FIRST IN, LAST OUT: TIME-TO-DEGREE OF FIRST-GENERATION STUDENTS

BY

MARK RICHARD UMBRICHT

THESIS

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Master's Committee:

Assistant Professor Denice Ward Hood, Chair
Professor William T. Trent
Assistant Professor Lorenzo D. Baber

Abstract

This is a study of factors which affect time-to-degree in first-generation students from a Midwestern research university. Astin's (1993) Input-Environment-Output (I-E-O) model was utilized to determine the effects of various input and environment variables. Chi-Square tests were performed to find interactions between variables in the model. A binary, logistic regression was utilized to find which variables and interactions had significant effects on time-to-degree. The results indicate that input variables such as input variables such as race/ethnicity and gender, environment variables such as continuous enrollment, average attempted credits per semester, taking summer courses, total credits earned, and missed credits were significant predictors of time-to-degree. Environment variables had a larger effect than input variables.

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TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

In less than ten years, the United States has moved from first to twelfth in the world rankings of percentage of college graduates for the ages of 25-34 (College Board, 2010). Higher education leaders and politicians across the country have recognized the need to drastically increase the rate of college completion to keep up with not only other countries, but our own job growth.

> "Education is the economic issue of our time. It's an economic issue when the unemployment rate for folks who've never gone to college is almost double what it is for those who have gone to college. Education is an economic issue when nearly eight in ten new jobs will require workforce training or a higher education by the end of this decade. Education is an economic issue when we know beyond a shadow of a doubt that countries that out-educate us today, they will out-compete us tomorrow" (Barack Obama, 2010)

Since higher education is so vital to the United States, there have been several goals set to increase college completion. The College Board created a plan to increase the percentage of 25-34 year olds who hold an associate degree or higher to 55% by 2025. The president has set an even steeper goal, calling on the United States to increase the rates to 60% by 2020 (De Nies, 2010). Achieving this goal would require the United States to add approximately 8 million additional graduates by 2020 (College Board, 2010).

In order to achieve this goal, higher education needs to focus its attention on groups who are underrepresented compared to their high school graduation rates, such as first-generation students. The National Center for Education Statistics (Chen & Carroll, 2005) published a report on first-generation students in postsecondary education. They found that 28% of high school graduates in 1992 would be considered first-generation if they attended college. However, these students only comprised 22% of the students who attended college. Conversely, students whose

parents attended at least some college saw an increase from 41% in high school to 42% of college attendees. Students with parents who completed at least a bachelor's degree saw the greatest gains, moving from 36% of the graduating class to 42% of the college attendees. Significantly increasing the number of first-generation students could potentially help to achieve the college completion goal set by Obama, assuming they are also completing their degrees.

This complicates matters of completing the goals as college costs have steadily raised over the past ten years. Tuition at private colleges rose by 60% while it has doubled at public colleges (Clark & Wang, 2011). As students struggle to pay for college, it has become increasingly important to finish in a timely manner, as additional semesters cost more money and potentially means taking out more loans. First-generation students are less likely to earn a bachelor's degree in a timely manner compared to their continuing-generation counterparts (Pascarella et al., 2004; Ishitani, 2006). This implies that first-generation students are likely to take on more student loan debt and forego more income than their continuing generation student counterparts. In addition, Bowen et al. (2009) adds that longer time-to-degree can cost institutions space and money too. If students can complete their degree in fewer semesters, it could free up money and space for the institution to bring in additional students, thus making it easier to increase the percentage of people who hold postsecondary credentials.

Theoretical Framework

This study utilizes Astin's (1977;1993) input-environment-output framework, modified by Knight (1994) to study time-to-degree. Astin's model attempts to simply the complexities of research on students by focusing on the interdependence between input, environment and output. Astin and Sax (1998) note that the model was initially designed to deal with the problems of

non-random sampling in non-experimental studies. As students entering programs can have different characteristics, outcomes may not show the impact of an environment, but rather the differences in student characteristics. By accounting for student characteristics, researchers can directly assess the impact of environmental variables. *Input* describes any characteristic inherent to a student or descriptor present at the time of enrollment. *Environment* characteristics, in the broadest sense, include anything that happens to a student during college that could affect the outcome in question. *Outcomes* are the desired aims and objectives of the educational program (Astin 1993). Input variables are used as control variables to study the effect of the environment variables on outcomes.

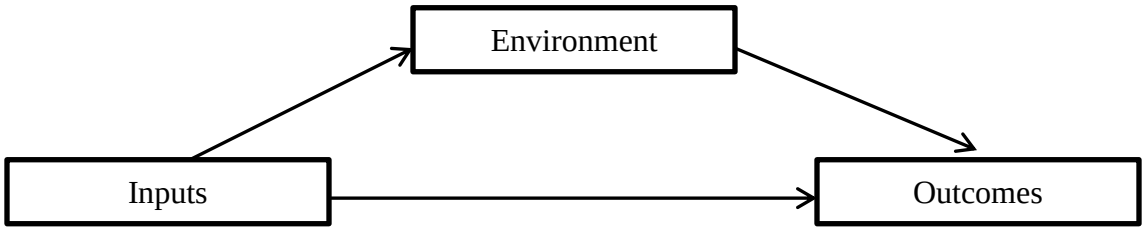

Figure 1. Astin's (1993) I-E-O model.

Knight (1994;2002) updated Astin's model to be used in an institutional research setting in order to predict and explain time-to-degree. Knight noted that in the early 1990's, there were issues of "financial constraint, accountability, and concern over the outcomes of the undergraduate experience" (1994, pg. 7). The economic downturn of the 1980's placed pressure on colleges and universities to document their effectiveness and efficiency. Comparisons can be drawn to the current postsecondary environment in the United States. By 1994, little research had been conducted on the topic of time-to-degree, but it was emerging as an important outcome. Thus, Knight set out to develop a model to measure time-to-degree within an individual

institutional setting, adding to his model in 2002. Knight's model added an intermediate output variable to account for differences after freshman year.

Problem Statement

Given the current recession and financial restraints placed on colleges, time-to-degree has reemerged as a significant outcome for students (Bowen et al., 2009). Numerous factors have been found to be associated with an increased time-to-degree. Utilizing Knight's version of the I-E-O framework, they can be categorized into inputs, environments, and outputs. Inputs such as gender (Knight, 1994; Adelman, 1999), race/ethnicity (OCSA, 1996), socioeconomic status (Astin, 1993; Campbell, 2003), and preparation (Zhu, 2003; Ishitani, 2003; Knight, 1994) have all been found to have either a direct or indirect effect on time-to-degree. Likewise, pre-college environments such as living on campus (Astin, 1993), choice of major (Pitter et al., 1996; Adelman, 2006), and financial aid (DesJardins et al., 2002; Lam, 1996; Volkwein & Lorang, 1996) have been found to impact time-to-degree. During college environment variables, such as credits per semester (Knight, 1994; DesJardins et al., 2003; Ishitani & Snider, 2003; Volkwein & Lorang, 1996), summer enrollment (Volkwein & Lorang, 1996), changes in major (Klopfenstein, 2000; Adelman, 2006; Ma, 2010; Knight & Arnold, 2000), first year GPA (Belcheir, 2000; Volkwein & Lorang, 1996; DesJardins et al., 2002) and continuous enrollment (Ishitani, 2005;2006; Belcheir, 2000) also have an effect on time-to-degree. Finally, end of college enrollment variables such as missed credits (Florida Board of Governors, 2004) and total credits earned (Pitter et al., 1996) have been found to affect time-to-degree. While there is an abundance of literature on time-to-degree for all students, little is known on how time-to-degree varies within different groups, such as first-generation students. Research has shown that first-

generation students tend to have a longer time-to-degree than continuing-generation students (Terenzini et al., 1996; Pascarella et al., 2005; Ishitani, 2006). However, there is no research that examines which of the factors listed above impact first-generation students' time-to-degree. Within the first-generation population, if time-to-degree is greatly affected by environmental factors, institutions would be able to create a program or intervention which would help the most at risk students.

Research Questions

Main question: What are the most significant factors related to time-to-degree for first-generation students?

a. Do input or environmental factors play a larger role in time-to-degree?
b. How do these variables interact?

Significance of the Study

This research will contribute to the body of knowledge in the areas of first-generation students and time-to-degree. In addition, it could provide a model that provides risk factors of an increased time-to-degree for first-generation students that could benefit institutions. Given the limited amount of funds available, the model provided by this study could inform institutions as to which students potentially need an intervention to graduate on time.

Definition of Terms

First-Generation Student – A student whose parents did not attend a postsecondary institution.

Continuing-Generation Student – A student with at least one parent who attended college.

Change in Major – When a student officially changes their major. This does not include students who began as undeclared, undeclared and then officially chose their major.

Time-to-Graduation – Time-to-degree will be measured by the number of semesters from enrollment to graduation.

Timely Graduation – A timely graduation will be denoted by students finishing their degree in four and a half years or less, or 9 semesters. This was determined by the number of semesters need to complete any degree in 1999 at the University of Illinois. This assumes 15 credit hours per semester, as recommended by all majors to finish in a timely manner. The highest number of credits needed was 134 for aeronautical engineering, which would take nine semesters to complete.

Continuous Enrollment – Defined as enrolling full-time for every fall and spring semester until graduation.

Stop Out – Any break in continuous enrollment.

Limitations

- There is only one university in the dataset. This study may only generalize well to large, Midwestern, research universities.
- Some environment variables, such as involvement are not available in the dataset. Student involvement variables, such as contact with faculty, have been found to decrease time-to-degree.
- Parental education data is drawn from FAFSA information, thus students with no FAFSA had to be dropped. FAFSA information is also student reported, so there is room for respondent error by the students.
- For students who are not continuously enrolled, there is no way to track whether students are taking courses from other colleges once they have entered the university. Credits

from high school AP courses are tracked in the data set, but there is no way to see if students are taking courses at other universities. Students could be taking courses over the summer at their local community college to decrease their time-to-degree which would not be captured in this data set. Additionally, for students who stop out, we have no way of telling whether they are taking courses elsewhere, working to receive money to pay for college, or some other reason.

CHAPTER 2

LITERATURE REVIEW

The purpose of this study was to examine first-generation status in relation to time-to-degree and changes in major. The review of literature is organized according to the following main sections: definitions of first-generation students, characteristics of First-generation students; time-to-degree; first-generation students and time-to-degree; Astin's I-E-O model. The literature review was conducted using search engines such as ERIC, Education Full Text, and Academic Search Premier (EBSCO). Key search terms included: first-generation students, I-E-O, input-environment-output, time-to-degree, and timely graduation.

First-Generation Students

There are various ways to define first generation students. The most prevalent definition of first-generation students is the first in their families to pursue postsecondary education (Terenzini et al., 1996; Choy et al., 2000; Rodriguez, 2003; Chen & Carroll; Ishitani, 2006). This implies that neither parent has attended any type of postsecondary institution. A second definition is a student whose parents do not have more than a high school education (Rodriguez, 2003). This opens the possibility for a parent to have attended a postsecondary institution, but they did not finish. Finally, it can be defined as a student from a family where no parent has earned a bachelor's degree (Pike & Kuh, 2005). This definition allows for a student's parents to have earned an associate's degree or have attended a four year school. Likewise, there are different ways to describe continuing-generation students. Most studies simply identify them as the opposite of a first-generation student. Chen and Carroll (2005) in a NCES study

distinguished between two types of continuing-generation students. There were medium and high parental attainment groups. The high attainment group consisted of students where both parents had a bachelor's degree. The medium attainment group was students with at least one parent who had college experience, and could have one parent with a bachelor's degree. Within the context of this study, Chen and Carroll's definition of first-generation students was utilized. First-generation students were classified as a student with two parents who have never attended college.

Characteristics of First-Generation Students

First-generation students have been the subject of numerous studies in recent years because they tend to be very different compared to continuing-generation students. The characteristics of first-generation students can be split into two categories: background characteristics which refer to things such as race/ethnicity, gender and college characteristics such as college GPA, preparation, engagement, attrition and performance.

First-generation students tend to have much different background characteristics compared to continuing-generation students. Economic characteristics are closely tied to first-generation status. In fact, Gladieux and King (1999) note that educational attainment is a primary contributor to social and economic stratification. Nunez (1998) found that nationwide nearly 25% of first-generation families come from families in the lowest quartile of yearly earnings. This is compared to only five percent of students whose parents had higher educational levels. Horn et al. (2000), in their work on math preparation of first-generation students, found that half of the students were low-income. This relates to a study by McDonough (1997) who found in her interviews with students that social class is the strongest variable on educational attainment. What is most interesting about the economic ties of first-generation status is that

there is a negative loop that follows it. First-generation students are less likely to attend college, which makes them less likely to make money, which makes their children less likely to go to college. Schworm (2005) notes that people who earn a bachelor's degree earn 62% more than high school graduates.

Various studies have analyzed the racial/ethnic backgrounds of first generation students. They are more likely to be ethnic minorities (Hsiao, 1992; London, 1992; Padron, 1992; Pike & Kuh, 2005). Specifically they are more likely to be Latino(a) (Terenzini et al., 1996; Nunez & Cuccaro-Alamin, 1998; Brown & Burkhardt, 1999; Chen, 2005; Horwedel, 2008) and African American (Horn & Nunez, 2000; Chen, 2005; Horwedel, 2008). Similarly, Nunez and Cuccaro-Alamin (1998) found that first generation students were less likely to be white and more likely to be female. Low-income and minority students tended to have worse outcomes than their higher income, non-minority counterparts.

First-generation status is not always found to be the primary cause of differences between students. Terenzini et al. (1996) found that first-generation students had lower aspirations compared to second-generation students. However, after controlling for differences in background characteristics and levels of engagement, the two groups did not differ in gains of cognitive development. To the contrary, Choy (2001) found that first-generation students were at a disadvantage for access to higher education. This disadvantage was present even after controlling for background variables including educational aspiration.

Choy (2001) found that first-generation students also have different enrollment trends compared to other students. Among 1992 graduates, 75% of students whose parents completed some college enrolled over the next 8 years and 93% of students whose parents had obtained a bachelor's degree enrolled. However, only 59% of first-generation students attended college. Of

the 59% first-generation students attending college, 26.9% attended a 4 year college while 27.3% attended a two-year college. Students with parents attending some college attended at rates of 41.6% at 4 year and 29.5% at 2 year schools while students with parents who finished their bachelor's degrees attended a 4 year school at 70.8% and 2 year school at 18%. This data shows that first-generation students viewed college in a different light compared to students whose parents attended college.

Choice of College

Astin and Oseguera (2004) set out to update studies such as Carnevale & Rose (2003) and Karabel & Astin (1975). Using Cooperative Institutional Research Program (CIRP) Entering Freshman Survey, the authors updated findings that students from the lower socioeconomic strata are underrepresented in higher education. One of the two measures of socioeconomic status was parental education. Using this measure, the study found that since 1971, the percentage of students with low parental education at all levels of institutional selectivity has fallen drastically since 2000. The share of low parental education students has decreased by 16% at high selectivity, 19% at medium selectivity and 20% at low selectivity institutions. Much of this change has been absorbed by the students with the highest parental education. At highly selective institutions, high parental education students increased by 33% since 1971, now accounting for 61.5% of students at these universities. The number of first-generation students in highly selective colleges has declined from 1 in 18 to 1 in 27. Similarly, the chances of a student from a highly educated family enrolling in a highly selective institution are three times better than a student whose parents have at least some college background and more than five times better than a first-generation student.

Cognitive Development

Terenzini et al. (1996) set out to answer three questions regarding first-generation students. Do they differ from continuing-generation students in terms of precollege characteristics, first year experience, and cognitive development in college? Using a stepwise regression, they analyzed 825 first-generation and 1,860 traditional college students from 23 institutions. They found that 14 of 37 characteristics were significantly correlated with first-generation status, including less encouragement and support from high school teachers and family, less certainty about their choice of major compared to traditional students. Looking at curricula experiences, first-generation students took fewer humanities and fine arts courses as well as completed fewer hours completed per academic year. In terms of academic experiences, first-generation students were less likely to be in honors programs and spent less time studying compared to traditional students. For out-of-class experiences, first-generation students were less likely to perceive faculty concern for student development and teaching, more likely to work, less likely to attend a racial/cultural workshop, attend an orientation program, have encouragement from fiends, and reported lower relationship levels with student peers. Finally, their study found that comparing institutional characteristics, first-generation students were slightly more likely to experience discrimination and less likely to say their environment had an academic/scholarly emphasis. In short, first-generation students tend to have much different experiences compared to traditional students. In a later study, Pascarella et al. (2004) used a NSSL longitudinal study to analyze student experiences and outcomes. Their study supported earlier findings that there were major differences between first-generation students and other students in the influence of specific academic and nonacademic experiences on college outcomes.

Preparation

Warburton et al. (2001) examined the relationship between parents' education level, high school curriculum, and persistence. The main finding was that first-generation students were less likely to have had a rigorous high school curriculum. Approximately 40% of first-generation students were at the core basics level or below compared to 9% in a rigorous curriculum. Continuing-generation students were almost equally as likely to be at the core or below (28%) or have had a rigorous curriculum (22%). The core basic curriculum consisted of four years of English, three years of mathematics and three years of science and social studies. The study also found that first-generation students were more likely to attend public and comprehensive universities compared to private institutions and research/doctoral universities.

Engagement

There are several pivotal studies that have addressed the engagement and development of first generation students. Pike and Kuh (2005) examined the experiences of first-generation students using multi-group structural equation models with latent variables. They noted that this approach allowed them to calculate relatively unbiased estimates of effects in their model. They utilized Astin's (1977;1993) input-environment-output model of college effects and Pascarella's (1985) model of environmental influences as the groundwork for their study. The sample consisted of 3,000 undergraduate students across the nation that completed the College Student Experience Questionnaire. Their findings on first-generation students were rich and numerous. First-generation students were less engaged overall and less likely to successfully integrate into diverse college experiences. This was paired with the finding that first-generation students perceived their college environment as less supportive than their peers. They also reported less progress in their learning and intellectual development. Most of the differences in perceived support and intellectual development were accounted for by differences in educational

aspirations and where the student lived during college. One of the more surprising results was that minority students, in addition to female students, those who planned to pursue an advanced degree, and students living in residence halls, tended to be more engaged overall in the study. The authors argued that first-generation students might tend to be less engaged because they know less about the importance of engagement or how to be engaged. Where second-generation students may be able to turn to their parents to fill in some of these gaps, parents of first-generation students may be unable to help, even if they really want to because they simply do not have the experience.

Attrition

St. John et al. (1994), using 1987 National Postsecondary Student Aid Study data, found that parents' education was consistently associated with persistence. What was interesting about their results was their finding that the lower the parental education level, the higher the persistence. The authors suggested that students with better educated parents simply found it easier to drop out and re-enroll later compared to their first-generation counterparts.

This finding has since been contradicted by other research. Riehl (1994) studied freshman students at Indiana University and found that first-generation students were much more likely to drop out in their first semester, as well as have lower grades on average. Similarly, Choy (2001) created a summary of NCES studies about the experience of high school graduates and postsecondary students whose parents did not attend college. Choy argues that, as a group, first-generation students at 4-year institutions tend to be less academically prepared than their counterparts. In addition, first-generation status was associated with leaving the institution before their second year. In fact, first-generation students were twice as likely as high education level students to drop out in the first year. This difference remained after controlling for

race/ethnicity, financial aid, attendance status, socioeconomic status, institutional control and satisfaction with campus life.

Somers, Woodhouse, and Cofer (2004) built on the work of St. John (1994) and used the National Postsecondary Student Aid Survey of 1995-96 to study the persistence of first-generation college students. The authors found that variables such as high income, high test scores, and high GPA did not influence the persistence of first-generation students. However, low-income, first-generation students were much less likely to persist. In explaining their findings, Somers, Woodhouse and Cofer argue that first-generation students are debt averse. They attempted to avoid accumulating debt even at the lowest level. They further argue that this may be a reflection of their limited knowledge of and family history with student loans.

Ishitani (2003) found similar results for persistence in first-generation students. Using a sample of 1,747 students who attended a 4-year comprehensive public university in 1995, Ishitani studied the attrition behavior of students. Because of the particular university, approximately 58% of the students were first-generation (neither parent with any college experience). Utilizing an event history model, the author found that first-generation students had higher attrition rates and that the gap in attrition rates grew over time. This finding was magnified when comparing first-generation students to high parental education students, as first-generation students were 71% more likely to leave than students with two college-educated parents. These findings were consistent even after controlling for factors such as race, gender, high school GPA, and family income. The exponential model found that four factors were significantly related to increased attrition: being female, family income of $25,000 or less, low high school GPA, and first-generation status. First-generation status was the most significant predictor of the four factors. In a break from some previous studies, there was no effect from

race, one parent with a college degree, an income of $25,000-$45,000, or size of hometown. Ishitani repeated this study with similar results in 2006 using National Education Longitudinal Study (NELS).

Completion

In 2005, the National Center for Education Statistics released a report by Chen and Carroll that studied first-generation students in postsecondary education. They found that 28% of graduating seniors would be first-generation students if they attended college. In comparison, 72% of graduating seniors would be continuing-generation students including 31% whose parents completed a bachelor's degree or higher. However, the numbers shifted when they looked at how many students enrolled in postsecondary education between 1992 and 2000. After enrolling in college, these potential first-generation students comprised of only 22% of the population, a 6% drop. Worse was that once these students broke the barrier and attended college, 53% did not complete an associate's degree. In addition, 24% completed a bachelor's degree. Students whose parent(s) had a bachelor's degree or higher had a completion rate of 68% for bachelor's degrees and 7% for associate degrees. In Choy's (2001) study, first-generation students were less likely than others to have stayed enrolled and attained a 4-year degree after five years. First-generation students finished their degree 13% of the time compared to 33% for other students.

Conclusion

The research is conclusive that first-generation students differ from their continuing generation counterparts for a wide variety of measures including preparation, background characteristics, involvement, attrition, and persistence. As first-generation students differ in many ways, it is logical to assume they could vary in other ways, such as in time-to-degree.

Time-To-Degree

Time-to-degree has become an increasingly important outcome to measure for students. Pennington (2004) argues students who are working toward their baccalaureate degree should do everything possible to graduate in four years to receive the best return on their financial investment and time. As the price of college skyrockets and grant money is threatened at the state and federal level by budget cuts, timely graduation is more important than ever. Knight (2004) adds predicting how long a student will be enrolled will help families and students plan their college expenses, determine when to enter the labor force, or other concerns. In addition, reiterating the point made by Bowen et al. (2009), predicting time-to-degree would have benefits for institutional planning including academic and student services, residence hall capacity, or instructional demand.

Research on time-to-degree can be categorized into several groups: student backgrounds and characteristics, college environment, student involvement, enrollment behavior, extenders. Early researchers, such as Knight (1994), argue that factors that influence attainment tend to influence time-to-degree as well. Studies analyzing time-to-degree began during the 1990's following the recession in the 1980's. As resources for both colleges and students became scarce, it became increasingly important to ensure that students were as efficient as possible when attending college.

Student Background Characteristics

Background characteristics of college students are often related to certain outcomes for students. Within the research on time-to-degree, several factors have been found to delay timely graduation including: being male (Knight, 1994; Adelman, 1999; Ishitani & Snider, 2003), older

students (Knight, 1994; Oklahoma Council on Student Affairs, 1996), socioeconomic factors (Astin, 1993; Campbell, 2003), religion (Astin, 1993), expectation of time-to-degree, academic preparation, and race/ethnicity (Oklahoma Council on Student Affairs, 1996). However, the literature does not always agree that these play the same role in time-to-degree.

The Oklahoma Council on Student Affairs (1996) ultimately argued that race and ethnicity played primary roles in time-to-degree. They utilized a Student Advisory Board database and the Unitized Data System 1988 Entering Freshman Cohort Data to create the database for their study. The Oklahoma study did not use change in major, extracurricular activities, financial aid, or remediation in their study, but acknowledged that they could play a role in time-to-degree. They found that 52.4% of students expected to complete their degree in four years or less, about 30% expected to take between four and six years, while only 5.4% expected to finish their degree in more than six years. In actuality, only 4.5% of students were able to finish in four years or less, 7.5% were able to finish in between four to six years, and 5.6% finished in over six years, for a total of 17.6% completing their degree. African American and Hispanic students were least likely to graduate on time. Astin (1993) argues that the difference in race/ethnicity is simply due to differences in socioeconomic status that happen to lie along racial/ethnic lines. Therefore, race/ethnicity is a secondary factor in time-to-degree while socioeconomic status is a primary influence.

Ishitani (2005), in his study of first-generation students, found that they were 51% less likely to graduate in the fourth year and 32% less likely to graduate in the fifth year compared to students whose parents graduated from college. Volkwein and Lorang (1995) studied students who took more than four years to complete their degree without stopping out, which they identify as “extenders.” They classify extenders into two categories: vocational extenders and

collegiate extenders. Vocational extenders are those "who have higher levels of financial need and loan indebtedness, more frequently report that they are 'required' to work in order to meet expenses, and have lower grade point averages" (p. 7). Collegiate extenders, on the other hand are those who "indicated that they often take a light credit load because they desire more free time, or that they dropped one or more courses after the semester began because it was too difficult and/or because they were dissatisfied with their grade" (p. 7). In addition, the authors of this study examined whether extenders shared more common characteristics with those who finished on time or those who dropped out. The results of the study indicated that extenders had much more in common with students that finish on time. Thus, in reviewing the data extenders tended to be students who simply take fewer credits per semester.

Institutional Characteristics

Several studies have analyzed institutional factors which could affect attainment and time-to-degree. As mentioned previously, attainment and time-to-degree have been found to be highly correlated. While the current study is at a single institution and cannot compare between institution characteristics, it is important to see what factors could potentially affect the students as a whole. Institutional factors that increase attainment include attending a private institution (Ishitani, 2005), more selective institutions (Stoecker, Pascarella & Wolfe, 1988; Ishitani, 2005), and smaller institutions (Stoecker, Pascarella & Wolfe, 1988; Astin, 1993). Additionally, within institution factors such as financial aid (Lam, 1996), percent of women and PHD's on the faculty (Astin, 1993), and the percent of resources invested in student services (Astin, 1993).

Student Perceptions

One group of variables that one would expect to have an impact on time-to-degree is student perceptions. However, Volkwein and Lorang (1996) and Knight (2002) have found that

most of measures of student perceptions were not significant predictors. In Knight's comprehensive model for time-to-degree, perceptions of incoming students and satisfaction of seniors were not predictive. Only importance of graduation played a significant role in the number of semesters elapsed prior to degree completion. Included in the study were ten college perception and engagement surveys, which were found to be non-significant.

Student Involvement

After student and college characteristics have been taken into account, measures of student involvement are the next logical set of variables to review. Student involvement includes in college variables which can affect time-to-degree for students. Some of the factors that can affect time-to-degree include the amount of time spent with faculty and the quality of those encounters (Astin, 1993), quality and quantity of time spent with peers (Astin, 1993, Stoecker, Pascarella and Wolfe, 1988), living in residence halls for at least the freshman year (Astin, 1993) and participation in orientation activities (Pascarella, Terenzini and Wolfe, 1986). While working on campus often needed to help subsidize the cost of college or living expenses, it can often have a negative effect on time-to-degree. Lam (1996) utilized a single university database to study the effects of financial aid on time-to-degree, including work study. Using a regression model, Lam found that students who received only loans had the shortest time-to-degree, while students who received gift aid and were employed had the next shortest time-to-degree. However, after holding all factors constant, employment alone added approximately one half semester. This led to the conclusion that "student employment was detrimental to students' timely academic progress" (p. 20). The Florida Board of Governors (2004) found that as hours per week of employment increased, credits per semester attempted decreased. As students who worked took fewer credits per semester, they were unable to take the number of credits needed to

graduate in a timely fashion. The Oklahoma Council on Student Affairs (1996) argued that time-to-degree is negatively affected by employment because it takes time away from classes and study time. Similarly, the same study found that an adequate balance between extracurricular activities and schoolwork was important.

Enrollment Behavior

Perhaps one of the more important time-to-degree variables is enrollment behavior. This includes the number of credit hours taken per semester, whether or not a student is full-time or part-time, and continuous enrollment. Numerous studies have found that enrolling in fewer credit hours per semester is associated with taking additional semesters to finish a degree (Desjardins, Kim, and Rzonca, 2003; Florida Board of Governors, 2004; Ishitani and Snider, 2006; Knight, 2004; Knight, 1994; Oklahoma Council on Student Affairs, 1996; Volkwein and Lorang, 1996). In order to finish most programs within the four year time frame, students must earn more than 30 semester hours each year (Garcia, 1994). Ishitani and Snider (2006) found similar results as students earning over 31 credit hours each year had the greatest chance of graduating in five or fewer years. Volkwein and Lorang (1996) note that some baccalaureate programs require a credit hour load of 16-17 per semester in order to graduate in four years without taking summer courses. However, Knight (2004) points out that in order to be considered full-time for financial aid and other purposes, a student is only required to enroll for 12 credits per semester.

Unneeded credits, which are defined as credits beyond the 120 that is typically required to graduate, is another important enrollment factor in time-to-degree. The Florida Board of Governors (2004) used data from all the public schools in Florida and found that the largest amount of unneeded credits are accumulated when students repeat, fail, or withdraw from

courses In addition, students who change their major had more unneeded credits than students who did not change their major, including unneeded upper level credits. The average student who began in 1997-1998 spent approximately 4.4 years completing their bachelor's degree (2004). Similar to unneeded credits, certain major fields have higher credit hour requirements to graduate, which can influence time-to-degree. Pitter, LeMon, and Lanham (1996) found that fields vary in the amount of credit hours required to graduate. For example, majors in the social sciences, foreign languages, psychology and mathematics had the lowest credit requirements, which was between 122 and 124 total credits. Fields such as engineering, architecture and health professions tended to have higher credit requirements, ranging from 130-142. The highest credit requirement was for a 5 year pharmacy program at 161 credits. If a student is majoring in engineering, an additional 10-22 credits could be mean an additional semester or two. Adelman (2006) argues that any major which has a credit requirement in excess of 120 degrees will have one of two effects. First, it could add additional semesters in a student's time-to-degree. Otherwise, in order to graduate in a timely fashion, students will be more likely to try and earn credits through CLEP tests or AP courses, enroll in summer courses, or take more than 15 credits per semester.

Equally as important as differences in credits is continuous enrollment. Continuous enrollment is defined as a student enrolling in courses during every fall or spring semester until they graduate. Students who do not continuously enroll fall into one of three categories: departed, transferred or stopped out (Ishitani, 2006). Students who depart leave their institution and do not return to any institution. Students who transfer leave their institution, but return to a different institution. In this study, both of these variables are treated as leaving the university and not returning. Stopped out students are of interest to the current study because the behavior

can be captured in the data set. Students who stop out may skip one or two semesters at a time, though no reason is attached to their stop out behavior. Ishitani (2005) argues that continuous enrollment was the strongest factor linked to time-to-degree in his study. Students who were continuously enrolled were about eleven times more likely to graduate within four years compared to students who stopped out for at least one semester. Belcheir (2000) found results that were significant, but not as robust as Ishitani. Freshman who were continuously enrolled through graduation were twice as likely to graduate after four years as those who stopped out. To the contrary, Campbell (2003) found that even if a student remains continuously enrolled, degree programs that require an excess of 120 credit hours may extend time-to-degree.

Changes in major

There are very few studies that have had the primary purpose of examining time-to-degree in relation to changes in major. However, many studies have added a measure of changes in major to a large set of variables. A majority of the studies have found that changes in major were associated with a longer time-to-degree (Klopfenstein, 2000; Adelman, 2006; Knight & Arnold, 2000; Ma, 2010).

First-Generation Students and Time-To-Degree

While there are numerous studies relating first-generation status to persistence and retention, there are few studies that have examined first-generation students in relation to time-to-degree. Terenzini et al. (1996) surveyed students as part of the National Study of Student Learning, which was a three-year, longitudinal, national study. Their findings indicate that first-generation students were less likely to believe they would finish in four years or less, which means that they had lower aspirations. Pascarella et al. (2005) updated this work, using the same

data and found that first-generation students who persisted were less likely to attain a bachelor's degree after five years than continuing generation students. The most robust study relating first-generation status and time-to-degree comes from Ishitani (2006). Utilizing the National Educational Longitudinal Study of 1988 and the Postsecondary Education Transcript Study 1988-2000, Ishitani examined attrition and degree completion behavior of first-generation students using event history modeling, which takes into account the timing of events such as dropping out and graduation. Event history modeling calculates the risk of an event happening at a certain time. It is traditionally used in medical settings to determine the risk of death in patients. For the purposes of Ishitani's study, the event is leaving the university or graduating. The results indicate that first-generation students reduced the odds of graduating within 4 years by 51% and the odds of graduating in 5 years by 32%. Significant factors in time-to-degree besides first-generation status include continuous enrollment, high school class rank, and demographic factors such as being male and Hispanic. While there are few studies that examine first-generations status and time-to-degree, the literature that is present is clear that first-generation students do not graduate in a timely manner compared to their continuing-generation counterparts.

Astin's I-E-O Model

Origin of the model

Astin's Input-Environment-Outcome (I-E-O) model simplifies the complexity of higher education research by examining the interdependence of inputs, environments and outputs. The original purpose of the model was to examine the impact of environmental variables on outcomes, accounting for background characteristics (Astin, 1993). The I-E-O model allows researchers to examine multiple effects simultaneously, which helps to avoid the problem of a

lack of random assignment. As student samples are selected through non-random sampling, the students have different background characteristics before entering the environment. However, we cannot tell whether the background characteristics or environment are responsible for any changes in outcomes (Astin & Sax, 1998). "Input refers to the characteristics of the student at the time of initial entry to the institution…" (Astin, 1993, p. 7). Input variables can be classified into two subgroups: fixed student attributes and characteristics that change over time. Fixed student attributes includes race/ethnicity, gender, etc. The second subgroup refers to things such as cognitive functioning, values and attitudes, and educational background characteristics. Environment characteristics, in the broadest sense, include anything that happens to a student during college that could affect the outcome in question. Outcomes are the desired aims and objectives of the educational program (Astin, 1993).

Research using Astin's I-E-O Model

Research using Astin's I-E-O model is extremely diverse in nature. Due to its generalizability, the model has been used to study the effect of countless environment variables including socioeconomic status (Snyder, 2008), student engagement (Murray, 2006), type of institution (Astin, 1968), service activities (Astin & Sax, 1998), academic experiences (House, 1999), time of registration (Smith et al., 2002), web-based courses (Thurmond et al., 2002), social integration (Kelly, 1996), and early remediation (Campbell & Blakey, 1996).

Astin (1968) wanted to test the assumption that better institutions increase student development, after accounting for student characteristics. Using a national sample of four-year colleges and universities consisting of 699 students, Astin studied whether institutional characteristics such as a large library, emphasis on scholarship, high student-faculty ratio and a vigorous program of research impacted student development. These factors accounted for the

environment variables in the study. After accounting for student characteristics, Astin found that there was no significant relationship between institutional quality and student development.

Kelly (1996) used the model to study retention at the United States Coast Guard Academy. Using data from 619 students who entered the academy in 1991 and 1993, Kelly looked at how academic and social integration affected persistence. Integration is measured differently at the US Coast Guard Academy as many typical environment variables are tightly controlled. Integration was measured as how the cadet was "perceived as a member of the team regarding communicating, listening, and working effectively with or for others" (pg. 10) as measured by a skills rating. Results indicated that academic performance and social integration were significant indicators of long-term persistence.

Campbell and Blakey (1996) conducted a longitudinal study which evaluated the effects of early remediation on the persistence and performance of underprepared students. The sample included 3,282 community college students who completed a basic skills inventory. The results indicated that college GPA and the number of remedial courses taken impacted persistence in underrepresented students. In addition, age, ethnicity, gender, and degree seeking intent, which were inputs, were significant predictors of GPA for underrepresented students.

Astin and Sax (1998) conducted a longitudinal study of 3,450 students to examine the effects of participating in service activities. After controlling for student characteristics, the results indicated that participating in service activities had a significant effect on academic and life-skill development in students. It also gave a boost to scores of civic responsibility.

Smith, Street and Olivarez (2002) used Astin's model to study the effects of registration time on student success in community college. As a secondary purpose, the authors wanted to suggest late registration policy and practices that might improve student success. The results

indicated that students who registered late were less likely to persist from fall to spring compared to students who registered early or on time. In addition, students who registered late withdrew from 13% of their courses. Early and regular registrants withdrew from their courses at rates of 5% and 4% respectively. In terms of policy and practices, the authors suggested eliminating late registration, as it impeded student performance.

Snyder (2008) utilized Astin's model to examine low-income students in terms of academic success. Snyder used a quantitative focus at a single institution to highlight the importance of degree attainment, specifically looking across income groups. Snyder's research supported the need to move past simply understanding barriers and benefits of degree attainment for low-income students and acting on it.

Knight (1994) used Astin's I-E-O model to examine the factors that may play into an increased time-to-degree. Due to a recession in the 1980's, there was a large concern for accountability and outcomes of students. This was added to the financial constraints placed on students, their families and institutions. As a result, time-to-degree became an important factor for institutions to analyze. Knight wanted to create a model using variables that would be commonly available to institutional researchers, so the model could be recreated by other institutions. Knight conducted an exploratory study using a block multiple regression to examine the factors that affect time-to-degree. The population consisted of 868 students who graduated in 1992. Admission status, age, gender, high school GPA, race, and SAT composite scores served as input variables in the first block. Receipt of financial aid during freshman year, living in a residence hall during freshman year, and enrollment in an orientation course were used as environment variables in the second block. An intermediate output of freshman GPA was the third block. And several outcome variables (final GPA, total credits earned, and number of

courses dropped) constituted the final block of the model. The results indicated that cumulative credit hours earned, freshman GPA, SAT scores, number of courses dropped, high school GPA, and age had the greatest influence on time-to-degree. The total model accounted for 58% of the variance in time-to-degree. In addition, 37% of freshman GPA was explained by background variables and academic ability. Enrollment behaviors and academic ability were the best predictors of time-to-degree overall.

Comprehensive Model of Time-to-Degree

Knight (2002) worked toward creating a comprehensive model of influences in time-to-degree attainment. The purpose of the study was to better understand influences of time-to-degree and provide the enrollment management office with recommendations to decrease time-to-degree. After reviewing past literature and variables available at his own university, Knight created a model with 57 different variables which could affect time-to-degree. The model was grouped into six categories: student background, pre-enrollment perceptions, remedial course and summer freshman program participation, enrollment behaviors and financial aid, college experiences and perceptions, academic outcomes, and the outcome variables of total semesters enrolled and the number of total semesters elapsed. The strongest predictors of semesters enrolled were "average credit hours per semester, total credit hours, number of summer semesters enrolled, transfer credit hours, number of failed courses, number of cooperative education courses, number of withdrawn courses, number of repeated courses and participation in the Academic Forgiveness Program" (pg. 8). The strongest predictors of total semesters elapsed was similar, but added high school GPA, and dependent financial aid status. Several important non-significant factors included the dollar volume of student financial aid, and nearly all college experience and perception variables from questionnaires.

Application of Astin's I-E-O Model to This Study

This study also employs Astin's (1993) I-E-O model, as updated by Knight (1994) for time-to-degree. This study will employ many of the variables used by Knight (1994;2002). The variables will be added in four separate blocks: input variables, pre-college environment variables, during college environment variables, and end of college environment variables. Utilizing Astin's I-E-O model, this researcher created a diagram to describe the conceptual framework for this study. Figure 2 provides a visual representation of the variables in the study and their relationships.

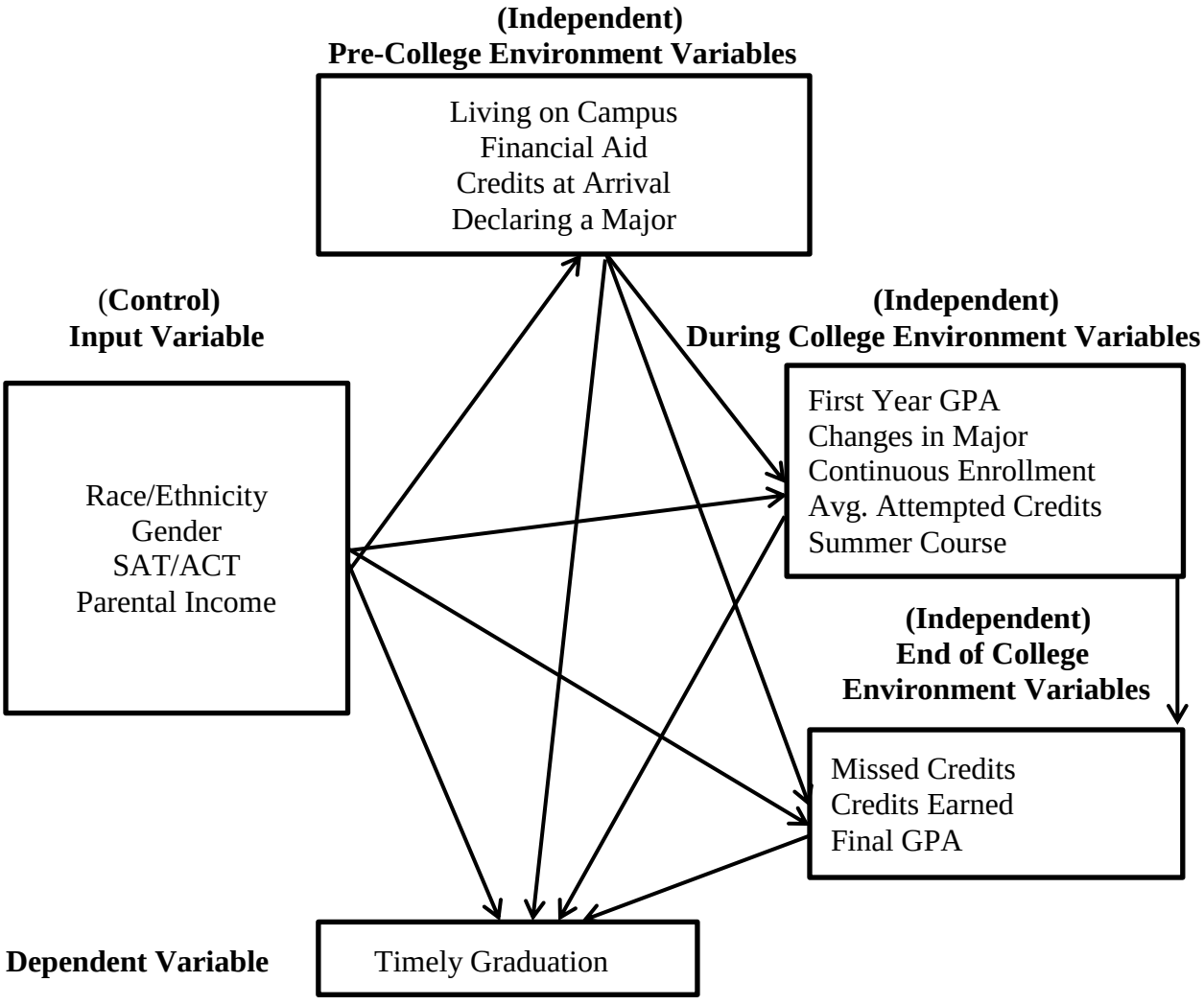

Figure 2. The conceptual framework for this study.

CHAPTER 3

METHODS

The purpose of this study is to examine the variables which are related with time-to-degree in first-generation students. This chapter presents the methods used to address the research questions, sample, and data analysis.

Source of Data

The source of data utilized in this study was a dataset provided by the Mellon Foundation. The author of this study contacted the institutional research office at his college to obtain a dataset. The institutional research office informed him they would not have time to create such a large dataset, but they had created a similar one for the Mellon Foundation several years earlier. The dataset was collected and used in the book Crossing the Finish Line, by Bowen, Chingos and McPherson (2009). The institutional research office released the data for their university and the data was given to the author of this study. The dataset consists of student level data beginning with the entering 1999 cohort and following the students through 2005. The dataset includes 7,539 students and a wide variety of information including demographics, enrollment data for each semester, and FAFSA data for each year. Institutional Review Board approval was sought in the summer of 2011 at the University of Illinois. All processes and procedures were reported in advance to the Institutional Review Board.

Population and Sample

There were 7,539 students in the dataset. From that number, students who did not graduate, students with no FAFSA information, students who were not first-generation students, and transfer students were removed from the dataset. Additionally, there were 77 students with

incomplete data which were removed. This left 632 first-time, first-generation students who graduated within the six and a half year time frame for the study. After reviewing the data for outliers, which will be discussed later in this chapter, 7 students were removed, leaving a sample dataset of 625 first-generation students. The students attended a large, doctoral granting research university in the Midwest.

Variables

The input category will consist of four dummy coded race/ethnicity variables, gender, combined income, and ACT score. The environment variable will consist of three separate blocks: pre-college, during college, and end of college. The pre-college variables consist of on or off campus residence, undeclared major, and Pell grant status. During college variables consist of continuous enrollment, summer course, change in major, first year GPA, and credits per semester. The end of college variables consist of missed credits, total credits earned, and cumulative GPA. The dependent variable is semesters elapsed. Table 2 provides a summary of the variables.

Statistical Approach

SPSS 20.0 was used for the analyses of data. Data analysis was performed through descriptive analysis and inferential analysis. All tests conducted assumed a .05 alpha level, which is the common level of accuracy for educational research.

The research design of the study is non-experimental. "Nonexperimental research is systematic empirical inquiry in which the scientist does not have direct control of independent variables because their manifestations have already occurred or because they are inherently not manipulable" (Kerlinger & Lee, 2000, p.558).

Table 1

List of Variables

Variable	Type of Variable	Description/Re-Coding
	Input Variables	
Race/Ethnicity	Categorical	Coded into 4 dummy variables for African American, White, Hispanic, and Asian: yes = 1, no = 0
Gender	Categorical	Coded 0 = Female, 1 = Male
ACT	Continuous	SAT composite score converted to ACT composite
Combined Income	Continuous	Combined income from first semester from parents and student
	Environment Variables (Pre-College)	
Residence	Categorical	During freshman year, student lives on campus = 1, off campus = 0
Undeclared	Categorical	Undeclared major at entry: 1 = yes, 0 = no
Pell Status	Categorical	Received Pell grant freshman year: 1 = yes, 0 = no
	Environment Variables (During College)	
Continuous Enrollment	Categorical	Student stopped out for at least one fall or spring semester: 1 = yes, 0 = no
Changes in Major	Categorical	Student changed major (undeclared to a major is not included): 1 = yes, 0 = no
Summer Course	Categorical	Took at least one summer course: 1 = yes, 0 = no
Avg. Att. Credits	Continuous	Average attempted credits per semester.

Table 2 Continued

Table 1 (cont.)

First Year GPA	Continuous	Calculated by taking number of total credits divided by number of semesters attempted Cumulative first year GPA
	Environment Variables (End of College)	
Missed Credits	Continuous	Total number of credits attempted less the total number of credits earned
Total Credits Earned	Continuous	Total number of credits earned
Cumulative GPA	Continuous	Cumulative GPA at end of studies
	Dependent Variable	
Time-to-degree (Semesters Elapsed)	Categorical	Number of semesters from entry until graduation: 0 = fewer than 10 semesters, 1 = 10 or more semesters

The study consists of a quantitative methodology with a correlational approach. This study will utilize block multiple regression, used by Knight (1994) and preferred by Astin (1991), to analyze the data. Multiple regression analysis is the appropriate statistical procedure to use when examining the effects of multiple predictors on a dependent variable (Creswell, 2009). This is based on the simultaneous effects of all the predictors. The variables will be entered with a stepwise method, which means they will be added into the regression equation based on a certain order. The variables are typically entered based on their validity, but with a block regression, the variables will be added in groups based on proximity of time to the dependent variable. The input variables will be added as a block into the equation, followed by the environment (Astin, 1991). The total variation explained by each regression equation along with the change in variation explained through adding each block will be calculated. A block must add a significant amount of variation to the equation to warrant adding it. The block

multiple regression is preferred for Astin's I-E-O model because it analyzes the effect of a group of variables, such as all input variables, at once. Linear regression was the preferred statistical method for this study as the dependent variable was continuous. However, the number of students in the dataset finishing in eight semesters was extremely high. Thus, a linear regression was deemed to be inappropriate due to high levels of kurtosis. In order to not violate the assumptions of linear regression, several methods, such as transformation of variables were attempted. However, the level of kurtosis was not lowered to reasonable levels by these measures. In order to remove the violations of assumption that were present, the dependent variable was changed into a binary variable so logistic regression could be utilized. Any student who finished in nine semesters or less was deemed as graduating on time, while any student finishing in ten semesters or more was coded as not graduating on time. Logistic regression is the preferred statistical method when the dependent variable is categorical with one or more level (Pallant, 2009; Tabachnick & Fidell, 1989). Logistic regression holds three assumptions: sample size, multicollinearity, and outliers (Pallant, 2009). The sample size of 625 is large enough for the 20 independent variables in the regression model. All independent variables were screened for multicollinearity and none were removed. Finally, outliers were analyzed and seven students were removed due to high residuals. These were the unknown and American Indian students.

To determine the order of entry for the variables, previous research was consulted. Astin (2002) recommended the following sequence of variables when utilizing a hierarchical, multiple regression when using the I-E-O model of assessment:

1. Simple, main effects of student input variables
2. Interactions between input variables
3. Within college environmental variables

4. Interactions among within college environmental variables
5. Interactions between input variables and environmental variables
6. Environmental variables that occur subsequent to matriculation to the college
7. Interactions between those subsequent environmental variables and any antecedent variables. (p. 309)

CHAPTER 4

FINDINGS

This chapter provides the findings of the research questions. This chapter is divided into two sections. The first section is descriptive statistics, which is followed by the quantitative section using hierarchical regression. The quantitative section will be organized by research questions:

1. What are the most significant factors related to time-to-degree for first-generation students?
    a. Do input or environmental factors play a larger role in time-to-degree?
    b. How do these variables interact?

Descriptive Statistics

Table 1 provides demographic information, encapsulating variables in the first block of the regression equation across three categories: all students in the original dataset, all first-generation students, and first-generation students in the sample dataset. The sample dataset does not include first-generation students who did not graduate or transfer students. Comparing all students to all first-generation students there were several similarities. Age was similar at just over 18 years old on average. Similarly, both groups had a similar breakdown of gender with slightly more males than females. Race/ethnicity between the two groups was different. From all students to first-generation students, there was a decrease in Asian students (3.9%) and White students (5.4%). There was a corresponding increase in African American students (2.4%) and nearly 300% increase in percentage of Hispanic students (8.8%). ACT scores were slightly lower for first-generation students and combined income lowered significantly. In terms of graduation status, first-generation students (74.3%) were less likely to graduate than the average student in the full dataset (82.1%). First-generation students were slightly more likely to be transfer students.

Comparing all first-generation to the sample dataset there were many similarities. Age, race/ethnicity, ACT score, and combined income were relatively unchanged. There was a visible difference in gender as the male population decreased while the female population increased for the sample dataset. These data confirm that the students in the sample dataset generally reflected first-generation students in the dataset. The patterns and changes of the first generation students compared to the full dataset are typical of what we would expect based on previous research. Tables 3-5 summarize the descriptive statistics of the independent variables.

Table 2

Characteristics of All Students, First-Generation Students, and Sample Dataset

Characteristics	Response	All Students	First-Generation	Sample Dataset
Age (Mean)	Age at Time of Entry	18.66	18.82	18.18
Gender	Male	52.3%	51.3%	47.4%
	Female	47.7%	48.7%	52.6%
Ethnicity/Race	African American	7.1%	9.5%	9.6%
	Asian	12.5%	8.6%	9.6%
	Caucasian/White	71.5%	66.1%	66.8%
	Hispanic	5.7%	14.5%	13.9%
	Native American	0.2%	0.3%	(removed)
	Unknown	3.1%	0.9%	(removed)
ACT Score (Mean)	ACT Score	26.67	25.55	25.74
Combined Income (Mean)	Combined Income of Parents And Student	$74,957	$55,951	$58,682
Graduation Status	Graduated	82.1%	74.3%	100%
	Did Not Graduate	13.1%	25.2%	
	Still Enrolled	0.4%	0.5%	
Transfer Status	First-Time Freshman	85.9%	81.3%	100%
	Transfer	14.1%	18.7%	

Table 3

Descriptive Statistics – Continuous Environment Variables

	N	Mean	SD
ACT	625	25.74	3.60
Combined Income	625	58630	35609
First Year GPA	625	2.88	0.67
Average Attempted Credits	625	12.45	1.17
Missed Credits	625	2.45	4.93
Total Earned Credits	625	124.76	10.44
Cumulative GPA	625	3.11	0.44

Table 4

Descriptive Statistics – Dichotomous Environment Characteristics

	N	%
Undeclared	205	32.8%
Decided	420	67.2%
Off Campus	115	18.4%
On Campus	510	81.6%
Pell Recipient	207	33.1%
Non-Pell Recipient	418	66.9%
Stop Out	37	5.9%
No Stop Out	588	94.1%
Change of Major	257	41.1%
No Change of Major	368	58.9%

Table 5

Descriptive Statistics – Dependent Variable

	N	%
Semesters to Degree		
7.0	14	2.2%
8.0	364	58.2%
8.5	41	6.6%
9.0	94	15.0%
10.0	85	13.9%
10.5	12	1.9%
11.0	7	1.1%
12.0	5	0.8%
12.5	2	0.3%
13.0	1	0.2%
Dichotomous		
Fewer than 10 semesters	513	82.1%
More than 10 semesters	112	17.9%

Quantitative Findings

To examine the main effects and interactions between variables in terms of their relationship to time-to-degree, chi-square tests of significance were performed. Following the chi-square analyses, the main effects, environments, and interactions were put into a logistic regression to find which variables predicted time-to-degree the best. Astin's (2002) method detailed in Chapter three was followed for entering variables by blocks into the equation. Prior to analyzing interactions, continuous variables were transformed into dichotomous variables in order to create comparable statistics.

Student Inputs – Main Effects

Chi-square tests were performed for each input variable in order to determine its relationship with retention. Table 6 displays the significant differences in time-to-degree based

on input variables. Gender was significantly related to a lower time-to-degree as well as Asian, Hispanic, and White race/ethnicities. African American was the only race that not found to be a significant predictor. ACT and combined income were not significant predictors of time-to-degree. Environmental variables consisted of three separate blocks of variables. The first block consisted of variables which occur before a student begins courses, including whether a student was undeclared their freshman year, living on or off campus, Pell recipient status, and whether the student brought credits to the institution. The second block consisted of variables which occur during college including whether a student stopped out, took summer courses, changed their major, had a high average attempted credits, and had high first year GPA. The third block consisted of variables which are a result of the student's college career, including final GPA, total number of earned credits, and total number of missed credits. All continuous variables were recoded into dichotomous variables with 0 indicating a score below the mean and 1 indicating a score above the mean.

Table 6

Main Effects of Inputs on Time-to-Degree

	Fewer than 10 Semesters		More than 10 Semesters			
	N	%	N	%	χ^2	Φ
Gender						
Female	288	87.5%	41	12.5%	14.07**	0.15
Male	255	76.0%	71	24.0%		
Race/Ethnicity						
Asian	42	70.0%	18	30.0%	6.59*	0.10
All Others	471	83.4%	94	16.6%		
Hispanic	57	65.5%	30	34.5%	18.85**	0.17
All Others	456	84.8%	82	15.2%		
White	365	87.3%	53	12.7%	23.57**	0.19
All Others	148	71.8%	59	28.5%		

*$p < .05$, **$p < .001$

Educational Environments

Environmental variables which can affect students on their path to degree were tested to determine significant effects on time-to-degree. Of the environmental variables, living of campus, Pell status, stopping out, changing major, average attempted credits, missed credits, total earned credits, and final GPA. Table 7 summarizes the Chi-Square analyses.

Table 7

Main Effects of Environment Variables on Time-to-Degree

	Fewer than 10 Semesters		More than 10 Semesters			
	N	%	N	%	χ^2	Φ
Live Off Campus	104	90.4%	22	9.6%	6.69*	0.10
Live On Campus	409	80.2%	101	19.8%		
Pell Recipient	157	75.8%	50	24.2%	8.18*	0.11
Non-Pell Recipient	356	85.2%	62	14.8%		
Stop Out	17	45.9%	20	54.1%	34.91**	0.24
No Stop Out	496	84.4%	92	15.6%		
Change in Major	198	77.0%	59	23.0%	7.53*	0.11
No Change in Major	315	85.6%	53	14.4%		
Low Missed Credits	375	90.4%	40	9.6%	57.59**	0.30
High Missed Credits	138	65.7%	72	34.3%		
Low Total Credits	347	91.6%	32	8.4%	58.79**	0.31
High Total Credits	166	67.5%	80	32.5%		
Low Average Credits	214	74.0%	75	26.0%	23.58**	0.19
High Average Credits	299	89.0%	37	17.9%		
Low Final GPA	266	75.1%	75	24.9%	19.33**	0.18
High Final GPA	287	88.6%	37	11.4%		

*$p < .05$, **$p < .001$

Gender and Student Input Interactions by Time-to-Degree

After main effects, the next step suggested by Astin (2002) is student input interactions. Data on student input interactions were analyzed for their impact on student retention. Table 8 shows the effects of gender and other input interactions. Males and the interactions with race/ethnicities of Asian and Hispanic and high ACT were found to have significant effects on time to degree. For females, significant interactions with White race/ethnicity, high income, and high ACT were found. Asian and Hispanic males and males with low ACTs were found to be significantly less likely to graduate on time. White females were more likely to graduate on time if they were white, had high income or a high ACT.

Table 8

Gender and Student Input Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Male and Race						
Asian	16	64.0%	9	36.0%	5.79*	0.10
All other	497	82.8%	103	17.2%		
Hispanic	30	56.6%	23	43.4%	25.55**	0.20
All other	483	84.4%	89	15.6%		
Female and Race						
White	314	77.3%	92	22.7%	17.7**	0.17
All other	199	90.9%	20	9.1%		

*$p < .05$, **$p < .001$

Race/Ethnicity and Student Input Interactions by Time-to-Degree

Several race/ethnicity input interactions were found to be significant. Low-income Asian students were less likely to graduate on time. White students with either a low or high ACT were significantly more likely to graduate on time than other students. Hispanic students with both levels of ACT and both levels of combined incomes were less likely to graduate on time.

There were no significant interactions found for African American students. Table 9 provides the summary for the significant Chi-Square tests.

ACT, Combined Income and Student Input Interactions by Time-to-Degree

No significant interactions were found between ACT and combined income.

Table 9

Race/Ethnicity and Student Input Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Asian						
Low Income	34	68.0%	16	32.0%	7.33*	0.11
All Others	479	83.3%	96	16.7%		
White						
High ACT	237	87.1%	35	12.9%	8.36*	0.12
All Others	276	78.2%	77	21.8%		
Low ACT	128	87.7%	18	12.3%	4.05*	0.08
All Others	385	80.4%	94	19.6%		
Hispanic						
High ACT	18	62.1%	11	37.9%	8.28*	0.11
All Others	495	83.1%	101	16.9%		
Low ACT	39	67.2%	19	32.8%	9.57*	0.12
All Others	474	83.6%	93	16.4%		
High Income	22	66.7%	11	33.3%	5.63*	0.10
All Others	491	82.9%	101	17.1%		
Low Income	35	64.8%	19	35.2%	11.98*	0.14
All Others	478	83.7%	93	16.3%		

*$p < .05$, **$p < .001$

Gender and Pre-College Environmental Variables by Time-to-Degree

Interactions between gender and pre-college environmental variables were analyzed using Chi-Square tests. Pre-college environmental variables include living on or off campus, Pell status, declared or undeclared major, and whether or not a student brought credits to the college. No significant interactions were found for males; however, several interactions were found for females. Females with a declared major, were not Pell recipients, and both levels of living on campus and credits upon arrival had significant effects on time-to-degree. Females were more likely to graduate on time than in all interactions. Table 10 summarizes the significant interactions.

Table 10

Gender and Pre-College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Female						
Declared	183	88.4%	24	11.6%	8.42*	0.12
All Others	330	78.9%	88	21.1%		
On Campus	231	86.2%	37	13.8%	5.40*	0.09
All Others	282	79.0%	75	21.0%		
Off Campus	57	93.4%	4	6.6%	5.93*	0.10
All Others	456	80.9%	108	19.1%		
No Pell	186	89.0%	23	11.0%	10.21*	0.13
All Others	328	78.6%	89	21.4%		
Credits on Arrival	34	94.4%	2	5.6%	3.97*	0.08
All Others	479	81.3%	110	18.7%		
No Credits Arrive	254	86.7%	39	13.3%	7.97*	0.11
All Others	259	78.0%	73	22.0%		

*$p < .05$

Asian and Pre-College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions between Asian race/ethnicity and pre-college environment variables. Significant interactions between Asian race/ethnicity and living off campus and receiving a Pell grant were found. A summary of the Chi-Square tests is found in table 11.

Table 11

Asian and Pre-College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Asian						
Off Campus	38	67.9%	18	32.1%	8.46*	0.12
All Others	475	83.5%	94	16.5%		
Pell Recipient	28	65.1%	15	34.9%	9.03*	0.12
All Others	485	83.3%	97	16.7%		

*$p < .05$

African American and Pre-College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions between African American race/ethnicity and pre-college environment variables on time-to-degree. No significant interactions were found for African American students and pre-college environment effects on time-to-degree.

White and Pre-College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions between White race/ethnicity and pre-college environment variables on time-to-degree. White students were more likely to graduate on time if they declared a major prior to enrolling, did not receive a Pell grant, lived on campus, lived off campus, and had high or low combined income. Table 12 provides a summary of the Chi-Square tests.

Table 12

White and Pre-College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
White						
Off Campus	88	90.7%	9	9.3%	5.83*	0.10
All Others	425	80.5%	103	19.5%		
High Income	206	86.9%	31	13.1%	6.08*	0.10
All Others	307	79.1%	81	20.9%		
Low Income	159	87.8%	22	12.2%	5.76*	0.10
All Others	354	79.7%	90	20.3%		
No Undeclared	264	87.4%	38	12.6%	11.32*	0.14
All Others	249	77.1%	74	22.9%		
On Campus	277	86.3%	44	13.7%	7.96*	0.11
All Others	236	77.6%	68	22.4%		
No Pell	287	87.8%	40	12.2%	15.08**	0.16
All Others	226	75.8%	72	24.2%		

*$p < .05$, **$p < .001$

Hispanic and Pre-College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions between Hispanic race/ethnicity and pre-college environment variables on time-to-degree. Hispanic students were less likely to graduate on time if they declared a major, lived on campus, received a Pell grant or did not receive a Pell grant. Table 13 provides a summary of the Chi-Square tests.

Table 13

Hispanic and Pre-College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Hispanic						
No Undeclared	30	60.0%	20	40.0%	18.01**	0.17
All Others	483	84.0%	92	16.0%		
Live on Campus	48	63.2%	28	36.8%	21.06**	0.18
All Others	465	84.7%	84	15.3%		
Pell Recipient	21	60.0%	14	40.0%	12.29**	0.14
All Others	492	83.4%	98	16.6%		
No Pell	36	69.2%	16	30.8%	6.37*	0.10
All Others	477	83.2%	96	16.8%		

*$p < .05$, **$p < .001$

Income and Pre-College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions between income and pre-college environment variables on time-to-degree. Students with above average combined income were more likely to graduate on time if they lived off campus and less likely to graduate if they received a Pell grant. Students with below average combined income were less likely to graduate on time if they lived on campus or received a Pell grant. Table 14 provides a summary of the Chi-Square test.

Table 14

Income and Pre-College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
High Income						
Off Campus	104	90.4%	11	9.6%	6.69*	.10
All Others	409	80.2%	101	19.8%		

Table 14 Continued

Yes Pell	157	75.8%	50	24.2%	8.18*	0.11
All Others	356	85.2%	62	14.8%		
Low Income						
On Campus	210	77.2%	62	22.8%	7.78*	0.11
All Others	303	85.8%	50	14.2%		
Yes Pell	156	76.1%	49	23.9%	7.42*	0.11
All Others	357	85.0%	63	15.0%		

*$p < .05$, **$p < .001$

Gender and During College Interactions by Time-to-Degree

Male students who stopped out, took summer courses, had a low first year GPA, changed majors, declared their major prior to entry, or had fewer than average attempted credits per semester were less likely to graduate on time. Male students who had greater than average attempted credits per semester were more likely to graduate on time. Females, on the other hand, were more likely to graduate if they did not stop out, did not take summer courses, had a high first year GPA, did not change major, and had high average attempted credits. Table 15 provides a summary of the Chi-Square tests for both males and females.

Table 15

Gender and During College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Male						
Stop Out	6	30.0%	14	70.0%	38.10**	0.25
All Others	507	83.8%	98	16.2%		
Summer Courses	102	72.3%	39	27.7%	11.74**	0.14
All Others	411	84.9%	73	15.1%		
Low 1st GPA	98	72.1%	38	27.9%	11.87**	0.14
All Others	415	84.9%	74	15.1%		

Table 15 Continued

Change of Major	81	66.9%	40	33.1%	23.38**	0.19
All Others	432	85.7%	72	14.3%		
Higher Avg Att	133	88.1%	18	11.9%	4.87*	0.09
All Others	380	80.2%	94	19.8%		
Low Avg. Att	92	63.4%	53	36.6%	44.56**	0.28
All Others	421	87.7%	59	12.3%		
Declared	163	76.5%	50	23.5%	6.78*	.10
All Others	350	85.0%	62	15.0%		
Female						
No Stop Out	277	88.8%	35	11.2%	19.03**	0.17
All Others	236	75.4%	77	24.6%		
No Summer	149	89.8%	17	10.2%	9.06*	0.12
All Others	364	79.3%	95	20.7%		
High 1st GPA	181	88.3%	24	11.7%	8.01*	0.11
All Others	332	79.0%	88	21.0%		
No Major Change	171	88.6%	22	11.4%	8.07*	0.11
All Others	342	79.2%	90	20.8%		
High Avg Cred.	166	89.7%	19	10.3%	10.46*	0.13
All Others	347	78.9%	93	21.1%		

*$p < .05$, **$p < .001$

Race/Ethnicity and During College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions between race/ethnicity and during college environment variables on time-to-degree. Asian students were less likely to graduate on time if they took a summer course, had a high first year GPA, changed their major, or had fewer average attempted credits. Table 16 shows the significant interactions for Asian students. African American students had no significant interactions with during college environment variables. White students were less likely to graduate on time if they stopped out, but were more likely to graduate if they took summer courses, did not take summer courses, had

a high first year GPA, or did not change their major. Table 17 shows the significant interactions for White students. Hispanic students were less likely to graduate if they did not stop out, took a summer course, had a low first year GPA, changed or did not change their major, or had low average attempted credits. Table 18 shows the significant interactions for Hispanic students.

Table 16

Asian and During College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Asian						
Summer Course	26	66.7%	13	33.3%	6.72*	0.10
All Others	487	83.1%	99	16.9%		
High 1st GPA	25	65.8%	13	34.2%	7.0*	0.11
All Others	488	83.1%	99	16.9%		
Change in Major	20	66.7%	10	33.3%	5.09*	0.09
All Others	493	82.9%	102	17.1%		
Low Avg. Cred.	25	64.1%	14	35.9%	9.14*	0.12
All Others	488	83.3%	98	16.7%		

*$p < .05$

Table 17

White and During College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
White						
Stop Out	13	56.5%	10	43.5%	10.61*	0.13
All Others	500	83.1%	102	16.9%		
No Stop Out	352	89.1%	43	10.9%	36.11**	0.24
All Others	161	70.0%	69	30.0%		
Summer	152	88.4%	20	11.6%	6.39*	0.10
All Others	361	79.7%	92	20.3%		

Table 17 Continued

No Summer	213	86.6%	33	13.4%	5.60*	0.10
All Others	300	79.2%	79	20.8%		
High 1st GPA	239	89.2%	29	10.8%	16.08**	0.16
All Others	274	76.8%	83	23.2%		
No Major Change	228	90.1%	25	9.9%	18.67**	0.17
All Others	285	76.6%	87	23.4%		

*$p < .05$, **$p < .001$

Table 18

Hispanic and During College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Hispanic						
No Stop Out	55	67.9%	26	32.1%	12.72**	0.14
All Others	458	84.2%	86	15.8%		
Summer Course	32	59.3%	22	40.7%	20.93**	0.18
All Others	481	84.2%	90	15.8%		
Low 1st GPA	31	60.8%	20	39.2%	17.12**	0.17
All Others	482	84.0%	92	16.0%		
Major Change	22	61.1%	14	38.9%	11.42*	0.14
All Others	491	83.4%	98	16.6%		
No Major Change	35	68.6%	16	31.4%	6.83*	0.10
All Others	478	83.3%	96	16.7%		
Low Avg. Cred.	27	52.9%	24	47.1%	32.06**	0.23
All Others	486	84.7%	88	15.3%		

*$p < .05$, **$p < .001$

Income and During College Environment Interactions

Chi-Square tests were utilized to find effects of interactions between combined income and during college environment variables on time-to-degree. Students with higher than average combined income were less likely to graduate on time if they stopped out, changed majors, or

had low average attempted credits. Students with lower than average combined income were less likely to graduate if they stopped out, took a summer course, changed their major, or had lower than average attempted credits. Table 19 provides a summary of the Chi-Square test for combined income.

Table 19

Income and During College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Higher Than Average Income						
Stop Out	17	45.9%	20	54.1%	34.91**	0.24
All Others	496	84.4%	92	15.6%		
Change Major	198	77.0%	59	23.0%	7.53*	0.11
All Others	315	85.6%	53	14.4%		
Low Avg. Cred.	214	74.0%	75	26.0%	23.68**	0.19
All Others	229	89.0%	37	11.0%		
Less Than Average Income						
Stop Out	10	50.0%	10	50.0%	14.46*	0.15
All Others	503	83.1%	102	16.9%		
Summer Course	133	76.4%	41	23.6%	5.22*	0.09
All Others	380	84.3%	71	15.7%		
Change in Major	105	75.5%	34	24.5%	5.20*	0.09
All Others	408	84.0%	78	16.0%		
Low Avg. Cred.	124	71.7%	49	28.3%	17.60**	0.17
All Others	389	86.1%	63	13.9%		

*$p < .05$, **$p < .001$

Gender and End of College Environment Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions between gender and end of college environment variables on time-to-degree. Male students were less likely to graduate on

time if they had more missed credits, high total credits earned, or a low GPA. Male students with fewer missed credits or low total credits earned had a shorter time-to-degree. Table 20 summarizes the significant Chi-Square tests for males.

Table 20

Male and End of College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Male						
High Missed	70	56.9%	53	43.1%	65.96**	0.33
All Others	443	88.2%	59	11.8%		
Low Missed	159	88.8%	20	11.2%	7.76*	0.11
All Others	354	79.4%	92	20.6%		
High Total	76	60.8%	49	39.2%	48.11**	0.28
All Others	437	87.4%	63	12.6%		
Low Total	149	87.1%	22	12.9%	4.09*	0.08
All Others	364	80.2%	90	19.8%		
Low GPA	117	68.8%	53	31.2%	27.90**	0.21
All Others	396	87.0%	59	13.0%		

*$p < .05$, **$p < .001$

Female students were more likely to graduate on time if they had few missed credits, lower than average total credits earned, or a higher than average cumulative GPA. Female students were less likely to graduate on time if they had higher than average total earned credits. Table 21 summarizes the significant Chi-Square tests for females.

Table 21

Female and End of College Interactions

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Female						
Low Missed	216	91.5%	20	8.5%	23.00**	0.19

Table 21 Continued

All Others	297	76.3%	92	23.7%		
High Total	90	74.4%	31	25.1%	6.05*	0.10
All Others	423	83.9%	81	16.1%		
Low Total	198	95.2%	10	4.8%	36.44**	0.24
All Others	315	75.5%	102	24.5%		
High GPA	179	90.4%	19	9.6%	14.65**	0.15
All Others	334	78.2%	93	21.8%		

*$p < .05$, **$p < .001$

Race/Ethnicity and End of College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions between race/ethnicity and end of college environment variables on time-to-degree. Asian students were less likely to graduate if they had high missed credits, higher than average total credits earned, or higher than average cumulative GPA. Table 22 shows the significant interactions for Asian students. African American students had no significant interactions with end of college environment variables. White students were less likely to graduate on time if they had higher than average missed credits or higher than average total credits earned. White students were more likely to graduate on time if they had fewer than average missed credits, fewer than average total credits earned, or higher than average cumulative GPA. Table 23 shows the significant interactions for White students. Hispanic students were less likely to graduate if they had higher than average missed credits, higher than average total credits earned, or lower than average cumulative GPA. Table 24 shows the significant interactions for Hispanic students.

Table 22

Asian and End of College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Asian						
High Missed Cred	12	57.2%	9	42.9%	9.19*	0.12
All Others	501	82.9%	103	17.1%		
High Total Cred	13	44.8%	16	55.2%	28.69**	0.21
All Others	500	83.9%	96	16.1%		
High GPA	19	67.9%	9	32.1%	4.03*	0.08
All Others	494	82.7%	103	17.3%		

*$p < .05$, **$p < .001$

Table 23

White and End of College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
White						
High Missed	73	69.5%	32	30.5%	13.53**	0.15
All Others	440	84.6%	80	15.4%		
Low Missed	292	93.3%	21	6.7%	53.58**	0.29
All Others	221	70.8%	91	29.2%		
High Total	114	76.0%	36	24.0%	4.96*	0.09
All Others	399	84.0%	76	16.0%		
Low Total	251	93.7%	17	6.3%	42.75**	0.26
All Others	262	73.4%	95	26.6%		
High GPA	228	91.6%	21	8.4%	25.32**	0.20
All Others	285	75.8%	91	24.2%		
Low Arrival	323	86.8%	49	13.2%	15.08**	0.15
All Others	190	75.1%	63	24.9%		
High Arrival	224	90.3%	24	9.7%	18.99**	0.17
All Others	289	76.7%	88	23.3%		

*$p < .05$, **$p < .001$

Table 24

Hispanic and End of College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Hispanic						
High Missed	24	52.2%	22	47.8%	30.19**	0.22
All Others	489	84.5%	90	15.5%		
High Total Cred.	22	51.2%	21	48.8%	30.01**	0.22
All Others	491	84.4%	91	15.6%		
Low GPA	29	54.7%	24	45.3%	29.48**	0.22
All Others	484	84.6%	88	15.4%		

*$p < .05$, **$p < .001$

Income and End of College Environment Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions between combined income and end of college environment variables on time-to-degree. Students with a higher than average combined incomes were less likely to graduate on time if they had higher than average missed credits or higher than average total credits earned. They were more likely to graduate if they had a higher than average cumulative GPA. Students with lower than average combined income were less likely to graduate on time if they had higher than average missed credits, total credits earned, or cumulative GPA. They were more likely to graduate on time if they had lower than average missed credits, total credits or cumulative GPA. Table 25 summarizes the significant Chi-Square tests for combined income.

Table 25

Income and End of College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
High Income						
High Missed	138	65.7%	72	34.3%	57.59**	.30
All Others	375	90.4%	40	9.6%		
High Total	166	67.5%	80	32.5%	58.79**	0.31
All Others	347	91.6%	32	8.4%		
High GPA	287	88.6%	37	11.4%	19.33**	0.18
All Others	226	75.1%	75	24.9%		
Low Income						
High Missed	87	66.9%	43	33.1%	25.64**	0.20
All Others	426	86.1%	69	13.9%		
Low Missed	179	88.6%	23	11.4%	8.66*	0.12
All Others	334	79.0%	89	21.0%		
High Total	101	65.6%	53	34.4%	37.80**	0.25
All Others	412	87.5%	59	12.5%		
Low Total	165	92.7%	13	7.3%	19.07**	0.18
All Others	348	77.9%	99	22.1%		
High GPA	144	87.8%	20	12.2%	4.95*	0.09
All Others	369	80.0%	92	20.0%		
Low GPA	122	72.6%	46	27.4%	12.98**	0.15
All Others	391	85.6%	66	14.4%		

*$p < .05$, **$p < .001$

Environment Variable Interactions

The next step recommended by Astin (2002) is to examine interactions between environment variables. Interactions will be examined in the following order, between pre-college variables, pre-college and during college variables, pre-college and end of college

variables, between during college variables, during college and end of college variables, and between end of college variables.

Undeclared and During College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions between whether a student declared a major prior to enrolling or not and during college environment variables on time-to-degree. Students who declared their major were less likely to graduate on time if they stopped out, changed majors, or had lower than average attempted credits. Students who declared their major were more likely to graduate on time if they did not change their major or had higher than average attempted credits. Students who were undeclared were less likely to graduate on time if they had low average attempted credits or stopped out. Table 26 summarizes the significant Chi-Square tests for students declaring or not declaring their major.

Table 26

Declared or Undeclared and During College Interactions

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Declared						
Stop Out	12	54.5%	10	45.5%	11.75*	0.14
All Others	501	83.1%	102	16.9%		
Change in Major	148	74.7%	50	25.3%	10.59*	0.13
All Others	365	85.5%	63	14.5%		
No Major Change	198	89.2%	24	10.8%	11.83*	0.14
All Others	315	78.2%	88	21.8%		
Low Avg. Cred.	129	73.3%	47	26.7%	12.85*	0.14
All Others	384	85.5%	65	14.5%		
Undeclared						
Low Avg. Cred.	85	75.2%	28	24.8%	4.41*	0.08
All Others	428	83.6%	84	16.4%		

Table 26 Continued

Stop Out	5	33.3%	10	66.7%	24.84**	0.20
All Other	508	83.3%	102	16.7%		

*$p < .05$, **$p < .001$

Residence and During College Interactions

Chi-Square tests were utilized to find effects of interactions between whether a student living on or off campus and during college environment variables on time-to-degree. Students who chose to live on campus were less likely to graduate if they stopped out, took a summer course, had a low first-year GPA, or had lower average credits attempted. They were more likely to graduate if they had a higher average credits attempted. Students who chose to live off campus were more likely to graduate if they did not stop out, did not take summer courses, did not change their major, or had higher than average credits attempted per semester. Table 27 summarizes the significant Chi-Square tests for students declaring or not declaring their major.

Table 27

Residence and During College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
On Campus						
Stop Out	12	41.4%	17	58.6%	34.25**	0.23
All Others	501	84.1%	95	15.9%		
Summer Course	199	77.7%	57	22.3%	5.57*	0.09
All Others	314	85.1%	55	14.9%		
Low 1st GPA	159	76.8%	48	23.2%	5.84*	0.10
All Others	354	84.7%	64	15.3%		
Major Change	160	74.8%	54	25.2%	11.83*	0.14
All Others	353	85.9%	58	14.1%		

Table 27 Continued

Low Avg. Cred.	169	71.0%	69	29.0%	32.03**	0.23
All Others	344	88.9%	43	11.1%		
High Avg. Cred.	240	88.2%	32	11.8%	12.41**	0.14
All Others	273	77.3%	80	22.7%		
Off Campus						
No Stop Out	99	92.5%	8	7.5%	9.57*	0.12
All Others	414	79.9%	104	20.1%		
No Summer	62	92.5%	5	7.5%	5.58*	0.09
All Others	451	80.8%	107	19.2%		
No Major Change	66	91.7%	6	8.3%	5.08*	0.09
All Others	447	80.8%	106	19.2%		
High Avg. Cred.	59	92.2%	5	7.8%	4.95*	0.09
All Others	454	80.9%	107	19.1%		

*$p < .05$, **$p < .001$

Pell Status and During College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions between whether a student received Pell grants and during college environment variables on time-to-degree. Students who did not receive Pell grants were less likely to graduate on time if they stopped out, but were more likely to graduate on time if they had higher than average credits attempted, did not stop out, did not change majors, or had higher than average first year GPA. Students who received a Pell grant were less likely to graduate on time if they stopped out, took summer courses, had a lower first year GPA, or had lower than average credits attempted per semester. Table 28 summarizes the significant Chi-Square tests for students receiving Pell or not receiving Pell.

Table 28

Pell Status and During College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
No Pell						
Stop Out	10	45.5%	12	54.5%	20.80**	0.18
All Others	503	83.4%	100	16.6%		
No Stop Out	346	87.4%	50	12.6%	20.59**	0.18
All Others	167	72.9%	62	27.1%		
High 1st GPA	215	87.4%	31	12.6%	7.80*	0.11
All Others	298	78.6%	81	21.4%		
No Major Change	220	87.6%	31	12.4%	8.85*	0.12
All Others	293	78.3%	81	21.7%		
High Avg. Cred	221	89.5%	26	10.5%	15.18**	0.16
All Others	292	77.2%	86	22.8%		
Pell						
Stop Out	7	46.7%	8	53.3%	13.10*	0.15
All Others	506	83.0%	104	17.0%		
Summer Course	82	70.1%	35	29.9%	14.08**	0.15
All Others	431	84.8%	77	15.2%		
Low 1st GPA	64	72.7%	24	27.3%	6.09*	0.10
All Others	449	83.6%	88	16.4%		
Major Change	62	68.9%	28	31.1%	12.44*	0.14
All Others	451	84.3%	84	15.7%		
Low Avg. Cred.	79	66.9%	39	33.1%	22.64**	0.19
All Others	434	85.6%	73	14.4%		

*$p < .05$, **$p < .001$

Arriving with Credits and During College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions between whether a student received Pell grants and during college environment variables on time-to-degree. Students who arrived with no credits were less likely to graduate if they stopped out, had lower than average first GPA, changed their major, or had lower than average credits attempted per semester. They

were more likely to graduate if they did not stop out, did not change major, or had high average attempted credits per semester. Students who arrived with credits did not have any interaction with during college variables. Table 29 summarizes the significant Chi-Square tests for students who arrived without credits.

Table 29

Arriving With Credits and During College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
No Arrival Credits						
High Avg. Cred.	267	88.7%	34	11.3%	17.32**	0.17
All Others	246	75.9%	78	24.1%		
Stop Out	15	42.9%	20	57.1%	38.78**	0.25
All Others	498	84.4%	92	15.6%		
No Stop Out	446	84.2%	84	15.8%	10.17*	0.13
All Others	67	70.5%	28	29.5%		
Low 1st GPA	184	78.0%	52	22.0%	4.36*	0.08
All Others	329	84.6%	60	15.4%		
Major Change	182	76.8%	55	23.2%	7.25*	0.11
All Others	331	85.3%	57	14.7%		
No Major Change	279	85.1%	49	14.9%	4.17*	0.08
All Others	234	78.8%	63	21.2%		
Low Avg. Cred.	194	73.5%	70	26.5%	22.96**	0.19
All Others	319	88.4%	42	11.6%		

*$p < .05$, **$p < .001$

Undeclared and End of College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions between whether a student declared their major prior to entry and end of college environment variables on time-to-degree. Students who were declared prior to entry were less likely to graduate if they had higher than average missed credits, total credits, or lower than average GPA. They were more likely to

graduate if they had fewer than average missed credits, total credits earned, or a higher GPA. Students without a declared major were more likely to graduate on time if they had lower than average missed credits, total credits, or higher GPA. They were less likely to graduate on time if they had more than average missed credits, total credits, or a lower cumulative GPA. Table 30 summarizes the interactions between declared and undeclared students and end of college variables.

Table 30

Undeclared Major and During College Interactions

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Declared Major						
High Missed	89	64.0%	50	36.0%	39.60**	0.25
All Others	424	87.2%	62	12.8%		
Low Missed	257	91.5%	24	8.5%	30.53**	0.22
All Others	256	74.4%	88	25.6%		
High Total	116	68.6%	53	31.4%	28.45**	0.21
All Others	397	87.1%	59	12.9%		
Low Total	230	91.6%	21	8.4%	26.03**	0.20
All Others	283	75.7%	91	24.3%		
High GPA	196	88.3%	26	11.7%	9.02*	0.12
All Others	317	78.7%	86	21.3%		
Low GPA	150	75.8%	48	24.2%	7.88*	0.11
All Others	363	85.0%	64	15.0%		
Undeclared Major						
High Missed	49	69.0%	22	31.0%	9.30*	0.12
All Others	464	83.8%	90	16.2%		
Low Missed	118	88.1%	16	11.9%	4.15*	0.08
All Others	395	80.4%	96	19.6%		
High Total	50	64.9%	27	35.1%	17.55**	0.17
All Others	463	84.5%	85	15.5%		

Table 30 Continued

Low Total	117	91.4%	11	8.6%	9.52*	0.12
All Others	396	79.7%	101	20.3%		
High GPA	91	89.2%	11	10.8%	4.22*	0.08
All Others	422	80.7%	101	19.3%		
Low GPA	76	73.8%	27	26.2%	5.77*	0.10
All Others	437	83.7%	85	16.3%		

*$p < .05$, **$p < .001$

Residence and End of College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions between whether a student lived on or off campus and end of college environment variables on time-to-degree. Students who lived on campus were more likely to graduate on time if they had fewer missed credits, total credits, or a higher GPA. They were less likely to graduate on time if they had higher than average missed credits, total credits, or a lower GPA. Off campus students did not show any interaction with end of college variables. Table 31 summarizes the significant Chi-Square tests for students who lived on campus.

Table 31

On Campus and During College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
On Campus						
High Missed	113	63.5%	65	36.5%	58.52**	0.31
All Others	400	89.5%	47	10.5%		
Low Missed	296	89.2%	36	10.8%	24.11**	0.20
All Others	217	74.1%	76	25.9%		
High Total	138	66.0%	71	34.0%	55.00**	0.30
All Others	375	90.1%	41	9.9%		

Table 31 Continued

Low Total	271	90.0%	30	10.0%	24.97**	0.20
All Others	242	74.7%	82	25.3%		
High GPA	225	86.9%	34	13.1%	6.91*	0.11
All Others	288	78.7%	78	21.3%		
Low GPA	184	73.3%	67	26.7%	21.95**	0.19
All Others	329	88.0%	45	12.0%		

*$p < .05$, **$p < .001$

Pell Status and End of College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions between Pell status and end of college environment variables on time-to-degree. Students who received a Pell grant were more likely to graduate on time if they had fewer missed credits, total credits, or a higher GPA. They were less likely to graduate on time if they had higher than average missed credits or total credits. Off campus students did not show any interaction with end of college variables. Pell recipients with higher than average missed credits, total credits, or lower cumulative GPA were less likely to graduate on time, but more likely to graduate on time if they had lower than average total credits earned. Table 32 summarizes the significant Chi-Square tests for students who received a Pell grant and did not receive a Pell grant.

Table 32

Pell Status and During College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Non Pell Recipient						
High Missed	90	70.3%	38	29.7%	15.15**	0.16
All Others	423	85.1%	74	14.9%		
Low Missed	266	91.7%	24	8.3%	34.21**	0.23
All Others	247	73.7%	88	26.3%		

Table 32 Continued

High Total	112	73.7%	40	26.3%	9.63*	0.12
All Others	401	84.8%	72	15.2%		
Low Total	244	91.7%	22	8.3%	29.32**	0.22
All Others	269	74.9%	90	25.1%		
High GPA	201	91.0%	20	9.0%	18.29**	0.17
All Others	312	77.2%	92	22.8%		
Low Arrival	317	84.8%	57	15.2%	4.55*	0.09
All Others	196	78.1%	55	21.9%		
Pell Recipient						
High Missed	48	58.5%	34	41.5%	35.57**	0.24
All Others	465	85.6%	78	14.4%		
High Total	54	57.4%	40	42.6%	45.64**	0.27
All Others	459	86.4%	72	13.6%		
Low Total	103	91.2%	10	8.8%	7.72*	0.11
All Others	410	80.1%	102	19.9%		
Low GPA	71	68.3%	33	31.7%	16.18**	0.16
All Others	442	84.8%	79	15.2%		

*$p < .05$, **$p < .001$

Credits at Arrival and End of College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions between credits at arrival and end of college environment variables on time-to-degree. Students who arrived with credits were less likely to graduate if they had higher than average missed credits or total credits, but were more likely to graduate if they had fewer than average total credits. Students who did not arrive with credits were more likely to graduate if they had fewer than average missed credits, total credits, or a higher cumulative GPA. They were less likely to graduate if they had higher than average missed credits, total credits, or lower cumulative GPA. Table 33 summarizes the

significant Chi-Square tests for students who received a arrived with credits or did not arrive with credits.

Table 33

Credits at Arrival and During College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Credits at Arrival						
High Missed	9	60.0%	6	40.0%	5.09*	0.09
All Others	504	82.6%	106	17.4%		
High Total	12	60.0%	8	40.0%	6.85*	0.11
All Others	501	82.8%	104	17.2%		
Low Total	40	100.0%	0	0.0%	9.33*	0.12
All Others	473	80.9%	112	19.1%		
No Credits at Arrival						
High Missed	129	66.2%	66	33.8%	48.88**	0.28
All Others	384	89.3%	46	10.7%		
Low Missed	332	89.7%	38	10.3%	36.08**	0.24
All Others	181	71.0%	74	29.0%		
High Total	154	68.1%	72	31.9%	46.76**	0.27
All Others	359	90.0%	40	10.0%		
Low Total	307	90.7%	32	9.4%	36.22*	0.24
All Others	206	72.0%	80	28.0%		
High GPA	255	88.2%	34	11.8%	13.85**	0.15
All Others	258	76.8%	78	23.2%		
Low GPA	206	74.6%	70	25.4%	18.61**	0.17
All Others	307	88.0%	42	12.0%		

*$p < .05$, **$p < .001$

Continuous Enrollment and During College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions continuous enrollment and during college environment variables on time-to-degree. Students who did not stop out were

more likely to graduate if they did not take summer courses, had higher than average attempted credits per semester, or had a higher than average first year GPA. They were not as likely to graduate if they changed majors or had lower than average attempted credits per semester. Students who stopped out were less likely to graduate under every circumstance including taking summer courses, high and low first year GPA, changes in major, no changes in major and low average attempted credits per semester. Table 34 summarizes the significant Chi-Square tests for continuous enrollment.

Table 34

Continuous and During College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Did Not Stop Out						
No Summer	270	86.3%	43	13.7%	7.46*	0.11
All Others	243	77.9%	69	22.1%		
High 1st GPA	298	86.9%	45	13.1%	11.91**	0.14
All Others	215	76.2%	67	23.8%		
Major Change	188	78.0%	53	22.0%	4.42*	0.08
All Others	325	84.6%	59	15.4%		
No Major Change	308	88.8%	39	11.2%	23.67**	0.20
All Others	205	73.7%	73	26.3%		
Low Avg. Cred.	201	77.3%	59	22.7%	6.89*	0.11
All Others	312	85.5%	53	14.5%		
High Avg. Cred.	295	89.9%	33	10.1%	28.98**	0.22
All Others	218	73.4%	79	26.6%		
Stop Out						
Summer Course	15	51.7%	14	48.3%	19.05**	0.18
All Others	498	83.6%	98	16.4%		
High 1st GPA	10	45.5%	12	54.5%	20.80**	0.18
All Others	503	83.4%	100	16.6%		

Table 34 Continued

Low 1st GPA	7	46.7%	8	53.3%	13.10*	0.15
All Others	506	83.0%	104	17.0%		
Change in Major	10	62.5%	6	37.5%	4.28*	0.08
All Others	503	82.6%	106	17.4%		
No Major Change	7	33.3%	14	66.7%	35.11**	0.24
All Others	506	83.8%	98	16.2%		
Low Avg. Cred	13	44.8%	16	55.2%	28.69**	0.21
All others	500	83.9%	96	16.1%		

*$p < .05$, **$p < .001$

Summer Courses and During College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions for summer courses and during college environment variables on time-to-degree. Students who did not take summer courses were more likely to graduate if they had a higher than average first year GPA, did not change their major, or had higher than average attempted credits per semester. They were less likely to graduate if they took fewer than average credits per semester. Students who took summer courses were less likely to graduate if they had fewer than average credits attempted per semester or changed their major. Table 35 summarizes the significant Chi-Square tests for students who did or did not take summer courses.

Table 35

Summer Courses and During College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
No Summer Courses						
High 1st GPA	177	88.1%	24	11.9%	7.20*	0.11
All Others	336	79.2%	88	20.8%		
No Major Change	180	87.8%	25	12.2%	6.80*	0.10
All Others	333	79.3%	87	20.7%		

Table 35 Continued

Low Avg. Cred.	27	55.1%	22	44.9%	26.31**	0.21
All Others	486	84.4%	90	15.6%		
High Avg. Cred.	245	90.1%	27	9.9%	29.92**	0.18
All Others	268	75.9%	85	24.1%		
Summer Courses						
Major Change	106	75.2%	35	24.8%	5.90*	0.10
All Others	407	84.1%	77	15.9%		
Low Avg. Cred	187	77.9%	53	22.1%	4.59*	0.09
All Others	326	84.7%	59	15.3%		

*$p < .05$, **$p < .001$

First Year GPA and During College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions for first year GPA and during college environment variables on time-to-degree. Students who had a high first year GPA were more likely to graduate on time if they had higher than average credits per semester or did not change majors. They were less likely to graduate if they had fewer than average attempted credits per semester. Students with low first year GPA were less likely to graduate on time if they had fewer than average attempted credits per semester or changed their major. Table 36 summarizes the significant Chi-Square tests for first year GPA interactions.

Table 36

First Year GPA and During College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
High First Year GPA						
No Major Change	185	88.9%	23	11.1%	9.98*	0.13
All Others	328	78.7%	89	21.3%		
Low Avg. Cred.	114	74.0%	40	26.0%	9.01*	0.12
All Others	399	84.7%	72	15.3%		

Table 36 Continued

High Avg. Cred.	194	91.9%	17	8.1%	21.08**	0.18
All Others	319	77.1%	95	22.9%		
Low First Year GPA						
Major Change	75	75.0%	25	25.0%	4.06*	0.08
All Others	438	83.4%	87	16.6%		
Low Avg. Cred	100	74.1%	35	25.9%	7.50*	0.11
All Others	413	84.3%	77	15.7%		

*$p < .05$, **$p < .001$

Changes in Major and During College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions for changes in major and during college environment variables on time-to-degree. Students who changed their major were less likely to graduate on time if they had fewer than average attempted credits per semester. Students who did not change their major were more likely to graduate if they had greater than average attempted credits per semester. Table 37 summarizes the significant Chi-Square tests for changes in major.

Table 37

Changes in Major and During College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Change of Major						
Low Avg. Cred.	214	74.0%	75	26.0%	23.58**	0.19
All Others	299	89.0%	37	11.0%		
No Change of Major						
High Avg. Cred.	198	90.4%	21	9.6%	15.91**	0.16
All Others	315	77.6%	91	22.4%		

*$p < .05$, **$p < .001$

Continuous Enrollment and End of College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions for continuous enrollment and during college environment variables on time-to-degree. Students who did not stop out were more likely to graduate on time if they had fewer than average missed credits, total credits, or a higher than average cumulative GPA. Conversely, they were less likely to graduate if they had greater than average missed credits, total credits, or a lower than average GPA. Students who did stop out had longer time to degrees for both levels of missed credits, total earned credits and cumulative GPA. Table 38 summarizes the significant Chi-Square tests for continuous enrollment.

Table 38

Continuous Enrollment and End of College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
No Stop Out						
High Missed	133	68.6%	61	31.4%	34.98**	0.24
All Others	380	88.2%	51	11.8%		
Low Missed	363	92.1%	31	7.9%	73.23**	0.34
All Others	150	64.9%	81	35.1%		
High Total	159	68.8%	72	31.2%	43.73**	0.26
All Others	354	89.8%	40	10.2%		
Low Total	337	94.4%	20	5.6%	85.88**	0.37
All Others	176	65.7%	92	34.3%		
High GPA	276	90.8%	28	9.2%	30.53**	0.22
All Others	237	73.8%	84	26.2%		
Low GPA	220	77.5%	64	22.5%	7.54*	0.11
All Others	293	85.9%	48	14.1%		
Stop Out						
High Missed	5	31.2%	11	68.8%	28.84**	0.22
All Others	508	83.4%	101	16.6%		
Low Missed	12	57.1%	9	42.9%	9.19*	0.12
All Others	501	82.9%	103	17.1%		

Table 38 Continued

High Total	7	46.7%	8	53.3%	13.10**	0.15
All Others	506	83.0%	104	17.0%		
Low Total	10	45.5%	12	54.5%	20.80**	0.18
All Others	503	83.4%	100	16.6%		
High GPA	11	55.0%	9	45.0%	10.30*	0.13
All Others	502	83.0%	103	17.0%		
Low GPA	6	35.3%	11	64.7%	26.01**	0.20
All Others	507	83.4%	101	16.6%		

*$p < .05$, **$p < .001$

Summer Courses and End of College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions for summer courses and during college environment variables on time-to-degree. Students who did not take summer courses were more likely to graduate on time if they had fewer than average missed credits, total credits, or a higher than average cumulative GPA. Conversely, they were less likely to graduate if they had greater than average missed credits or total credits. Students who took summer courses were more likely to graduate on time if they had fewer than average missed credits or total credits. They were less likely to graduate on time if they had higher than average missed credits, total credits, or a lower than average GPA. Table 39 summarizes the significant Chi-Square tests for summer courses

Table 39

Summer Courses and End of College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
No Summer Course						
High Missed	57	65.5%	30	34.5%	18.85**	0.17
All Others	456	84.8%	83			

Table 39 Continued

Low Missed	215	91.9%	19	8.1%	24.42**	0.20
All Others	298	76.2%	93	23.8%		
High Total	64	64.0%	36	36.0%	26.46**	0.21
All Others	449	85.5%	76	14.5%		
Low Total	208	94.1%	13	5.9%	33.68**	0.23
All Others	305	75.5%	99	24.5%		
High GPA	161	89.4%	19	10.6%	9.32*	0.12
All Others	352	79.1%	93	20.9%		
Yes Summer Course						
High Missed	81	65.9%	42	34.1%	27.41**	0.21
All Others	432	86.1%	70	13.9%		
Low Missed	160	88.4%	21	11.6%	6.91*	0.11
All Others	353	79.5%	91	20.5%		
High Total	102	69.9%	44	30.1%	19.33**	0.18
All Others	411	85.8%	68	14.2%		
Low Total	139	88.0%	19	12.0%	5.00*	0.09
All Others	374	80.1%	93	19.9%		
Low GPA	115	71.9%	45	28.1%	15.23**	0.16
All Others	398	85.6%	67	14.4%		

*$p < .05$, **$p < .001$

First Year GPA and End of College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions for first year GPA and during college environment variables on time-to-degree. Students with a high first year GPA were more likely to graduate on time if they had fewer than average missed credits or total credits earned. However, they were less likely to graduate on time if they had higher than average missed credits and total credits. Students with a low first year GPA were more likely to graduate on time if they had fewer than average missed credits or total credits earned. They were also less likely to

graduate on time if they had greater than average missed credits or total credits earned. Table 40 summarizes the significant Chi-Square tests for first year GPA.

Table 40

First Year GPA and End of College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
High First GPA						
High Missed	57	64.8%	31	35.2%	20.86**	0.18
All Others	456	84.9%	81	15.1%		
Low Missed	251	90.6%	26	9.4%	24.63**	0.20
All Others	262	75.3%	86	24.7%		
High Total	106	70.7%	44	29.3%	17.48**	0.17
All Others	407	85.7%	68	14.3%		
Low Total	202	94.0%	13	6.0%	31.41**	0.22
All Others	311	75.9%	99	24.1%		
Low First GPA						
High Missed	81	66.4%	41	33.6%	25.36**	0.20
All Others	432	85.9%	71	14.1%		
Low Missed	124	89.9%	14	10.1%	7.28*	0.11
All Others	389	79.9%	98	20.1%		
High Total	60	62.5%	36	37.5%	29.56**	0.22
All Others	453	85.6%	76	14.4%		
Low Total	145	88.4%	19	11.6%	6.07*	0.10
All Others	368	79.8%	93	20.2%		

*$p < .05$, **$p < .001$

Changes in Major and End of College Interactions

Chi-Square tests were utilized to find effects of interactions for changes in major and during college environment variables on time-to-degree. Students who changed their major were less likely to graduate if they had higher than average missed credits or total credits. No other interactions were found for students who changed their major. Students who did not change their

major were more likely to graduate if they had fewer than average missed credits or total credits earned, but more likely to graduate if they had fewer than average missed credits or total credits earned. Table 41 summarizes the significant Chi-Square tests for changes in major.

Table 41

Changes in Major and End of College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Change of Major						
High Missed	138	65.7%	72	34.3%	57.59**	0.30
All Others	375	90.4%	40	9.6%		
High Total	166	67.5%	80	32.5%	58.79**	0.31
All Others	347	8.4%	32	8.4%		
No Change of Major						
High Missed	81	73.0%	30	27.0%	7.61*	0.11
All Others	432	84.0%	82	16.0%		
Low Missed	234	91.1%	23	8.9%	23.88**	0.20
All Others	279	75.8%	89	24.2%		
High Total	91	71.1%	37	28.9%	12.21**	0.15
All Others	422	84.9%	75	15.1%		
Low Total	224	93.3%	16	6.7%	33.54**	0.23
All Others	289	75.1%	96	24.9%		

*$p < .05$, **$p < .001$

Average Credits Attempted Per Semester and End of College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions for average credits attempted and during college environment variables on time-to-degree. Students with fewer than average credits attempted per semester were less likely to graduate if they had higher than average total credits earned, lower than average missed credits, or lower than average GPA. Students with greater than average credits attempted per semester were more likely to graduate if they had

fewer than average credits missed, credits attempted, or higher than average cumulative GPA. Table 42 summarizes the significant Chi-Square tests for average credits attempted.

Table 42

Average Credits Attempted Per Semester and End of College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Low Avg. Cred.						
High Total	64	56.6%	49	43.4%	60.71**	0.31
All Others	449	87.7%	63	12.3%		
Low Missed	214	74.0%	75	26.0%	23.58**	0.19
All Others	299	89.0%	37	11.0%		
Low GPA	102	65.4%	54	34.6%	39.40**	0.25
All Others	411	87.6%	58	12.4%		
High Avg. Cred.						
Low Missed	299	89.0%	37	11.0%	23.58**	0.19
All Others	214	74.0%	75	26.0%		
Low Total	197	97.0%	6	3.0%	45.77**	0.27
All Others	316	74.9%	106	25.1%		
High GPA	175	91.6%	16	8.4%	17.03*	0.17
All Others	338	77.9%	96	22.1%		

*$p < .05$, **$p < .001$

Missed Credits and End of College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions for missed credits and during college environment variables on time-to-degree. Students with higher than average missed credits were less likely to graduate on time if they had higher than average total credits earned or lower than average cumulative GPA. Students with lower than average missed credits were more likely to graduate if they had lower than average total credits earned, higher than average GPA or lower than average GPA. No other interactions were found to be significant. Table 43 summarizes the significant Chi-Square tests for missed credits.

Table 43

Missed Credits and End of College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
High Missed						
High Total	46	50.0%	46	50.0%	75.48**	0.35
All Others	467	87.6%	66	12.4%		
Low GPA	96	62.3%	58	37.7%	54.15**	0.29
All Others	417	88.5%	54	11.5%		
Low Missed						
Low Total	255	97.7%	6	2.3%	74.35**	0.35
All Others	258	70.9%	106	29.1%		

Table 43 Continued

High GPA	245	91.4%	23	8.6%	27.81**	0.21
All Others	268	75.1%	89	24.9%		
Low GPA	130	88.4%	17	11.6%	5.28*	0.09
All Others	383	80.1%	95	19.9%		

*$p < .05$, **$p < .001$

Total Credits Earned and End of College Interactions by Time-to-Degree

Chi-Square tests were utilized to find effects of interactions for total credits earned and during college environment variables on time-to-degree. Students with lower than average total credits earned were more likely to graduate if they had a higher GPA. Students with a higher than average number of total credits earned were less likely to graduate at both levels of cumulative GPA. Table 44 summarizes the significant Chi-Square tests for total credits earned.

Table 44

Total Credits Earned and End of College Interactions by Time-to-Degree

	Fewer than 10 semesters		More than 10 semesters			
	N	%	N	%	χ^2	Φ
Low Total						
High GPA	195	98.5%	3	1.5%	53.03**	0.29
All Others	318	74.5%	109	25.5%		
High Total						
High GPA	92	73.0%	34	27.0%	8.82*	0.12
All Others	421	84.4%	78	15.6%		
Low GPA	74	61.7%	46	38.3%	42.08**	0.26
All Others	439	86.9%	66	13.1%		

*$p < .05$, **$p < .001$

Logistic Regression for Time-to-Degree

Hierarchical logistic regression was conducted using two separate models. The first used only main effects following Knight's (1994) model and the second used Astin's (2002) model of assessment. Using Knight's model, no high degrees of multicollinearity were found. The independent variables were entered in four blocks in the following sequence:

Step 1: Asian, African American, Hispanic, White, Gender, ACT, and Combined Income.

Step 2: Pell Status, Credits at Arrival, Living on Campus, Undeclared Major.

Step 3: Change in Major, Continuous Enrollment, Summer Course, First Year GPA, and Average Attempted Credits.

Step 4: Missed Credits, Total Earned Credits, Cumulative GPA.

The final model was statistically significant in predicting which variables contributed to a student's time-to-degree, $\chi^2(18) = 340.00$, $p < .001$. Final Cox and Snell $R^2 = 0.42$ and Nagelkerke $R^2 = 0.69$. Change in Cox and Snell and Nagelkerke values are presented in Table 45.

Table 45

Hierarchical Logistic Regression 1 Analysis Summary Table

Hierarchical	Cox & Snell		Nagelkerke	
Step	R^2	ΔR^2	R^2	ΔR^2
1	0.06	-----	0.10	-----
2	0.08	0.02	0.13	0.03
3	0.15	0.07	0.25	0.12
4	0.42	0.27	0.69	0.44

Regression coefficients are presented in Table 46. Numerous main effects were statistically significant in this model. Hispanic race/ethnicity was the only input variable which was statistically significant with an increased time-to-degree. Living on campus, stopping out, not taking a summer course or having a higher average attempted credit rate indicated a time to degree of ten semesters or more. Having higher amounts of missed credits or total credits earned also increased time-to-degree for first-generation students. For reference, Table 47 includes the effect sizes for each main effect on time-to-degree. Given the large sample size of the study, it is important to note the effect size as well as significance for variables in the regression. Effect sizes of 0.10 are considered small, 0.20 are considered moderate, and 0.50 are considered large. Several of the main effects had moderate effect sizes including continuous enrollment, missed credits and total credits earned. The remaining significant main effects had small effect sizes. The Hosmer and Lemeshow test was not significant, χ^2 (8) = 14.46, p = 0.07, which indicates support for our model. Poor fit is indicated by a significant result of the Hosmer and Lemeshow test (Pallant, 2010). The final model successfully predicted 91% of the students in the dataset.

Table 46

Hierarchical Logistic Regression 1 Coefficients

	B	S.E.	Wald	Odds Ratio
Total Credits Earned	0.18	0.19	90.67**	1.20
Missed Credits	0.31	0.05	41.97**	1.34
Summer Course	-3.54	0.55	40.94**	0.03
Avg. Att. Credits	-1.32	0.22	37.55**	0.27
Stop Out	3.40	0.59	33.00**	30.00
Hispanic	1.01	0.47	4.59*	2.73
Live On Campus	1.13	0.54	4.45*	3.01
Combined Income	0.00	0.00	3.55	1.00
First Year GPA	0.55	0.34	2.68	1.73
Asian	0.67	0.57	1.40	1.96
African American	-0.98	0.84	1.36	0.38
Pell Grant Recipient	0.54	0.48	1.27	1.72
Gender	0.35	0.38	0.86	1.42
Cumulative GPA	-0.48	0.55	0.75	0.62
ACT	0.05	0.06	0.61	1.05
Change in Major	-0.22	0.37	0.37	0.80
Credits at Arrival	-0.34	0.69	0.24	0.71
Undecided	-0.12	0.40	0.10	0.89

*$p < .05$, **$p < .001$

Table 47

Summary of Significant Variable Effect Size for Time-to-Degree

	Φ
Total Credits Earned	0.31
Missed Credits	0.30
Continuous Enrollment	0.24
Avg. Att. Credits	0.19
Cumulative GPA	0.18
Hispanic	0.17
Gender	0.15
Pell Grant Recipient	0.11
Change in Major	0.11
Asian	0.10
Living on Campus	0.10

The second logistic regression took into account significant interactions with at least a medium effect size on time-to-degree. Several variables were removed due to high multicollinearity. All remaining variables were entered as recommended by Astin (2002). The variables were entered as follows:

Step 1: Asian, African American, ACT, Combined Income.

Step 2: Male_Hispanic, Male_LowACT.

Step 3: Undeclared, Residence, Credits at Arrival.

Step 4: Summer Course, First Year GPA, Average Attempted Credits.

Step 5: OnCampus_LowAvgAtt, NoStopOut_NoMajorChange, NoStopOut_HighAvgAtt, Undeclared_StopOut.

Step 6: Male_Pell, Male_StopOut, Male_LowAvgAtt, Hispanic_LowAvgAtt.

Step 7: Missed Credits, Total Credits Earned, Cumulative GPA.

Step 8: Male_HighMissed, Male_HighTotal, Female_LowTotal, Asian_LowTotal, White_LowMissed, White_LowTotal, White_LowGPA, Hispanic_HighMissed, Hispanic_HighTotal, Hispanic_HighGPA, LowIncome_HighMissed, LowIncome_HighTotal.

Step 9: Declared_HighMissed, Declared_HighTotal, OnCampus_HighMissed, OnCampus_LowTotal, NoPell_LowMissed, NoPell_LowTotal, Pell_HighMissed, NoArrivalCred_LowMissed, StopOut_LowMissed, StopOut_LowTotal, StopOut_HighGPA, NoStopOut_LowGPA, NoSummer_LowMissed, NoSummer_HighTotal, High1stGPA_LowTotal, High1stGPA_LowMissed, Low1stGPA_HighMissed, LowAvgAtt_HighTotal, LowAvgAtt_LowGPA,

HighAvgAtt_LowTotal, HighMissed_HighTotal, HighMissed_LowGPA, HighTotal_HighGPA.

The final model was statistically significant in predicting which variables contributed to a student's time-to-degree, $\chi^2(65) = 412.17$, $p < .001$. Final Cox and Snell $R^2 = 0.48$ and Nagelkerke $R^2 = 0.79$. Change in Cox and Snell and Nagelkerke values are presented in Table 48.

Table 48

Hierarchical Logistic Regression 2 Analysis Summary Table

Hierarchical	Cox & Snell		Nagelkerke	
Step	R^2	ΔR^2	R^2	ΔR^2
1	0.01	-----	0.02	-----
2	0.07	0.06	0.11	0.09
3	0.08	0.01	0.13	0.02
4	0.13	0.05	0.21	0.07
5	0.17	0.04	0.29	0.08
6	0.19	0.02	0.31	0.02
7	0.44	0.25	0.72	0.41
8	0.45	0.01	0.74	0.02
9	0.48	0.04	0.79	0.05

Regression coefficients are presented in Table 53. Numerous main effects were statistically significant in the final model. Higher first year GPA, fewer credits attempted per semester, fewer missed credits and fewer total credits earned indicated a student with fewer than 10 credit hours elapsed. Numerous interactions were also significant. Students who received a Pell grant and had higher than average total credits earned, did not take a summer course and had higher than average total credits earned were less likely to graduate on time. In contrast, students who did not stop out and did not change their major, did not take summer courses and had fewer than average credits attempted per semester, or were white and had fewer than average missed credits

were more likely to graduate on time. For reference, Table 54 includes the effect sizes on time-to-degree. Given the large sample size of the study, it is important to note the effect size as well as significance for variables in the regression. Effect sizes of 0.10 are considered small, 0.20 are considered moderate, and 0.50 are considered large. All interactions had moderate effect sizes. The Hosmer and Lemeshow test was not significant, χ^2 (8) = 1.02, p = 0.998, which indicates support for our model. Poor fit is indicated by a significant result of the Hosmer and Lemeshow test. The final model successfully predicted 93.8% of the students in the dataset.

Table 49

Hierarchical Logistic Regression 2 Coefficients

	B	S.E.	Wald	Odds Ratio
Total Credits Earned	0.26	0.04	45.33**	1.30
Avg. Att. Credits	-2.02	0.41	24.14**	0.13
Missed Credits	0.47	0.10	20.72**	1.61
NoSummer_HighTotal	3.59	1.40	6.60*	36.29
StopOut_NoMajorChange	4.01	1.65	5.92*	54.85
White_LowMissed	-2.92	1.28	5.17*	0.05
First Year GPA	1.51	0.72	4.42*	4.52
NoSummer_LowAvgAtt	2.77	1.33	4.33*	15.96
Pell_HighTotal	5.61	2.82	3.97*	273.18

*p < .05, **p < .001

Table 50

Summary of Significant Variable Effect Size for Time-to-Degree

	Φ
Total Credits Earned	0.31
Missed Credits	0.30
White_LowMissed	0.29
Pell_HighTotal	0.27
StopOut_NoMajorChange	0.24
NoSummer_LowAvgAtt	0.21
NoSummer_HighTotal	0.21
Avg. Att. Credits	0.19

Summary

In summary, this chapter discussed the descriptive and quantitative findings. The descriptive findings suggest that the first-generation students who attended this university may differ in some characteristics compared to other first-generation students. Specifically Pell status may be lower and combined income may be higher than the general population of first-generation students. The quantitative findings suggest that input and during college variables have a small effect on time-to-degree, explaining just over 10% of variance in the first regression model. Pre-college characteristics had virtually no effect on time-to-degree in either model. The largest effect in both models came from end of college variables such as total credits earned and missed credits, which explained 44% of variance in the original model. These findings reflect the previous research by Knight (1994).

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to examine factors which increase time-to-degree in first-generation students. Previous research has shown that numerous background variables (Astin, 1993; Campbell, 2003; Knight, 1994) and environment variables (Knight, 2004; Ishitani & Snider, 2006; Ishitani, 2005) can impact a student's time-to-degree. This study chose to focus on first-generation students rather than all students at a university. First-generation students are at risk for several outcome variables including an increased time-to-degree (Pascarella et al., 2005; Ishitani, 2006). Bowen et al. (2009) noted that a decreased time-to-degree is not only important to lower the cost of a degree to students and their families, but also to the institutions they are attending. Subsequently, if we have a lower time-to-degree for all students, we will be able to move additional students through the pipeline to help attain our completion goals.

The foundation of this study is built upon Astin's I-E-O model and Knight's application for time-to-degree. To address the research question, quantitative methods including chi-squares and logistic regression were utilized. The results indicated that both input and environmental variables significantly impacted time-to-degree. Furthermore, after controlling for student background characteristics and pre-college environment variables, during college and end of college environment variables were found to have large effects on time-to-degree.

The research questions used in this study were:

1. What are the most significant factors related to time-to-degree for first-generation students?
    a. How do these variables interact?
    b. Do input or environmental factors play a larger role in time-to-degree?

Discussion and Conclusions

This chapter provides discussion and conclusions related to the variables which were associated with a change in time-to-degree and their relation to the literature.

Descriptive Statistics

It is interesting to note that the average credits attempted per semester was well below 15 for the students in this dataset. This may be partially due to how this variable was created. Summer courses were counted as half of a semester attempted. Likewise, summer credits were counted towards total credits earned. Since most students only took three credits during summer semesters, it had the same effect as taking only six credit hours for a fall or spring semester, thus lowering the average credits attempted per semester.

Another interesting finding was that 66.9% of first-generations students were not Pell recipients. This runs contrary to Nunez (1998) who found first-generation students tend to have lower socioeconomic status than other students. In 1999, approximately 90% of Pell grants were awarded to students with parental income below $41,000 (Heller, 2003). The combined income for students was just under $60,000, which indicates that first-generation students who graduated from this institution were more affluent than the average first-generation student. This finding contradicts previous research which implies that first-generation students are much poorer than their peers. According to Pryor et al. (2007), the average parental income for a student attending a public university was just over $70,000. This puts the first-generation students just behind the average student in the county. One reason for this disparity of income could be the fact that the institution is the highest priced public institution in the state. As the maximum Pell award is the same regardless of the institution attended, Pell recipients may feel their money will go further at an institution with lower tuition. Supporting this claim, only 15.8% of students at the institution

received a Pell grant in 1999-2000 (Heller, 2003). Disaggregating the income variable by race/ethnicity reveals some interesting findings. The average income for white students was by far the highest among the different groups with an average of $66,000. This puts the average white, first-generation student just below the average student attending a public university in this year. Students of Hispanic ($49,000), Asian ($39,000) and African American ($38,000) race/ethnicity had significantly lower combined incomes. These incomes are more in line with the traditional view of first-generation students in terms of income levels. However, as the majority of first-generation students could not be considered low income, this contradicts the view first-generation and low income can often be used nearly interchangeably.

The descriptive statistics for time-to-degree show there was not much variability among first-generation students. Students graduated in 8 or fewer semesters approximately 60.4% of the time and graduated in fewer than 10 semesters 82.0% of the time. Most of those who graduated did so in a timely fashion. This is likely because of the high quality of students who attend the university.

Input Variables

Results from the first logistic regression indicate that Hispanic race/ethnicity was the only input variable to affect time-to-degree. This confirms some of the findings from the Oklahoma Council on Student Affairs (1996), who found that and Hispanic students were least likely to graduate on time. After accounting for other factors, Hispanic students in this study were 2.73 times more likely to spend 10 or more semesters obtaining their bachelor's degree. Contrary to previous research, African American students graduated at approximately the same rate as other students in this study, which included any interactions with other input or environment variables. This contradicts much of the previous research discussed in the literature review, in addition to a

line of research about the theory of mismatch in college students (Sowell, 2004; Jensen, 1970). The theory holds that students, specifically African Americans are hurt by race based admissions. When African American students of lower academic quality (based on preparation) are admitted to an institution of higher academic quality, they are mismatched and will perform poorly. The African American students had a lower ACT (M=20.87) than Hispanic (M=23.72), Asian (M=26.10) or White students (M=26.80). However, the performed as well, if not better, than every race/ethnicity in the study. Several studies have found similar results, showing that African American students who are considered under matched actually perform better at more selective institutions (Bowen & Bok, 1998; Cross, 1993; Bowen et al., 2007). Asian and White students, had significant interactions with time-to-degree, but after accounting for other variables, most differences disappeared. One exception is that low-income Asian students were more likely to have an increased time-to-degree. It would have been interesting to disaggregate the Asian students further by ethnicity, but the dataset did not contain that information. Contrary to previous research involving socioeconomic status (Astin, 1993; Campbell, 2003) and preparation (Zhu, 2003; Ishitani, 2003; Knight 1994), ACT and combined income had no main effects on time-to-degree either by themselves or in the regression model. This may be attributed to programs on campus or simply to the high level of quality in students which attend the university. No input variables were found to be significant in the second regression model. Hispanic race/ethnicity was removed due to high multicollinearity with several interaction variables; however, these variables were insignificant in the final model.

Pre-College Environment Variables

Results from the first logistic regression indicate that only residence had significant effects on time-to-degree. Contrary to Astin's (1993) finding, students who lived in residence

halls their freshman years were less likely to graduate on time compared to students who did not in terms of main effects with time-to-degree. However, once put into the first regression model, living on campus significantly increased chances of graduating on time by 3.1 times. Examining the interactions shed some light on this phenomenon. Of the 126 students who reportedly lived off campus their freshman year, 115 of them had higher than average income. These higher income students graduated on time at a remarkable 90% rate. Even more interesting, all 11 of the lower than average income students who lived off campus did not graduate on time. Residence was not significant in the second regression model.

The main effect of receiving a Pell grant showed students were less likely to graduate on time, which supports previous research (Knight, 1994; DesJardins et al., 2003; Ishitani & Snider, 2003; Volkwein & Loraing, 1996). However, once put into the regression equation, the effect disappeared. Pell status was removed from the second regression due to high multicollinearity with an interaction that was significant. Interactions will be discussed in depth later in this chapter. The disappearance of this effect may simply be due to the high level of students who attend the university. Arriving with credits had no main effects on time-to-degree and were not significant in the first or second regression model. It was hypothesized that arriving with credits would have a positive impact on time-to-degree because it lessens the amount of total credits needed to graduate, but there was no evidence to support it. Similarly, students who began undecided did no better or worse than students who began with a major, regardless of race/ethnicity.

During College Environment Variables

Results from main effects indicate that continuous enrollment, changes in majors, and having a lower than average attempted credits per semester had significant effects on time to

degree. In the first regression model continuous enrollment, summer course, first year GPA, and average attempted credits had significant effects on time-to-degree. Finally, in the second regression, only first year GPA and average attempted credits had significant effects on time-to-degree.

In support of previous research (Ishitani, 2005; Belcheir, 2000) students who did not have continuous enrollment, or stopped out, were significantly less likely to graduate on time. This was true for the main effect and first regression model. The effect of stopping out was staggering in the first regression model as those students were 30 times more likely to have an increased time-to-degree. Continuous enrollment was dropped from the second regression due to high multicollinearity. These results indicate that continuous enrollment is one of the top factors in time-to-degree among first-generation students, supporting previous research.

Results indicate that students who changed their major were more likely to increase time-to-degree not accounting for any other variables. However, one put into both regression equations, the effect disappeared. The findings from the regression equations run contrary to previous research (Klopfenstein, 2000; Knight & Arnold, 2000; Adelman, 2006; Ma, 2010). This is likely because changes in major plays directly into missed credits and total credits earned, which were significant in both regressions. Upon further examination, the rate of changes in major did not significantly vary between race/ethnicity, but students who began college as undecided were much less likely to change their major (28.8%) compared to those who began with a major (47.1%).

Results indicate that students with low average attempted credits were less likely to graduate on time. This was true for main effects on time-to-degree as well as both regression models. This supports previous research by Knight (1994), DesJardins et al., (2003), Ishitani and

Snider (2003), and Volkwein and Lorang (1996). In the first regression model, a one credit per semester increase resulted in a 0.175 decrease in chances of an increased time-to-degree. In the second regression model, a one credit per semester increase resulted in a 0.133 decrease in chance of an increased time-to-degree. As Volkwein and Lorang (1996) implied, students have three choices: they can take the recommended number of credit hours each semester, they can take summer courses, or they can increase their time-to-degree.

Results indicate that in the second regression, students with a higher first year GPA increased their time-to-degree, which runs contrary to previous research (Belcheir, 2000; Volkwein & Lorang, 1996; DesJardins et al., 2002). A one grade increase in GPA was associated with a 4.52 time. This effect is puzzling because the main effect, which was not significant, showed students with higher first year GPA's were likely to have a decreased time-to-degree. It can only be assumed that once accounting for other variables, first year GPA had an opposite effect.

Results from the first regression model indicate that taking summer courses increased time-to-degree in first-generation students. This runs contrary to previous research (Volkwein & Lorang, 1996). A student who took summer courses was 0.03 times more likely to have an increased time-to-degree. While this is statistically significant, the practical effect of this finding is relatively minor. The interactions of students taking summer courses are very telling as to why this contradicts previous research. Students who took summer courses were more likely to change their major and have a lower than average attempted credits per semester. Conversely, students who did not change their major were more likely to not change their major, have a higher first year GPA, or have higher average attempted credits per semester. These interactions seemed to change the effect of GPA on time-to-degree from positive to negative.

End of College Environment Variables

Results from main effects on time-to-degree, and both regression equations yielded significant results for both missed credits and total credits earned. The main effect between cumulative GPA and time-to-degree was significant as well. Students with additional missed credits, total credits earned, or lower GPA tended to have a longer time-to-degree.

Results from the main effect between cumulative GPA and time-to-degree showed that a higher than average GPA led to a decreased time-to-degree. However, once put into the regression models, the effect disappeared. Cumulative GPA interacted significantly with numerous input and environment variables, which likely dampened the effect on time-to-degree.

Results show that missed credits was an extremely effective predictor of time-to-degree in first-generation students. The main effect of missed credits on time to degree was of moderate size, which supports previous research (Florida Board of Governors, 2004). In the first regression model, each missed credit decreased chances of timely graduation by 1.37. Thus, failing or withdrawing from a three credit hour class would decrease your chances by 4.11 times. In the second regression model, this effect was increased to a 1.61 times per missed credit or 4.83 times per one three credit hour class. Students may withdraw or fail courses for various reasons; some of them necessary, such as a medical withdraw. However, these missed credits add up and can require students to retake courses which can delay their graduation.

Results show that total earned credits was the strongest predictor of time-to-degree and a higher total number of credits was associated with a longer time-to-degree. This was significant across the main effects on time-to-degree and over both regression models and supports previous research (Pitter et al., 1996). In the first regression model, each additional credit corresponded to a 1.2 times increase in the chance of an increased time-to-degree, with a 3 credit hour class

increasing the likelihood 3.6 times. In the second model, each additional credit taken corresponded to a 1.3 times increase in the chances of an increased time-to-degree. Thus, one additional class would increase the chances 3.9 times. It is uncertain whether students take additional credits and therefore stay in school longer, or if they stay in school longer and therefore take additional credits. However, since interactions with factors such as changes in major and higher missed credits meant higher total credits earned, it appears that there may be factors other than idleness at play.

Input versus Environmental Factors

Results indicate that environmental variables played a much larger role in time-to-degree than input variables. More specifically, during college (12% explained) and end of college variables (44% explained) were better predictors than input variables (10% explained). Pre-college variables had a surprisingly small effect, only increasing the variability explained by 2%. These findings are consistent with Knight (1994; 2004) who found that specifically enrollment characteristics played a large role in time-to-degree for all students. This means that what happens to students while they are at school is much more significant than what they bring with them to school in terms of time-to-degree. While regression analysis does not provide causation that environment variables can cause an increased time-to-degree, the evidence of this study and the findings of Knight (1994;2004) indicate that environment variables are more likely to play a role in increased time-to-degree than input variables.

Interactions Between Variables

As there were so many significant interactions between variables, this section will focus on the variables which had the most moderate interactions or had contradictory interactions compared to the rest of the data.

The results indicate that male and Hispanic students more likely to have an increased time-to-degree compared with other students. There were no interactions where Hispanic students performed better than all other students and white students only performed better when they had higher than average attempted credits per semester, lower than average missed credits or lower than average total credits earned. This is consistent with previous research which suggests that male (Knight, 1994; Adelman, 1999) and Hispanic students (Oklahoma Council on Student Affairs, 1996) are less likely to graduate on time than their peers. Female students saw the opposite effect as they were more likely to graduate at nearly every interaction. Male and Hispanic students tend to underperform on a variety of other measures including retention and graduation rates. It was surprising that African American students had no interactions with any variable. As previously stated, this may be because there were institutional programs designed to assist these students which helped them.

Continuous enrollment was found to be a significant variable in time-to-degree by Ishitani (2005) and Belcheir (2000). The findings of this study are consistent with the previous research as students who stopped out for at least one fall or spring semester had no significant interactions where students graduated at higher rates than their counterparts. In the second regression model, students who stopped out and did not change majors were much more likely to take more than ten semesters to graduate. While only 37 students stopped out in this dataset, those that did tended to have a longer time-to-degree regardless of total credit hours, missed credits or average credits attempted per semester. Stopping out can be the result of many problems, such as a lack of financial resources or having to return to help family, these results indicate that institutions must take precautions to ensure that as few students stop out as possible.

Missed credits and total credits had the largest effects on students consistently through both regression models. Higher values for these variables consistently led to a higher time-to-degree for all significant interactions. These variables has some of the highest effect sizes out of any interactions including no stop out and low total credits ($\Phi = 0.37$), high missed credits and high total credits ($\Phi = 0.35$), and low missed credits, low total credits ($\Phi = 0.35$). In the second regression model, three of the five significant interaction variables related to missed credits or total credits: White and low missed credits, Pell recipients and high total credits, no summer courses and high total credits.

Summary

The findings of this research suggest time-to-degree is affected most by factors that happen during college, such as continuous enrollment, average credit hours attempted, and total credit hours earned. In addition, there is reason to suggest that White students are not comparable to their Asian, Hispanic, or African-American counterparts in terms of ACT and combined income. However, the differences end at the before college characteristics as only Hispanic males were less likely to graduate on time. There are several policy implications of this research. First, the findings suggest that postsecondary institutions have the ability to impact the time-to-degree of its students through these during college variables. However, additional research must be done to find ways to impact a variable such as continuous enrollment or total credits earned. Second, if institutions can decrease the time-to-degree of its students, it could have far reaching effects in institutional planning. It would mean in the long term the institution would have the resources to graduate additional students. Institutions and policy makers currently put more weight in 6-year graduation rates (Bowen et al., 2007). In order to create a culture of change to decrease time-to-degree, a greater emphasis must be put on 4-year

graduation rates. A 4-year graduation rate is no longer reasonable given the number of majors which require an excess of 120 credits. While it may be more complicated, perhaps a graduation rate of five years or one which takes into account the number of credits for the students first or last major would yield more appropriate results. The emphasis of graduation rates in a given time frame should be the percentage of students who graduate in the number of semesters they should be graduating in, given full-time status and academic progress.

Recommendations for Future Research

Based on the researcher's findings and observations, the following are recommended for future research and inquiry.

This study was restricted to one major research university in the Midwest. Further examination is needed to find if the results will generalize to other types of institutions or institutions in different locations.

The database used in this study is over 10 years old. While several years are needed to conduct a longitudinal study such as this, an updated dataset may confirm or challenge these results. A newer dataset could capture effects of the ongoing recession or satisfactory progress measures which affect financial aid.

The inclusion of other environmental variables, such as college level interventions and programs, or student involvement measures could significantly improve the models. Astin (1993) notes that factors such as the amount and quality of time spent with faculty or peers can have significant effects on time-to-degree. The Florida Board of Governors (2004) adds that time spent working can significantly affect average credits attempted, which in turn affects time-to-degree. The inclusion of these variables could improve the model.

Finally, quantitative studies cannot provide the depth of analysis which qualitative work can provide. Interviewing students who spent additional semesters in school would provide a unique look at why students have longer time-to-degree and what factors could decrease their time-to-degree.

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