic were contributing factors.

Even considering these cautionary arguments against over-generalization, the finding that students who received the Garnet LIFE award but failed to retain the scholarship had higher retention rates than students that did not receive the scholarship and also failed to meet the scholarship retention requirements is notable. Similar to the findings of Question 1 on initial enrollment, these findings suggest that there is some motivational effect in small value "vanity" scholarships awarded to students who do not receive other merit scholarships from the institution on student persistence. The difference is that the scholarship effect on persistence for students that did not meet the scholarship retention requirements was observed across all groups of students, while the scholarship effect on initial enrollment primarily impacted majority students and wealthier students.

As discussed in Chapter 2, literature relating merit aid to persistence is lacking. It is unclear how students factor their aid awards into their decisions to persist (Swail, 2003). But this study does seem to show that the scholarship provided additional motivation for students to achieve academic success, perhaps in part to meet the requirements to retain the award, which in turn resulted in additional confidence and optimism for continued enrollment. Even if they fail to retain their awards, scholarship recipients may feel a stronger connection to the university as a result of receiving the award, believing the institution has confidence in their abilities, is rewarding them for

past success, and investing in their future. Perhaps this reciprocity of commitment creates a mutual affirmation effect, strengthening the bond between students and the institution. Additional study is recommended to further explore the merits of this theory.

Implications for Practice

Enrollment managers are charged with meeting institutional enrollment goals, including headcount, academic ability, diversity, net tuition revenue, and retention and graduation rates. Changing student demographics, restricted aid budgets, and declining numbers of high school graduates make it imperative that practitioners are knowledgeable of student preferences and the factors that influence enrollment and persistence. Data-driven approaches to understanding the enrollment management landscape are necessary in order to identify, create, and evaluate campus-based programs designed to meet enrollment goals.

Enrollment managers should evaluate the return on institutional investment for scholarship programs like the one examined in this study and should develop their own models and research to make these determinations. Practitioners are encouraged to replicate this analysis at their own institutions and examine other variables that might provide greater insights into student enrollment decisions. This study was conducted at a large, public flagship research university located in the Southeastern United States with an enrollment over 35,000 students. A limitation of this study is that the results may not be applicable to dissimilar institutions.

Since institutional merit programs are by nature institutional specific, analysis of variables included in this study as well as others not examined may provide different insights at other institutions that are more relevant to their student outcomes. In other words, when it comes to merit aid, what is effective at one school may not be so effective at another. Scholarship programs should therefore be institutionally tailored, because while all schools likely want to improve enrollment and retention in general, they may have different objectives for specific populations of students.

Institutional merit scholarship programs are ostensibly created to meet certain institutional goals. Enrollment practitioners are often concerned first and foremost with generating additional net tuition revenue, but there are institutional goals that are important to achieve regardless of the cost and impact on tuition revenue. Rather, the scholarship program may be viewed as an investment in achieving these goals. For example, most institutions are interested in increasing the enrollment and persistence of underrepresented racial minorities, and some schools utilize financial aid in the form of scholarships to attract and retain minority students. However, given the case about affirmative action in university admissions currently being considered by the United States Supreme Court, institutions are cautioned that scholarship programs based on race are likely to be impacted by the Court's pending decision.

In the case of the Garnet LIFE award, the program was intended to attract more students to enroll at the institution, and for those students to persist and graduate from the institution. While this study was able to find some statistically significant evidence that vanity scholarship awards are effective at increasing initial enrollment and student persistence, the relatively minor improvement in these enrollment outcomes may not

justify the cost of the program, particularly if the students who benefit are mostly those who are already likely to enroll and persist at the university. Further, if the scholarships are less likely to improve student diversity, such programs should be carefully evaluated to determine if they are the best use of institutional funds. If the data does not prove the program to be a good use of funds, practitioners are encouraged to find a better use for these institutional funds.

Suggestions for Future Research

This study is but one of a few that explore the impacts of institutional merit scholarships, and there remains much to be discovered about this form of financial aid. This study was limited to one institution and one specific merit scholarship of relatively small value. The population of students were all charged essentially the same resident tuition. And, while this study did examine the effects by bio-demographic characteristics, the scholarship program itself was not targeted at students based on race, gender, income level, or other characteristics other that state of residency and those students who receive a state-funded scholarship as well. This study prompts the researcher to encourage future research on institutional merit aid, including:

- Additional study by student category is recommended, especially low income and minority students, who may respond differently to vanity awards. The response of Pell students discussed in question 1 is particularly curious, as it runs counter to Demand Theory. An experiment where two groups of Pell students receive the same dollar amount award, with the award for one group framed as a need-based

grant and the other as a scholarship would test whether labeling the award as a scholarship has value in the enrollment decision.

- There is much to be learned about merit scholarship from a variety of other angles including the impact of different scholarship amounts. As practitioners seek to optimize aid awards so that positive enrollment outcomes are achieved at the lowest possible cost to the institution, further research is needed to evaluate merit awards of differing amounts. A variation would be to offer both scholarships and grants of different values to determine if increasing values of awards have a positive impact, and if there is an optimal price point, and if there is a diminishing value after a particular price point. This could be particularly illuminating for Pell and minority students.
- Also, many public institutions offer aid to attract out-of-state students and would therefore benefit from similar study of non-resident merit aid recipients. Practitioners would benefit from knowing if small vanity awards to non-residents had a positive impact on enrollment and persistence.
- Much attention is given to incoming freshmen and how well they persist. Freshmen tend to receive more merit aid than other categories of students, such as transfer students, however transfers may become an increasingly important source of student enrollments, particularly as the number of high school graduates is expected to decline in coming years. Colleges and universities may expand merit aid offerings to transfers and would therefore benefit from additional study of merit aid on transfer enrollment behaviors.

- This study suggests that small vanity awards may have some perceived benefit beyond the dollar amount of the award. Despite the relatively small value of the award, they may nonetheless capture the attention of students and their parents so that they consider the institution carefully enough that they end up choosing to enroll for reasons other than the vanity scholarship.
- Additional study of psycho-social factors that may explain student's reactions to merit aid and their decision-making process to enroll and persist in college is recommended. Practitioners may find that aid offered as "scholarships" may evoke a different response from students than awards of equal value that are positioned as grants rather than scholarships.
- Similarly, it is suggested to explore if merit aid creates a stronger connection or extra motivation to persist that is not as pronounced when aid is framed as need-based aid.
- While admittedly difficult to compare aid awards across institutions, a useful study would be to identify students that were offered aid from multiple institutions to determine the impact of aid on college choice.
- This study was quantitative in nature and, while statistical analysis is effective at understanding what occurred, it is limited by the variables at the researcher's disposal. In order to better understand student behavior, a qualitative study that included interviews with students who were offered the scholarship as well as those who were not would reveal additional insights on initial enrollment. In addition, interviews with students who retained as well as those who left the institution would glean insights that would supplement this study's results.

Summary and Conclusion

This study sought to contribute to the literature by examining the effect of institutional merit aid on initial enrollment as well as student persistence. A quasi-experimental design was used to study two nearly identical cohorts of students; one cohort received a small "vanity" scholarship while the other cohort did not. Binary logistic regression models were run to determine the impact of these scholarships on initial enrollment and retention.

The results of this study found the Garnet LIFE scholarship had a statistically significant positive impact on overall initial enrollment, however it failed to increase net tuition revenue or improve the academic profile of the entering class. The study also found that the scholarships went to students who were already likely to enroll at the institution, that it mainly encouraged enrollment of females and majority students, and likely deterred enrollment of low-income Pell students. From a practical standpoint, the minor gains in overall enrollment and lack of positive impact on important categories of students do not appear to justify the cost of the scholarship program.

This study also found the Garnet LIFE scholarship had a statistically significant positive impact on overall student persistence, but the gains in retention did not increase net tuition revenue. While overall retention improved for scholarship recipients, retention of males and first-generation students were negatively impacted by the scholarship. This finding also calls into question the return on institutional investment for this scholarship program.

Lastly, the Garnet LIFE award appears to have had a positive impact on retention even for students who lost their scholarship after the first year of enrollment. This finding is encouraging, as vanity scholarships may have some motivating effect and value to the student that is greater than the modest dollar amount of the award.

It should be noted that the institution discontinued the Garnet LIFE scholarship after one year. The results of this study provide additional justification for that decision.

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APPENDIX A: VARIABLES

Table A.1

Variable Descriptions and Data Source

Variable Name	**Description**	**Data Source**
ACTCOMP	Admissions test score used for admissions decision. Missing if the ACT was not the highest test score admitted.	Fall 2018 Admissions Research Dataset. Fall 2019 Admissions Research Dataset
ACTConv	If a student only submits an ACT score, the ACT Composite score was used. If a student submits only an SAT, the converted SAT to ACT value was used. If a student submits both an ACT and SAT score, the higher score (converted SAT to ACT or actual ACT score) was used.	Fall 2018 Admissions Research Dataset. Fall 2019 Admissions Research Dataset
AnyFinAid	Specifies whether or not a student received any scholarships, grants, or loans during the academic year.	Academic Year 2018-2019 Financial Aid Research Dataset Academic Year 2019-2020 Financial Aid Research Dataset
AnyFinAid_Amt	Total amount of scholarships, grants, and loans received by a student for the academic year.	Academic Year 2018-2019 Financial Aid Research Dataset Academic Year 2019-2020 Financial Aid Research Dataset
AnyStudLoan	Specifies whether or not a student received any student loans during the academic year.	Academic Year 2018-2019 Financial Aid Research Dataset Academic Year 2019-2020 Financial Aid Research Dataset
AnyStudLoan_Amt	Amount of student loans received by student during the academic year.	Academic Year 2018-2019 Financial Aid Research Dataset

		Academic Year 2019-2020 Financial Aid Research Dataset
AWEval	Measure of academic work ethic.	Fall 2018 Admissions Research Dataset. Fall 2019 Admissions Research Dataset
AWE	Variable indicating whether a student's AWEval is one-half standard deviation or more below the average AWE score of all applicants.	Fall 2018 Admissions Research Dataset. Fall 2019 Admissions Research Dataset
Enrolled	Specifies whether or not the applicant enrolled.	Fall 2018 Admissions Research Dataset Fall 2019 Admissions Research Dataset
FirstGen	If neither parent attended college, the applicant is considered a first-generation college student.	Fall 2018 Admissions Research Dataset. Fall 2019 Admissions Research Dataset
First_Yr_Cum_GPA	Cumulative institutional grade point average at the conclusion of the first year of enrollment	Enrollment Analytics Longitudinal Dataset
First_Yr_Cum_HE	Cumulative institutional credit hours earned at the conclusion of the first year of enrollment	Enrollment Analytics Longitudinal Dataset
FM_Gross_Need	Calculated amount of money a student can contribute toward their educational expenses.	Academic Year 2018-2019 Financial Aid Research Dataset Academic Year 2019-2020 Financial Aid Research Dataset
Gender	Reported gender of the applicant.	Fall 2018 Admissions Research Dataset. Fall 2019 Admissions Research Dataset
HighLoan	Specifies if student has student loans greater than the median loan amount in the cohort.	Created variable using data from the 2018 and 2019 Fall Admissions Research Datasets
HistoricURM	Specifies if student identifies with a historically underrepresented minority group as defined by the National Science Foundation	Created variable using data from the 2018 and 2019 Fall Admissions Research Datasets
HSGPA	High school grade point average.	Fall 2018 Admissions Research Dataset.

		Fall 2019 Admissions Research Dataset
ID	Unique student identification number assigned by the institution	Fall 2018 Admissions Research Dataset. Fall 2019 Admissions Research Dataset
Legacy	If at least one parent attended UofSC, the applicant is considered to be legacy.	Fall 2018 Admissions Research Dataset. Fall 2019 Admissions Research Dataset
Lost_Scholarship	Indicates whether or not the student satisfied requirements to retain the GARNET scholarship award the second year of enrollment.	Created variable using data from the 2018 and 2019 Fall Admissions Research Datasets
PELL	Specifies whether or not a student received a Pell grant.	Fall 2018 Admissions Research Dataset. Fall 2019 Admissions Research Dataset
Race	IPEDS calculated race	Fall 2018 Admissions Research Dataset. Fall 2019 Admissions Research Dataset
Retention	Specifies whether or not a student returned for their second fall semester.	Enrollment Analytics Longitudinal Dataset
SATT	Admissions test score used for admissions decisions. Super-scored. If taken before the SAT revision, converted to the SAT revised score. Missing if the SAT was not the highest test score submitted.	Fall 2018 Admissions Research Dataset. Fall 2019 Admissions Research Dataset
Scholarship	Identifies applicants who were eligible to receive the new Garnet scholarship in 2018 and those who received the Garnet scholarship in 2019.	Created variable using data from the 2018 and 2019 Fall Admissions Research Datasets
WCGPA	Weighted core grade point average	Fall 2018 Admissions Research Dataset Fall 2019 Admissions Research Dataset

APPENDIX B: QUESTION 1 MODELS

Table B.1

Model Selection Analysis Statistics for Research Question 1

# of Variables	Model	Chi-Square Score	AUC	AIC
1	Pell	196.2017	0.5649	8113.354
1	Legacy	25.5322	0.5257	8289.702
1	AWEval	13.3354	0.525	8304.717
1	HighLoan	3.9508	0.5022	8310.609
1	Gender	2.4837	0.5099	8312.867
1	HistoricURM	0.9295	0.5052	8314.237
1	FirstGen	0.8088	0.5053	8314.425
2	Legacy + Pell	241.5377	0.594	8069.392
2	AWEval + Pell	215.9069	0.5903	8085.311
2	HistoricURM + Pell	207.8964	0.5811	8102.952
2	FirstGen + Pell	203.889	0.5794	8107.419
2	Gender + Pell	200.6263	0.5771	8110.962
2	HighLoan + Pell	196.6012	0.5657	8114.743
3	Legacy + AWEval + Pell	259.7363	0.6124	8042.416
3	HistoricURM + Legacy + Pell	250.4875	0.6037	8061.794
3	Gender + Legacy + Pell	245.3487	0.6032	8067.572
3	Legacy + FirstGen + Pell	242.4819	0.5983	8070.36
3	HighLoan + Legacy + Pell	242.0377	0.5944	8070.678
3	HistoricURM + AWEval + Pell	226.1178	0.601	8076.507
3	FirstGen + AWEval + Pell	222.1214	0.5967	8080.784
4	HistoricURM + Legacy + AWEval + Pell	267.4763	0.6181	8036.135
4	Gender + Legacy + AWEval + Pell	260.4702	0.6132	8043.64
4	HighLoan + Legacy + AWEval + Pell	260.2970	0.613	8043.789
4	Legacy + FirstGen + AWEval + Pell	260.2543	0.6132	8043.819
4	HistoricURM + Gender + Legacy + Pell	253.9138	0.6092	8060.365

4	HistoricURM + Legacy + FirstGen + Pell	251.0591	0.6057	8063.171
4	HighLoan + HistoricURM + Legacy + Pell	250.9280	0.6042	8063.162
4	Gender + Legacy + FirstGen + Pell	246.2155	0.6053	8068.621
4	HighLoan + Gender + Legacy + Pell	245.8891	0.6038	8068.821
4	HighLoan + Legacy + FirstGen + Pell	243.0062	0.5984	8071.62
5	HistoricURM + Gender + Legacy + AWEval + Pell	268.1103	0.6186	8037.468
5	HighLoan + HistoricURM + Legacy + AWEval + Pell	267.9761	0.6185	8037.576
5	HistoricURM + Legacy + FirstGen + AWEval + Pell	267.7533	0.6183	8037.812
5	HighLoan + Gender + Legacy + AWEval + Pell	261.0467	0.6138	8044.996
5	Gender + Legacy + FirstGen + AWEval + Pell	260.9814	0.6139	8045.05
5	HighLoan + Legacy + FirstGen + AWEval + Pell	260.8334	0.6137	8045.171
5	HistoricURM + Gender + Legacy + FirstGen + Pell	254.4348	0.6102	8061.795
5	HighLoan + HistoricURM + Legacy + FirstGen + Pell	251.5184	0.606	8064.5178
5	HIghLoan + Gender + Legacy + FirstGen + Pell	246.7797	0.6058	8069.843
6	HighLoan + HistoricURM + Gender + Legacy + AWEval + Pell	268.6243	0.619	8038.894
6	HistoricURM + Gender + Legacy + FirstGen + AWEval + Pell	268.3839	0.6187	8039.148
6	HighLoan + HistoricURM + Legacy + FirstGen + AWEval + Pell	268.2666	0.6187	8039.237
6	HighLoan + Gender + Legacy + FirstGen + AWEval + Pell	261.5764	0.6144	8046.358
6	HighLoan + HistoricURM + Gender + Legacy + FirstGen + Pell	254.931	0.6108	8063.106
6	HighLoan + HistoricURM + Gender + FirstGen + AWEval + Pell	232.3323	0.6057	8075.951
7	HighLoan + HistoricURM + Gender + Legacy + FirstGen + AWEval + Pell	268.9115	0.6192	8040.558

APPENDIX C: QUESTION 1 INTERACTION PLOTS

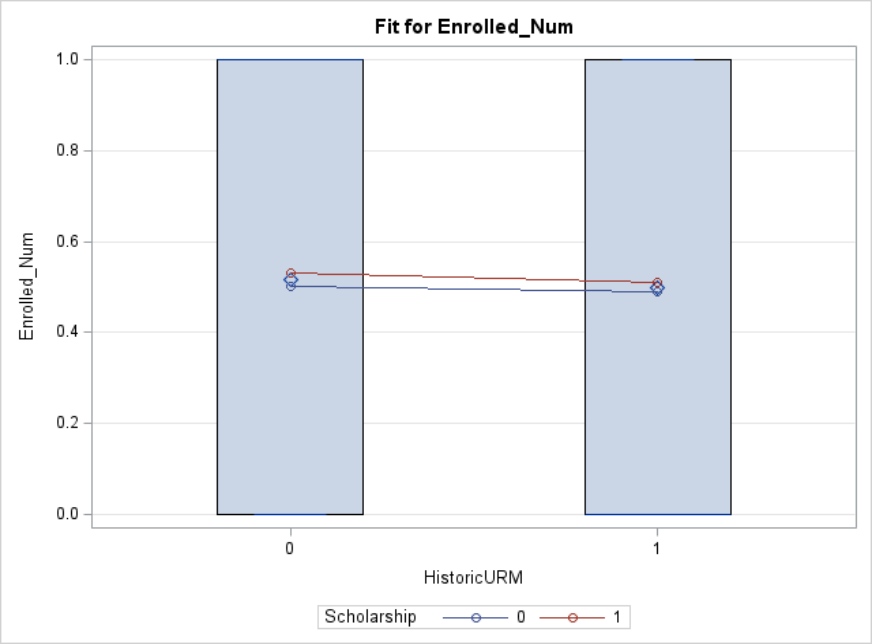

Figure C.1. Historic URM and Scholarship Interaction Plot

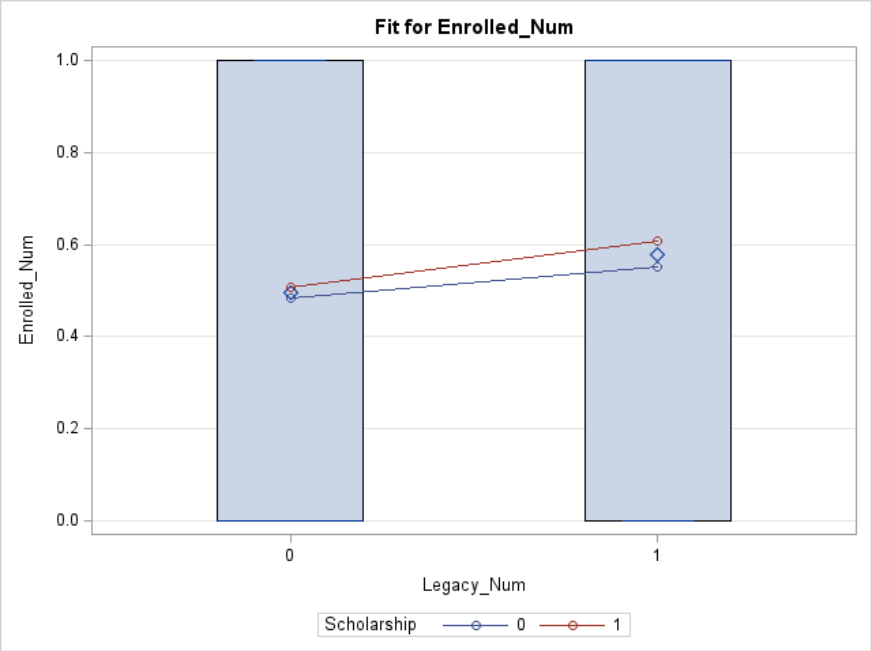

Figure C.2. Legacy and Scholarship Interaction Plot

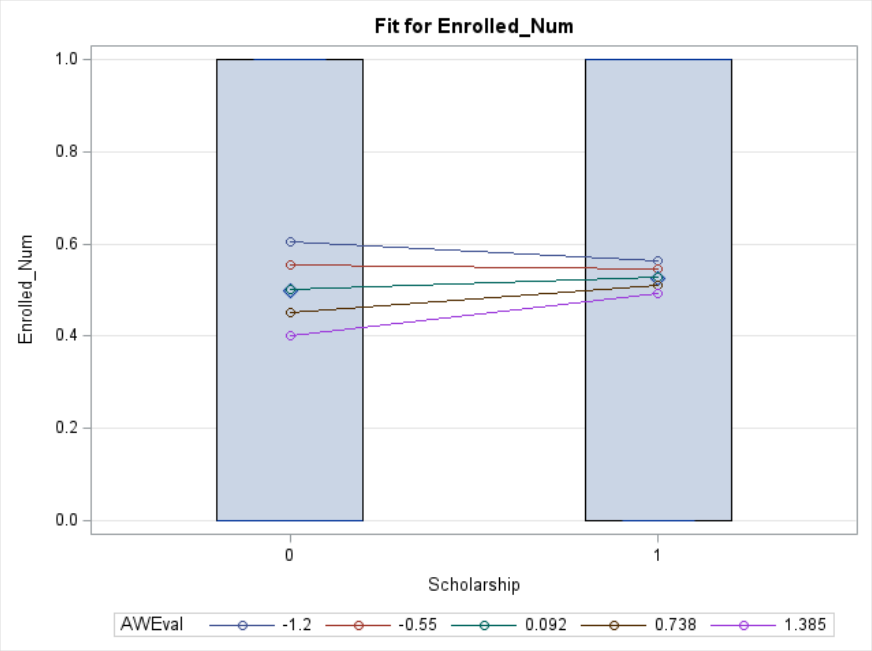

Figure C.3. AWEval and Scholarship Interaction Plot

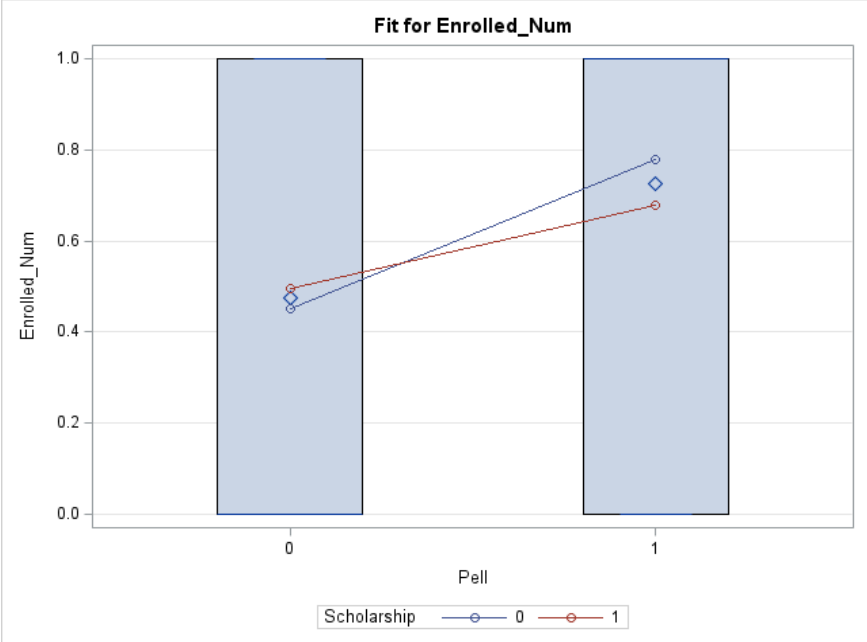

Figure C.4. Pell and Scholarship Interaction Plot

APPENDIX D: QUESTION 2 MODELS

Table D.1

Model Selection Analysis Statistics for Research Question 2

# of Variables	Model	Chi-square Score	AUC	AIC
1	First_Yr_Cum_HE	1226.8175	0.8619	1557.576
1	First_Yr_Cum_GPA	541.1314	0.7555	2135.667
1	LostSchl	354.4742	0.7382	2199.719
2	First_Yr_Cum_GPA + First_Yr_Cum_HE	1238.9887	0.8690	1549.673
2	First_Yr_Cum_HE + FirstGen	1232.3579	0.8646	1555.153
2	First_Yr_Cum_HE + Legacy	1228.9618	0.8625	1557.060
2	First_Yr_Cum_HE + Gender	1228.3206	0.8630	1558.708
2	First_Yr_Cum_HE + AWEval	1227.8828	0.8621	1559.115
2	First_Yr_Cum_HE + LostSchl	1227.6581	0.8696	1552.702
2	First_Yr_Cum_HE + Pell	1227.1020	0.8637	1559.308
2	First_Yr_Cum_HE + HighLoan	1226.8567	0.8620	1559.468
2	First_Yr_Cum_HE + HistoricURM	1226.8191	0.8624	1558.932
3	First_Yr_Cum_GPA + First_Yr_Cum_HE + FirstGen	1244.2829	0.8713	1547.402
3	First_Yr_Cum_GPA + First_Yr_Cum_HE + Gender	1242.8750	0.8716	1548.751
3	First_Yr_Cum_GPA + First_Yr_Cum_HE + Legacy	1240.9209	0.8698	1549.029
3	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl	1239.3744	0.8707	1549.298
3	First_Yr_Cum_GPA + First_Yr_Cum_HE + Pell	1239.2908	0.8699	1551.372
3	First_Yr_Cum_GPA + First_Yr_Cum_HE + HighLoan	1239.0505	0.8692	1551.564
3	First_Yr_Cum_GPA + First_Yr_Cum_HE + HistoricURM	1239.0146	0.8695	1550.942
3	First_Yr_Cum_GPA + First_Yr_Cum_HE + AWEval	1238.9963	0.8694	1551.163
4	First_Yr_Cum_GPA + First_Yr_Cum_HE + Gender + FirstGen	1247.6774	0.8735	1546.707

4	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + FirstGen	1244.8059	0.8733	1547.182
4	First_Yr_Cum_GPA + First_Yr_Cum_HE + Legacy + FirstGen	1244.7455	0.8714	1548.377
4	First_Yr_Cum_GPA + First_Yr_Cum_HE + Gender + Legacy	1244.6953	0.8726	1548.142
4	First_Yr_Cum_GPA + First_Yr_Cum_HE + HistoricURM + FirstGen	1244.5406	0.8719	1548.235
4	First_Yr_Cum_GPA + First_Yr_Cum_HE + FirstGen + AWEval	1244.3963	0.8715	1549.051
4	First_Yr_Cum_GPA + First_Yr_Cum_HE + FirstGen + Pell	1244.3209	0.8713	1549.402
4	First_Yr_Cum_GPA + First_Yr_Cum_HE + HighLoan + FirstGen	1244.3156	0.8715	1549.348
5	First_Yr_Cum_GPA + First_Yr_Cum_HE + Gender + FirstGen + AWEval	1248.2854	0.8736	1548.466
5	First_Yr_Cum_GPA + First_Yr_Cum_HE + Gender + Legacy + FirstGen	1248.1340	0.8738	1547.668
5	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + Gender + FirstGen	1248.0446	0.8756	1546.325
5	First_Yr_Cum_GPA + First_Yr_Cum_HE + HistoricURM + Gender + FirstGen	1247.9976	0.8741	1547.397
5	First_Yr_Cum_GPA + First_Yr_Cum_HE + Gender + FirstGen + Pell	1247.7547	0.8734	1548.685
5	First_Yr_Cum_GPA + First_Yr_Cum_HE + HighLoan + Gender + FirstGen	1247.6947	0.8736	1548.678
6	First_Yr_Cum_GPA + First_Yr_Cum_HE + Gender + Legacy + FirstGen + AWEval	1248.7355	0.8738	1549.417
6	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + Gender + FirstGen + AWEval	1248.7122	0.8757	1548.062
6	First_Yr_Cum_GPA + First_Yr_Cum_HE + HistoricURM + Gender + FirstGen + AWEval	1248.5407	0.8742	1549.149
6	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + Gender + Legacy + FirstGen	1248.5303	0.8760	1547.444
6	First_Yr_Cum_GPA + First_Yr_Cum_HE + HistoricURM + Gender + Legacy + FirstGen	1248.5056	0.8745	1548.238
6	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HistoricURM + Gender + FirstGen	1248.3497	0.8758	1546.995

6	First_Yr_Cum_GPA + First_Yr_Cum_HE + Gender + FirstGen + AWEval + Pell	1248.3451	0.8734	1550.449
6	First_Yr_Cum_GPA + First_Yr_Cum_HE + HighLoan + Gender + FirstGen + AWEval	1248.3057	0.8737	1550.398
6	First_Yr_Cum_GPA + First_Yr_Cum_HE + Gender + Legacy + FirstGen + Pell	1248.2432	0.8736	1549.624
6	First_Yr_Cum_GPA + First_Yr_Cum_HE + HighLoan + Gender + Legacy + FirstGen	1248.1491	0.8738	1549.645
6	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + Gender + FirstGen + Pell	1248.1149	0.8756	1548.285
6	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HighLoan + Gender + FirstGen	1248.0635	0.8757	1548.304
6	First_Yr_Cum_GPA + First_Yr_Cum_HE + HistoricURM + Gender + FirstGen + Pell	1248.0267	0.8742	1549.393
6	First_Yr_Cum_GPA + First_Yr_Cum_HE + HighLoan + HistoricURM + Gender + FirstGen	1248.0172	0.8742	1549.366
6	First_Yr_Cum_GPA + First_Yr_Cum_HE + HighLoan + Gender + FirstGen + Pell	1247.7784	0.8735	1550.651
7	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + Gender + Legacy + FirstGen + AWEval	1249.1932	0.8760	1549.169
7	First_Yr_Cum_GPA + First_Yr_Cum_HE + HistoricURM + Gender + Legacy + FirstGen + AWEval	1249.0371	0.8746	1549.971
7	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HistoricURM + Gender + FirstGen + AWEval	1248.9500	0.8758	1548.667
7	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HistoricURM + Gender + Legacy + FirstGen	1248.8866	0.8763	1547.962
7	First_Yr_Cum_GPA + First_Yr_Cum_HE + Gender + Legacy + FirstGen + AWEval + Pell	1248.8233	0.8736	1551.380
7	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + Gender + FirstGen + AWEval + Pell	1248.7645	0.8756	1550.029
7	First_Yr_Cum_GPA + First_Yr_Cum_HE + HighLoan + Gender + Legacy + FirstGen + AWEval	1248.7534	0.8739	1551.356
7	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HighLoan + Gender + FirstGen + AWEval	1248.7344	0.8758	1550.004

7	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + Gender + Legacy + FirstGen + Pell	1248.6318	0.8759	1549.379
7	First_Yr_Cum_GPA + First_Yr_Cum_HE + HistoricURM + Gender + FirstGen + AWEval + Pell	1248.5631	0.8742	1551.143
7	First_Yr_Cum_GPA + First_Yr_Cum_HE + HighLoan + HistoricURM + Gender + FirstGen + AWEval	1248.5630	0.8742	1551.077
7	First_Yr_Cum_GPA + First_Yr_Cum_HE + HistoricURM + Gender + Legacy + FirstGen + Pell	1248.5530	0.8745	1550.238
7	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HighLoan + Gender + Legacy + FirstGen	1248.5469	0.8760	1549.428
7	First_Yr_Cum_GPA + First_Yr_Cum_HE + HighLoan + HistoricURM + Gender + Legacy + FirstGen	1248.5229	0.8745	1550.212
8	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HistoricURM + Gender + Legacy + FirstGen + AWEval	1249.4765	0.8763	1549.663
8	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + Gender + Legacy + FirstGen + AWEval + Pell	1249.2726	0.8759	1551.112
8	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HighLoan + Gender + Legacy + FirstGen + AWEval	1249.2128	0.8761	1551.117
8	First_Yr_Cum_GPA + First_Yr_Cum_HE + HistoricURM + Gender + Legacy + FirstGen + AWEval + Pell	1249.0756	0.8746	1551.971
8	First_Yr_Cum_GPA + First_Yr_Cum_HE + HighLoan + HistoricURM + Gender + Legacy + FirstGen + AWEval	1249.0569	0.8746	1551.907
8	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HighLoan + HistoricURM + Gender + FirstGen + AWEval	1248.9742	0.8759	1550.616
8	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HistoricURM + Gender + FirstGen + AWEval + Pell	1248.9689	0.8758	1550.675
8	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HistoricURM + Gender + Legacy + FirstGen + Pell	1248.9300	0.8763	1549.961
8	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HighLoan + HistoricURM + Gender + Legacy + FirstGen	1248.9054	0.8763	1549.944

8	First_Yr_Cum_GPA + First_Yr_Cum_HE + HighLoan + Gender + Legacy + FirstGen + AWEval + Pell	1248.8479	0.8737	1553.311
8	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HighLoan + Gender + FirstGen + AWEval + Pell	1248.7924	0.8758	1551.964
8	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HighLoan + Gender + Legacy + FirstGen + Pell	1248.6555	0.8759	1551.356
8	First_Yr_Cum_GPA + First_Yr_Cum_HE + HighLoan + HistoricURM + Gender + FirstGen + AWEval + Pell	1248.5891	0.8743	1553.074
8	First_Yr_Cum_GPA + First_Yr_Cum_HE + HighLoan + HistoricURM + Gender + Legacy + FirstGen + Pell	1248.5751	0.8745	1552.212
8	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HighLoan + HistoricURM + Gender + FirstGen + Pell	1248.4005	0.8758	1550.993
9	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HistoricURM + Gender + Legacy + FirstGen + AWEval + Pell	1249.5106	0.8763	1551.662
9	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HighLoan + HistoricURM + Gender + Legacy + FirstGen + AWEval	1249.4980	0.8764	1551.609
9	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HighLoan + Gender + Legacy + FirstGen + AWEval + Pell	1249.2989	0.8760	1553.051
9	First_Yr_Cum_GPA + First_Yr_Cum_HE + HighLoan + HistoricURM + Gender + Legacy + FirstGen + AWEval + Pell	1249.0999	0.8746	1553.907
9	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HighLoan + HistoricURM + Gender + FirstGen + AWEval + Pell	1248.9966	0.8759	1552.616
9	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HighLoan + HistoricURM + Gender + Legacy + FirstGen + Pell	1248.9535	0.8763	1551.942
10	First_Yr_Cum_GPA + First_Yr_Cum_HE + LostSchl + HighLoan + HistoricURM + Gender + Legacy + FirstGen + AWEval + Pell	1249.5367	0.8764	1553.607