AN ANALYSIS OF TRANSFER STUDENT SUCCESS UTILIZING
AN INITIAL COLLEGE CHOICE-PERSISTENCE NEXUS MODEL

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by
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The undersigned, appointed by the dean of the Graduate School, have examined the dissertation entitled

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AN INITIAL COLLEGE CHOICE-PERSISTENCE NEXUS MODEL

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and hereby certify that, in their opinion, it is worthy of acceptance.

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Thank you to my family and friends for standing by me throughout this journey.

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AN ANALYSIS OF TRANSFER STUDENT SUCCESS UTILIZING AN INITIAL COLLEGE CHOICE-PERSISTENCE NEXUS MODEL

Kathryn Schmidtke Felts

Dr. Barbara K. Townsend, Dissertation Supervisor

ABSTRACT

Research on transfer student success is important to institutions interested in retaining transfer students and well as transfer students interested in attaining a baccalaureate. This study on transfer student success is grounded in a student-centered initial college choice-persistence nexus model that asserts there is a nexus between the factors that determine whether a student initially enters higher education through a community college or four-year institution and the factors that affect persistence to a baccalaureate. Utilizing two-group path analysis, this study found that transfer GPA, transfer hours, completion of college algebra, completion of freshmen English, and first-semester GPA had a positive effect on baccalaureate attainment for community college transfer students to a Midwestern, public research university. In contrast, only first-semester GPA and transfer hours had a positive effect on baccalaureate attainment for four-year transfer students to the same institution. Additionally, it was found that the effects of entering academic history on first-semester GPA and degree attainment differed for community college and four-year transfer students. This difference is attributed to the nexus of factors that affect initial college choice and persistence.
Chapter 1

OVERVIEW

Introduction

Transfer students are a distinctive group of students for public, research institutions to adopt. On one hand, public universities rely on these students to maintain a high level of enrollment while supporting their mission of access to students who did not initially enroll at the university. Recruiting transfer students is only worthwhile for both the transfer students recruited to the institution and for the institution itself if these students persist to graduation. Different strategies are utilized by institutions to ensure that transfer students persist, including setting admission policies for transfer students that utilize standards shown to support student success. Sometimes policies are implemented with standards not yet shown to positively affect student persistence.

Additionally, it has become difficult to determine transfer student success as students’ attendance patterns have become increasingly complex. In the past, the traditional transfer student attended a community college prior to attending a four-year institution. An increasing number of transfer students have attended another four-year institution prior to transferring, if not multiple institutions from both sectors. This type of “swirling” (de los Santos & Wright, 1990) makes it difficult to determine if previous academic experiences have an effect on future academic performance. It has been
shown, however, that earlier decisions, even choosing to go to college in the first place, and the factors that are taken into consideration in order to make these decisions do have an effect on college student persistence (St. John, Paulsen, and Starkey, 1996). This study relies on a nexus model of college choice and persistence to analyze the effects of transfer student demographic variables and previous academic history on the completion of a baccalaureate degree at a public, Midwestern research university.

Conceptual Framework

In a study of transfer student baccalaureate attainment, Townsend, McNerny, and Arnold (1993) grouped studies of transfer student success into three categories: (a) student-centered explanations, (b) institution-centered explanations, and (c) societal analyses. This study utilizes a student-centered approach is grounded in both student persistence theory and college choice theory. In particular, the nexus model of college choice and persistence developed by St. John, Paulsen, and Starkey (1996) functions as the theoretical framework. Student-centered persistence models have found that a student’s likelihood of earning a baccalaureate is increased the more he or she is able to become socially and academically integrated into an institution of higher education (Astin, 1975; Bean, 1980; Bean & Metzner, 1985; Tinto, 1975, 1987, 1993). Factors that have been shown to affect baccalaureate attainment are academic preparation, educational aspirations, involvement in social organizations at an institution, and other measurements of academic and social integration (e.g., Freeman, 2007; Koker & Hendel, 2003; Pascarella, Smart, & Ethington, 1986; Tinto, 1975, 1987, 1993).
Extending the longitudinal process of college persistence back to when a student initially chooses a college is a novel approach to research of student persistence and transfer student success. A theory developed by St. John, Paulsen, and Starkey (1996) is based on the notion that the same factors that affect a student’s choice of institution also affect student persistence. The theory focuses primarily on financial factors that affect college choice and persistence, including the amount of financial aid received by students. St. John, Paulsen and Starkey (1996) felt that there were other factors besides financial motives common to both the college choice decision and the decision to remain in college or complete a degree. The proposed study focuses on the factors that affect a student’s choice to attend a community college or four-year institution and how these factors sequentially affect persistence to degree completion.

The theoretical framework is a nexus between college choice and persistence; however, the college choice decision is framed in the decision to initially attend a community college or four-year institution and therefore embodies all of the factors that may influence that decision, as opposed to only the financial motives to attend one institution over another. Thus, this study utilizes a modified St. John, Paulsen, and Starkey (1996) model based on the nexus of initial college choice factors and factors that affect persistence developed by the author.
When comparing research of transfer student success, it is important to note the definition of transfer student that is being utilized in each study. There is a wide range of definitions utilized, and depending upon the definition of the initial cohort, varied levels of transfer student success have been found. For example, Rouse (1995) compared two initial cohorts of students from the High School & Beyond data developed by the National Center for Educational Statistics; those whose first institution of attendance was a community college and those whose first institution of attendance was a four-year institution. Since we assume that a community college student must transfer to a four-year institution in order to earn a baccalaureate, it follows that the cohort that initially attended a community college will have to transfer in order to earn a baccalaureate. Utilizing this extremely broad definition of transfer, Rouse (1995)
found that for the cohort that initially enrolled in a community college, 11% graduated with a baccalaureate, compared to 43% of the cohort that initially enrolled in a four-year institution.

Other studies have limited the students in the initial cohort to those who have completed a certain number of credit hours at a community college prior to transferring. In a study of one state’s system of institutions, Arnold (2001) reported a 62% graduation rate of community college students with 45 to 89 transfer credit hours. Cohen and Brawer (2003) defined transfer students as those who enter a community college with no prior college experience, earn at least twelve credits within four years of entry, and take one or more classes at an in-state, public university within four years. The authors found that 70% of transfer students persist to their junior year utilizing this definition. The highest graduation rates have been found in studies that include associate degree attainment in the definition of transfer student. For example, in an eight-year longitudinal study of transfer students in Florida, 74% of transfer students who earned an Associate of Arts degree prior to transferring graduated (Goodman, Copa, and Wright, 2004, as cited in Adelman, 2005).

Authors of previous research on transfer student success utilized several measurements of success. One of the most widely utilized measures of transfer student success has been the drop in first-semester grade point average (GPA) at a receiving institution as a measurement of transfer shock (Hills, 1965). Transfer students from a community college have been found to drop half a grade point at a university after
transferring (Townsend, McNerny, and Arnold, 1993). Different variables have been found to affect transfer shock, including gender, academic discipline, and age (Cejda, Kaylor, & Rewey, 1998; Keeley & House, 1993; Townsend, McNerny, and Arnold, 1993).

Many of the factors that have been found to affect first-semester GPA have also been found to affect baccalaureate attainment, another measure of transfer student success. These variables can be grouped into two categories: (a) entering academic history, and (b) student demographics. Entering academic history includes a student’s previous academic experience including transfer GPA, number of transfer hours, and coursework completed prior to transferring. In terms of persistence research, entering academic history acts as a proxy for academic integration. Transfer student success literature supports the theory that academic integration has a positive effect on degree completion. In a multi-institution system, Mullen and Eimers (2001) found that for every one point increase in transfer GPA, a student’s likelihood of graduating increased 40%. The number of credit hours completed prior to transferring also has a positive effect on baccalaureate attainment. Koker and Hendel (2003) found that the more hours a transfer student completes prior to transferring, the more likely he or she is to graduate. Lastly, the coursework completed prior to transfer has been investigated in previous research and has been found to affect degree completion. Utilizing the National Educational Longitudinal Study:88/2000, Alfonso (2006) found that the more college math and science courses completed prior to transfer, the more likely a student would be to graduate.
In addition to entering academic history, student demographics have also been found to affect baccalaureate attainment. Student demographics include gender, minority status, enrollment status, low income status, age, and discipline of study. Gender has been found to affect baccalaureate attainment with women graduating at a higher rate than men. In a study of the success of students who transferred to a multi-institution study, Mullen and Eimers (2001) found that women were 1.26 times as likely to graduate as men. In a study of the success of students whose initial institution was a community college that utilized national data, Freeman (2007) found that women were 2.29 times as likely to earn a baccalaureate as men.

Other variables besides gender affect baccalaureate attainment. Minority status has also been found to affect degree completion. Pascarella, Smart, and Ethington (1986) found that being a minority was not a significant effect on graduation status of women who initially started at a community college, but that minority status did have a negative effect on degree completion for men who initially started at a community college. Baccalaureate attainment has also been shown to be affected by enrollment status. Utilizing a structural equation model that included a variable for type of initial institution (community college or four-year), Alfonso (2006) found that full-time enrollment was a statistically significant, positive indicator of baccalaureate attainment. Receiving financial aid can be used as a proxy for socioeconomic status which has also been shown to affect baccalaureate attainment. Alfonso (2006) found that student in
the lowest socioeconomic quartile were less likely to graduate than students in the upper three quartiles.

Additional factors affect baccalaureate attainment. One is age. Community colleges are known for having a higher population of nontraditional age students. Schmidtke and Eimers (2004) found that regardless of the type of institution a transfer student initially attended, nontraditional age students were less likely to graduate than traditional age students. It has also been shown that declaring a major prior to transferring increases the likelihood that a student will graduate by as much as 25% (Alfonso, 2006). The discipline in which a student majors once he or she transfers has an effect on baccalaureate attainment as well, with students majoring in the sciences less likely to succeed in (Mullen & Eimers, 2001).

Purpose of Study

The purpose of this study is to determine if transfer GPA, transfer hours, and completion of college algebra and freshmen English prior to transfer have an effect on transfer students first-semester GPA and baccalaureate attainment at a Midwestern, public, research university (MRU) while taking into account the direct effects of certain student demographics, including gender, minority status, enrollment status, low income status, age, fall enrollment and discipline of study, on entering academic history variables, first-semester GPA, and degree attainment. Additionally, the difference in the effects of the entering academic history variables for students who solely attend a community college and those who solely attend a four-year institution prior to transfer
is investigated. Knowing the effects of entering academic history on baccalaureate attainment will help inform policy regarding admission standards for transfer students. Additionally, investigating the differences between the effects of entering academic history variables for community college and four-year transfer students will contribute to the discussion surrounding the St. John, Paulsen, and Starkey (1996) college choice-persistence nexus model.

Research Questions

The following questions are investigated in this study:

1. What effect do the number of hours transferred, transfer GPA, and meeting the mathematics/English admissions requirement (entering academic history) have on first-semester GPA and baccalaureate attainment when taking into account the effects of gender, minority status, entering enrollment status, Pell Grant status, age, fall enrollment, and entering discipline (student demographic variables) on entering academic history variables, first-semester GPA, and degree attainment?

2. Is there a difference in these effects between students who solely attended one or more community colleges prior to transfer and those who solely attended one or more four-year institutions prior to transfer?

Research Design

Quantitative analysis is utilized to investigate the effects of entering academic history and student demographics on transfer students’ baccalaureate attainment in a
single institution study. Both the direct effects and indirect effects of entering academic history and student demographics are measured utilizing first-semester GPA as a mediating variable. Data for this study were provided by the institution’s student information systems with permission from the registrar. The data provided included student level and transfer course level information for 14,337 students who transferred to the institution from the fall of 1993 to the summer of 2001. Mplus software is utilized to analyze the path analysis model. The two-group conceptual model developed by the researcher in accordance with the method of structural equation modeling is seen below.
Figure 2. The two-group conceptual model.
Definitions

**Age** – The age of a student when they first enroll at the public, Midwestern research university (MRU). Students are grouped into those who are traditional-age (18 – 23 years old) and those who are not.

**Baccalaureate attainment** – The completion of a bachelor’s degree within six years of enrolling at MRU.

**Community college transfer student** – A student who solely attended one or more community colleges prior to entering MRU with at least 24 credit hours and a 2.00 transfer grade point average (GPA).

**Credit in College Algebra** – Completion of a course equivalent to College Algebra at MRU, prior to transfer to MRU.

**Credit in Freshmen English** – Completion of a course equivalent to Freshmen English at MRU, prior to transfer to MRU.

**Discipline of Study** – The initial major a student enrolled in at MRU categorized into the following groups: (a) science, technology, engineering, and mathematics (STEM), (b) non-STEM, and (c) undecided.

**Enrollment Status** – The initial enrollment status of a student when he or she enrolls at MRU, where full-time is considered 12 hours of credit per semester.

**Ethnicity** – The reported ethnicity of an individual categorized into the following groups: (a) white, (b) non-white, and (c) unknown.
Fall enrollment – The initial term which a student enrolls at MRU. If the initial term is a fall semester, then the student is recorded as a fall enrollment.

First-semester GPA – GPA for the first-semester of coursework at MRU.

Four-year transfer student – A student who solely attended one or more four-year institutions prior to entering MRU, with at least 24 credit hours and a 2.00 transfer GPA.

Gender – The reported gender of a student, either male or female.

Low income status – A student received a Pell Grant at any time during their enrollment at MRU. A student is categorized as being low income if he or she received the Pell Grant.

Transfer GPA – GPA of courses taken prior to transfer to MRU; excludes dual-credit courses.

Transfer hours – Number of hours taken prior to transfer to MRU; includes dual-credit courses.

Transfer student – A student enrolling at MRU with at least 24 credit hours and a 2.0 transfer GPA.

Limitations of Study

There are several limitations of this study. First, it is a single-institution study and thus has limited generalizability. Additionally, the conceptual path analytic model is limited by the number of variables due to the number of observations that are available. Therefore, there are variables that could have been included had there been more observations, including more categories for discipline of study, and average distance of
previous attended institutions from MRU. Additionally, there are other variables that
have been found to affect baccalaureate attainment that are not included in the model
because they are not available in the institutional data. For some of these variables a
proxy has been included. For example, receiving a Pell Grant is acting as a proxy for
socioeconomic status. Parental status, another variable that has been shown to affect
baccalaureate attainment, is not available in the institutional data. However, if these
variables also affect college choice and the type of institution a student initially attends,
the influence of their effects may still be present in the model.

Another limitation of this study was the lack of a reliable measure of whether or
not a course that was transferred in was taken as a dual-credit course. In this study a
course was determined to be dual credit if it was taken prior to high school graduation
date. High school graduation date and course term were only available for 899 of the
initial 13,744 students with transfer course records who transferred to MRU from the
Fall semester 1992 to the Summer semester 2001. Of these 899 students, it was
determined that only 206 had transferred in dual credit courses. Dual credit status of a
course is utilized in determining the number of transfer hours. A dual credit course is
not utilized in calculating the transfer GPA; however it is utilized in the sum of transfer
hours. This is similar to the practices of the admissions office at MRU in determining the
acceptance of a student.
Significance of Study

The retention of transfer students and native students is important to four-year institutions in order to sustain or build their future enrollments. Part of ensuring a high retention rate is to develop admissions policies that fit the mission of the institution. At a public, Midwestern, research university, with very high research activity, it is important to be somewhat selective in student admissions while maintaining a certain level of access to students within the state. The institution that is the subject of this study and referred to in this paper as MRU maintains separate admissions policies for first-time college students and transfer students. To be admitted as a first-time college student, applicants must have an ACT score of 24 and must have completed 17 high school course requirements. Conversely, transfer students must meet the following requirements: (a) have a 2.50 GPA, (b) complete at least 24 hours, and (c) complete a college algebra course and freshmen English course with at least a C-. If a student wishing to transfer to MRU does not meet the aforementioned requirements, then he or she must meet the first-time college student requirements.

Just as the admissions requirements for first-time college student occasionally change, so too does the transfer student admissions requirements. In 2006, the GPA requirement for transfer students increased from a 2.00 GPA to a 2.50 GPA and the mathematics/English course requirements were added. Whereas the increase in GPA can be supported by research of transfer student success, the effects of completing college algebra and freshmen English have not been specifically examined. This
information informs admissions requirements decisions, as well as advising of students prior to transfer.

In addition to investigating the benefits of mathematics/English course requirements, this study includes a short-term and long-term transfer student success variable. First-semester GPA at MRU is measured as a short-term success variable. First-semester GPA is a more immediate measurement of transfer student success than baccalaureate attainment. This initial measure of academic integration into the receiving institution provides evidence of whether transfer students to MRU experience transfer shock. To determine the long-term effects of transfer GPA, transfer hours and completion of college algebra and freshmen English, this study measures baccalaureate attainment as a long-term success variable. Additionally, the effects of first-semester GPA at MRU on baccalaureate attainment were analyzed to determine if the first-semester experience has a stronger effect on degree completion than entering admissions requirements. By including first-semester GPA as a mediating variable, the effects of transfer GPA, transfer hours, and completion of mathematics and English requirements were separated into direct and indirect effects.

Lastly, this study emphasized the role of initial college choice. In particular, emphasis was placed on whether a transfer student entered higher education through a community college or a four-year institution prior to attending MRU. Multiple institutional attendance was taken into consideration due to the current rise in the phenomenon of the “swirling student” (de los Santos & Wright, 1990). It is important to
separate students into groups who solely attend one type of institution over the other as it has been shown that the composition of the population of students who attend community colleges differs from that of the population of students who attend four-year institutions (Cohen & Brawer, 2003; Adelman, 2005, Freeman, 2007). The characteristics that differentiate these two populations of students (part-time attendance, nontraditional age, and minority status) have also been shown to affect degree completion (Alfonso, 2006; Freeman, 2007; Mullen & Eimers, 2001; Schmidtke & Eimers, 2004).

Summary

Institutions need to understand the factors that affect students’ degree completion in order to design admissions policies with standards that match their mission and allow students to be successful. This study utilized a college choice-persistence nexus model to analyze the factors that affect transfer student persistence at a Midwestern, public, research university. These factors include entering academic history (transfer hours, transfer GPA, and completion of college Algebra and freshman English) and student demographics (gender, minority status, entering enrollment status, Pell Grant status, age, fall enrollment and entering discipline). Additionally, the effects of these factors on first semester GPA were analyzed along with the sequential effect of first semester GPA on baccalaureate attainment.
Chapter 2
LITERATURE REVIEW

Introduction

Recruiting transfer students has become an integral part of enrollment management strategies in higher education. All entering cohorts of first-time college students will lose some members due to attrition each year. By recruiting and retaining qualified transfer students to replace native students who have dropped out, institutions will not feel the financial pinch of lost tuition as much as they would without enrolling transfer students. Additionally, accepting transfer students provides an educational opportunity to students who first attend a community college or choose to leave another four-year institution. For the most part, in order for the experience to be worthwhile for transfer students, it is important them to complete a bachelor’s degree.

A review of the literature of persistence theory and transfer student success is offered below. A conceptual framework framed from both college choice theory and student persistence theory is developed based upon St. John, Paulsen, and Starkey’s (1996) college choice-persistence nexus model. Varying definitions of transfer students and their implications will be discussed. In addition, factors that research has shown to affect transfer student success will be presented.
Conceptual Framework

Townsend, McNerny and Arnold (1993) categorized studies which try to explain low degree completion rates of transfer students into three groups: (a) student-centered explanations, (b) institution-centered explanations, and (c) societal analyses. Studies that focus on student-centered explanations utilize Astin’s (1975) student involvement model, Tinto’s (1975, 1987, 1993) student integration model, Bean’s (1980) student attrition model, and Bean and Metzners’ (1985) nontraditional undergraduate student attrition model (e.g., Freeman, 2007; Koker & Hendel, 2003; Pascarella, Smart, & Ethington, 1986; Schmidtke & Eimers, 2004). In these student-centered studies, variables that have been found to predict persistence and degree attainment, such as academic preparation, educational aspirations, academic and social integration, and financial support, are utilized to determine the success of transfer students.

The second category of studies on transfer students is comprised of studies that focus on institution-centered explanations (Townsend, McNerny, & Arnold, 1983). Studies within this category focus on the open-access mission of community colleges and how the mission has shaped the curriculum and pedagogy of community colleges (McGrath & Spear, 1991 and Richardson, Fisk, & Okun, 1983, as cited in Townsend, McNerny, & Arnold, 1983).

The third category of studies on transfer students is comprised of societal analyses. These studies take a critical view of the balance between and contradiction of the community college transfer mission and the institution’s mission to prepare
students for an occupation (Brint & Karabel, 1989; Dougherty, 1994). Some studies that fall in the societal analysis category have compared the baccalaureate attainment of students who begin their postsecondary education in a community college with those who start in a four-year institution (e.g., Alfonso, 2006; Rouse, 1995). Both authors (Alfonso, 2006; Rouse, 1995) found that students who began their postsecondary education in a community college were less likely to earn a baccalaureate than students who first enrolled in a four-year institution. However, the population of students who first attended a four-year institution was not limited to students who transfer at some point. By not limiting the population to four-year college transfer students, the authors do not control for the effect of transfer on a student’s degree attainment. That is, not all of the four-year students in their studies were transfer students, whereas the community college students had to transfer to earn a baccalaureate degree.

The categories above (student-centered, institution-centered, and societal analyses) were originally used to describe studies that analyzed the academic success of community college transfer students only. Students who initially begin their postsecondary careers at a four-year college may also transfer at some point in time. However, four-year institutions do not share the transfer mission with community colleges. Thus studies that included transfer students from both four-year colleges and community colleges could not be categorized as institution-centered or as societal analyses. These studies should be categorized as student-centered. A few student-centered studies have focused on the success of both community college transfer
students and four-year transfer students (Hill, 1965; Mullen & Eimers, 2001; Schmidtke & Eimers, 2004). It is important to look at both groups of students as both groups have gone through the process of transfer.

The effect of transfer on student’s initial performance was defined as “transfer shock” by Hills (1965), where defined transfer shock as “a severe drop in performance upon transfer” (Hills, 1965, p. 202). Hills is most known for looking at transfer shock of community college transfer students; however, he briefly describes transfer shock of four-year transfer students also. Since his landmark study, little has been done to determine whether this phenomenon is common to both groups. From a more practical standpoint, four-year institutions that accept transfer students are interested in retaining both those from community college and from other four-year institutions. Those interested in enrollment management issues at four-year institutions are interested in the success of both groups and must evaluate whether their admissions policies and retention efforts are appropriate for both groups. This study looks at the performance of both community college and four-year transfer students. In order to do so, a student-centered approach is utilized.

Student-centered studies of transfer student success utilize student persistence theory (e.g., Freeman, 2007; Koker & Hendel, 2003; Pascarella, Smart, & Ethington, 1986; Schmidtke & Eimers, 2004). In particular, Astin’s (1975) student involvement model, Tinto’s (1975, 1987, 1993) student integration model, Bean’s (1980) student attrition model, and Bean and Metzners’ (1985) nontraditional undergraduate student
attrition model have been utilized to conceptualize studies on transfer student success
(e.g., Freeman, 2007; Koker & Hendel, 2003; Pascarella, Smart, & Ethington, 1986;
Schmidtke & Eimers, 2004).

The four student persistence models (student involvement, student integration,
student attrition, and nontraditional undergraduate student) all portray persistence as a
path which begins prior to a student’s enrollment in a postsecondary institution with
measurements of his or her entering ability and characteristics. Based on the
theoretical student’s educational and career aspirations, he or she will decide whether
or not to attend college. The models were developed to describe those students who
choose to attend college. As a student’s path continues into college, student
persistence models measure a student’s ability to integrate into or fit in within his or her
chosen institution. Based on this fit and a student’s educational and career aspirations
post matriculation to college, the student decides either to remain in college or leave.
In actuality, this decision may be made multiple times over the course of a person’s
academic career. Depending upon the study, the number of times a student makes a
decision to remain in college may or may not be taken into account. Additionally,
research on student persistence does not consistently include transfer to another
institutions as retention or a varied level of retention.

Astin (1975) and Tinto (1975) developed two of the first student persistence
models. Astin’s (1975) student involvement model includes entering characteristics
(e.g., student’s high school grades, degree aspirations, religious background, parents’
education, and growing up in a large city or town), experiential factors (e.g., getting good grades in college, marital status while in college, participation in ROTC, participation in sports, taking out loans, and transferring from one four-year institution to another), institutional characteristics (e.g., start at a community college or four-year, public or private institution, religiously affiliated, and selectivity), and measures of institutional and student fit (e.g., similar religious affiliation, size of college compared to the community from which a student came, student population with similar abilities). When Astin tested his model, he found that the more a student was involved in his or her institution, the more likely he or she was to graduate. He also found that regardless of a student’s prior academic history, the student’s academic performance at the institution affects his or her decision to persist to graduation. Whereas Astin mentions that transferring from one four-year institution to another reduces likelihood of persistence, in his discussion of future research he only addresses transfer issues for community college students. He includes this discourse concerning transfer issues for community college students in his discussion of institutional characteristics. Thus transfer is not further discussed as an experiential factor. The idea that the act of transferring is not experiential contradicts Hills’ (1965) assertion that the act of transferring affects a student’s academic performance at the receiving institution.

Tinto’s (1975) model is similar to Astin’s in that he conceptualizes student persistence as a path leading up to a decision to persist or drop out of college. Tinto (1975) stated, “One must view dropout from college as the outcome of a longitudinal
process of interactions between the individual and the institution (peers, faculty, administration, etc.) in which he is registered” (p. 103). The following components comprise Tinto’s theoretical model of attrition and persistence: (a) pre-entry attributes (family background, skills and abilities, and prior schooling); (b) goals and commitments at time one (intentions, and goal and institutional commitments); (c) institutional experiences (academic performance, faculty/staff interactions, extracurricular activities, and peer-group interactions); (d) personal/normative integration (academic integration and social integration); (e) goals and commitments at time two (intentions, goal and institutional commitments, and external commitments); and (f) departure decision (Tinto, 1987, p. 114). Tinto originally based his model on Durkheim’s (1951, as cited in Tinto, 1975) theory of suicide. Tinto associated the decision-making process of leaving an institution with the decision-making process of suicide. Durkheim proposed that individuals who are more sufficiently integrated into society are less likely to commit suicide. Similarly, Tinto proposed that the more a student was academically and socially integrated into an institution, the less likely he or she would be to leave. Thus, Tinto argued that academic and social integration into an institution supports student persistence within that institution.

Bean (1980) continued to conceptualize persistence as a longitudinal process; however, unlike Tinto who framed his student integration model within suicide theory, Bean’s student attrition model is based on turnover in work organizations. Additionally, Bean’s model was the first to conceptualize and measure student attrition as a causal
model. Background variables such as past academic performance and socioeconomic status affect organizational determinants, such as university GPA, goal commitment, relationships with faculty and staff, and involvement in campus organizations. In turn, these organizational determinants affect satisfaction, which affects institutional commitment, which affects a student’s drop-out decision. The longitudinal nature of student persistence is taken into account in the causal model and measured through path analysis. Thus, many of the factors in Tinto’s model are utilized, though they are conceptualized within a framework of turnover in work organizations and measured in a causal model.

Bean and Metzner (1985) built upon Bean’s (1980) attrition model to develop a nontraditional undergraduate attrition model. This model was very similar to Bean’s attrition model and included similar background and academic variables. In addition, particular factors unique to nontraditional students were included (e.g., stress, family responsibilities, outside encouragement, finances, and hours of employment). Bean and Metzner found that for nontraditional undergraduates, external environmental factors had a greater affect on attrition than social integration factors. In particular, they found that support from peers from outside of the institution had a positive affect on persistence. To test the validity of their model, Bean and Metzner analyzed studies that included students at both community colleges and four-year institutions. Nonetheless the authors did not take into consideration how the variables that affected persistence affected a student’s initial college choice.
This approach was taken by St. John, Paulsen, and Starkey (1996) when they developed the nexus model of college choice and persistence. After examining college-choice literature and student persistence literature, the authors found that similar variables were used to determine which institutions students choose to attend and how much education students choose to attain. In particular, the nexus model is a market-based model that focuses on financial factors that determine college-choice and persistence. St. John, Paulsen, and Starkey (1996) measured college choice through six measures from the National Postsecondary Aid Study-87 that assessed the importance of financial factors (financial aid awarded, importance of low tuition cost in college choice, the interaction between the previous two mentioned variables, importance of low cost of living in college choice, ability to work, and the interaction between the previous two variables). In addition, St. John, Paulsen, and Starkey (1996) included factors found to affect persistence. These factors include student background, college experience, aspirations, and financial factors. Student background included ethnicity, gender, mother’s education, age, high school degree, employment status, dependency status, and level of income. College experience included private or public college, years in college, and grades. Aspirations included some college, master’s degree, and advanced degree. Financial factors included fixed costs (amount of grants awarded, amount of loans received, amount of money made from working, amount of tuition, and amount of housing costs) and controllable costs (food and travel costs). They found that
the model that explained the most variance in student persistence included student background, college choice, college experience, aspiration, and financial variables.

This study was framed within a revised St. John’s, Paulsen’s, and Starkey’s (1996) nexus model of college choice and persistence. This study differed from St. John’s, Paulsen’s, and Starkey’s (1996) nexus model in that the college choice factor is based on whether a student originally chooses to attend a community college or a four-year institution prior to transfer to the institution under study, MRU. St. John, Paulsen, and Starkey (1996) focused on financial factors that influenced students’ college choice. For the purpose of this study, the college choice variable was a measurement of whether the student chose to attend a community college or four-year institution prior to attending MRU. In part, due to the population demographics of students who choose to attend community colleges versus the population demographics of students who choose to attend a four-year institution, the college choice factor reflects the effect of financial factors on student persistence. Adelman, Daniel, Berkovits, and Owings (2003) found that of the 1992 twelfth graders below the 40th percentile in socioeconomic status more than 50% chose to attend a community college. Of the same group, less than 40% chose to attend a doctoral or other four-year institution. Additionally, the tuition differential between these two types of institutions are reflected in the college choice variable based on type of institution.

However, the population of students who attend community colleges compared to the population of students who attend four-year colleges differs in other ways as
well. These factors include age (Cohen & Brawer, 2003; Freeman, 2007), minority status (Cohen & Brawer, 2003; Adelman, 2005), and part-time attendance (Cohen & Brawer, 2003). For example, Freeman (2007) found that 21% of students who attend a four-year institution are older than 18 when they first enroll, whereas 60% of students who attend community colleges are older than 18 years of age.

In addition to financial factors, these student demographic factors may also affect college choice and persistence. By including the type of institution attended prior to transfer to MRU, or the receiving institution, the effect of the financial factors and student demographic factors are reflected in the model. The following is a visual representation of the theoretical conceptual framework developed by the researcher for this study:

Figure 3. Theoretical Conceptual Framework
Research on Transfer Student Success

The majority of persistence research and theory does not include transfer students. It is based on the retention of first-time, full-time students in four-year institutions. As transfer students have become a more critical population for four-year institutions to recruit and retain, more research has been developed regarding the persistence of this population. Following is a review of this research.

Definitions of Transfer Students

To understand research about transfer students, one needs to pay attention to how transfer students are defined in the studies. The definition of transfer students varies across studies. Townsend (2002) showed how this difference in definition affects calculated transfer rates and complicates the ability to compare transfer rates from one study to another. This is also true when considering baccalaureate attainment. The level of success of transfer students varies as the definition varies. In particular, as definitions become more restrictive of who is included as a transfer student, the higher the graduation rate of the group becomes. Graduation rates also differed between studies that utilized a national data set and those based on institutional data. Even within the group of studies that utilized institutional data, there were varying levels of graduation rates for transfer students depending upon the definition of transfer student utilized to select an initial cohort.

The most liberal definition of transfer students includes all students who began their postsecondary education at a community college. Transfer is defined as a primary
mission of community colleges (Cohen and Brawer, 2003) and in order to obtain a baccalaureate these students must transfer to a four-year institution. Rouse (1995) found that students who begin their postsecondary education at a community college graduate with a baccalaureate at a rate of 11% compared to their counterparts who begin their postsecondary education at a four-year institution who graduate at a rate of 43%. Alfonso (2006) utilized a similar definition when analyzing the National Education Longitudinal Study:88/2000 (NELS 88:2000). The author found that 20% of students who began their education at a community college earned a baccalaureate, compared to 71% of students who began at a four-year institution. Alfonso (2006) took into consideration whether a student aspired to earn a baccalaureate degree as determined in the NELS 88:2000 survey. The author found the graduation rate for community college students increased to 30%.

Other studies have also refined the initial cohort by including measurements of educational aspiration. For these studies a transfer student is defined as a student who attends a community college and aspires to earn a baccalaureate. Pascarella, Smart, and Ethington (1986) utilized data from the 1971 – 1980 Cooperative Institutional Research Program (CIRP) and found that 53% of the students who entered a community college in 1971 and aspired to earn a bachelor’s degree or above graduated by 1980.

The most common definition of transfer utilized in studies of transfer student success is that of the vertical transfer. A vertical transfer is defined as a student who transfers from a community college or sub-baccalaureate institution to a four-year
institution. Glass and Harrington (2002) found that two cohorts of students who attended a community college system and transferred to one large university in the University of North Carolina system graduated at a rate of 46% (Fall 1996 cohort) and 30% (Fall 1997 cohort) respectively. It is important to note that a substantial difference in graduation rate between the two cohorts can be seen even when utilizing the same definition within the same system of higher education. Using the Beginning Postsecondary Student Survey: 96/2001, Freeman (2007) found that students who start at a sub-baccalaureate institution and subsequently attend a four-year institution graduate at a rate of 37%. Glass and Harrington’s (2002) and Freeman’s (2007) findings for graduation rates are slightly higher when compared to Alfonso’s (2006) study, but slightly lower when compared to Pascarella, Smart, and Ethington’s (1986) study, both of which utilized a measurement of educational aspiration in their definition.

Another definition commonly used in studying transfer student success involves a minimum number of hours completed at the community college prior to the vertical transfer to the four-year institution. This minimum number of hours varies between studies but is often based upon admissions requirements for transfer students. When studying community college transfer student success, Townsend, McNerny, and Arnold (1993) defined transfer students as those who transferred from a large, suburban community college to a private, moderately selective urban university with 20 or more semester hours. To be included, students were to enroll at the university as full-time
students and were not to have attended multiple institutions prior to transfer. Not all studies take prior multiple institution attendance into consideration.

Bach et al. (2000) did include transfer students who attended multiple institutions prior to transfer. Additionally to be included in the study, students were to have earned at least three credits at a community college and not return the following year. Of this group 48% graduated with a baccalaureate. This group was then broken down into four separate groups: (a) T-LURT or True-Linear Urban Transfer, transferred from a community college within the urban postsecondary system (UPS) to a university within the UPS; (b) F-LURT or False-Linear Urban Transfer, transferred from a community college outside of the UPS to a four-year institution within the UPS; (c) CURT-C or Complex Urban Transfer-Community college, attended multiple institutions prior to attending the university, the first of which was a community college; and (d) CURT-U or Complex Urban Transfer-University, attended multiple institutions prior to attending the university, the first of which was a university. Of these groups, F-LURT’s had the highest graduation rate (52%), followed by T-LURT’s (49%), CURT-U’s (48%), and CURT-Cs (44%).

Additional studies have included a minimum number of hours earned at a community college prior to transfer and reported some of the highest graduation rates for transfer students. For example, in a study of a statewide system of institutions Arnold (2001) found that the graduation rate of community college transfer students with 45-89 transfer hours was 62%. Cohen and Brawer (2003) define a transfer student
as: “All students entering the community college in a given year who have no prior college experience, and who complete at least twelve credit units within four-years of entry, divided into the number of that group who take one or more classes at an in-state, public university within four years” (p. 56). Utilizing this definition, Cohen and Brawer (1982) found that 70% of transfer students persist to their junior year. Garcia (1994, as cited in Adelman, 2005) found that 61% of transfer students graduated in six years when defining transfer students as those who matriculated to the California State University system with at least 56 transfer hours.

Adelman (2005) offers a more restrictive definition of transfer student. “The student (a) begins postsecondary study at a community college, (b) earns more than 10 additive credits from community colleges before attending a four-year college, and (c) subsequently earns more than 10 additive credits from four-year colleges (p. 14)”. Under this definition, Adelman found that 60% of transfer students earned a baccalaureate.

One of the most exclusive definitions of transfer student has yielded the highest graduation rates. Studies that limit their population of transfer students to students who have earned an associate’s degree have found these transfer students to be successful at earning a baccalaureate degree. Bach et al found that 68% of students who had completed the Associate of Arts of Oregon Transfer prior to transferring earned a baccalaureate. Goodman, Copa, and Wright (2004, as cited in Adelman, 2005)
found that 74% of transfer students who earned an Associate of Arts degree prior to transferring graduated in an eight-year longitudinal study of transfer students in Florida.

Not all associate degrees are the same. Townsend and Barnes (2001) reported that more Applied Associate of Arts degree recipients are transferring to four-year institutions, even though this degree is considered by some to be a terminal degree. Deng (2006) found that 67% of liberal arts graduates, or those earning an associate of arts degree, from a Borough of Manhattan community college transferred to a senior institution in the City University of New York (CUNY) system, compared to 58% of career-oriented graduates, or those earning an associate of applied sciences degree. Deng reported a 42% graduation rate for liberal arts transfer students and a 41% graduation rate for career-oriented transfer students.

None of the definitions described above included students who transfer from a four-year institution to another four-year institution. Preparing students for transfer is not a mission of four-year institutions, nor are four-year institutions held accountable for the success of their transfer students. However, four-year institutions that enroll transfer students from other four-year institutions may be interested in the success of these students. Studies that include transfer students from four-year institutions as well as community colleges either compare the two groups of students or group them together. In a study of a four-university system, Mullen and Eimers (2001) defined transfer students as those who transferred from either a four-year institution or community college with at least 24 credit hours. This combined group of transfers
graduated within six years or less at a rate of 54%. At the same system, Schmidtke and Eimers (2004) categorized transfer students into three categories: (a) those who transferred from a community college, (b) those who transferred from a four-year institution, and (c) those who transferred from another system institution. In order to be included, regardless of the assigned category, students were to have completed at least 24 credit hours, and earned at least a 2.0 GPA. Under this definition, 59% of within system transfer students graduated, followed by 52% of four-year transfer students, and 51% of community college transfer students. Similarly, Koker & Hendel (2003) separated transfer students into three categories: (a) Post Secondary Education Opportunity students (high school students enrolled in dual credit programs), (b) community college transfer students (earned at least 26 credits at a community college in the state), and (c) four-year transfer students (earned at least 26 credits at a four-year institution in the state). Koker and Hendel found that 42% of community college transfer students graduated or were retained within four years post transfer and 43% of four-year transfer students graduated or were retained. Only 28% of the Post Secondary Education Opportunity students either graduated or were retained.

This study used a fairly exclusive definition of transfer student based upon admissions requirements at the receiving institution. To be included, students had to have earned 24 credit hours and earned a 2.0 GPA at their institution prior to transfer. Additionally, students were categorized into two groups based upon the type of institution they attended prior to transfer. Students who solely attended community
colleges were categorized as community college transfer students, whereas students who solely attended four-year institutions prior to transfer were categorized as four-year transfer students. Students who attended more than one type of institution prior to entrance into the institution were not included in the analysis.

Previous Research on Transfer Students

Previous research on transfer students has primarily focused on factors that affect baccalaureate attainment (e.g. Alfonso, 2006; Arnold, 2001; Cabrera, Burkum, & LaNasa, 2003; Freeman, 2007; Townsend, McNerny, & Arnold, 1993; Rouse, 1995; Koker & Hendel, 2003; Glass & Harrington, 2002; Mullen & Eimers, 2001; Schmidtke & Eimers, 2004). These factors include transfer GPA, transfer hours, coursework at initial institution, gender, ethnicity, low income status, and entering major at receiving institution. These factors can be categorized as entering academic history and student demographics.

Entering Academic History (Academic Integration at Sending Institution)

Entering academic history has long been utilized in admissions requirements for both first-time freshmen and transfer students. Research has shown that entering academic history does have an effect on future academic success and persistence. Often, measures of entering academic history (transfer GPA and transfer hours) are a reflection of academic integration at the previously attended institution. Academic integration has been shown to be an important part of persistence models (Astin, 1975; Bean, 1980; Bean & Metzner, 1985; Tinto, 1975, 1987, 1993).
Transfer GPA. One of the strongest predictors of transfer student success is transfer GPA. The higher a student’s transfer GPA, the more likely he or she is to earn a baccalaureate or have a higher upper division GPA. Townsend, McNerny, and Arnold (1993) found that the most significant predictor of community college transfer student cumulative GPA at a university was transfer GPA (Pearson’s r = 0.5777, p<0.000, n=74). In a model utilizing hierarchical linear regression to predict upper grade point average, Carlan and Byxbe (2000) found that for every one point increase in transfer GPA, upper division GPA increased 0.67 points (p<0.05). Mullen and Eimers (2001) found that for every one point increase in transfer GPA a student’s likelihood of graduating increased 40% (p<0.01).

Transfer GPA is a strong predictor of baccalaureate attainment regardless of whether a student transfers from a four-year institution or a community college. Schmidtke and Eimers (2004) constructed four incremental GPA categories: (a) Less than 2.50, (b) 2.50 – 2.99, (c) 3.00 – 3.49, and (d) 3.50 or more. The authors found that for every increase in GPA category a transfer student from a four-year institution was 1.484 times as likely to graduate and a transfer student from a community college was 1.529 times as likely to graduate.

It is interesting to note that Pascarella, Smart, and Ethington (1987) found that the effect of transfer GPA on baccalaureate attainment differed depending on a student’s gender. The authors ran a separate analysis for each gender and did find transfer GPA to be significant for male transfer students.
Transfer hours. The number of hours a student earns prior to transfer has also been found to affect transfer student success. Mullen and Eimers (2001) found that transfer hours had a slight statistically significant effect on baccalaureate attainment for transfer students. Koker and Hendel (2003) and Schmidtke and Eimers (2004) both found that the more hours a transfer student completed prior to transferring, the more likely he or she was to graduate. Both studies found that this was true regardless of whether the student transferred from a four-year institution or a community college. Koker and Hendel (2003) did find that the number of transfer hours had a greater interaction effect with community college transfer students than with students who transferred from a four-year institution.

Coursework completed prior to transfer. The type of credits earned prior to transfer has been measured in several different ways with varying results. One measurement for coursework completed prior to transfer would be the completion of an associate of arts degree (Cohen and Brawer, 2003). Mullen and Eimers (2001) utilized a post-secondary degree variable that measured whether a transfer student (either from a community college or four-year institution) had earned a postsecondary degree prior to transfer. This postsecondary degree variable included associate of arts degrees, associate of sciences degrees, and applied associate of sciences degrees among others. The authors found that earning a post-secondary degree prior to transfer had a negative effect on earning a baccalaureate degree.
Schmidtke and Eimers (2004) reported separate logistic regression results for community college transfer students and four-year transfer students. Measurements for earning an associate’s of arts degree and earning other types of associate degrees were included in the model for community college students only. The authors found that completing the Associate of Arts degree prior to transferring increased the likelihood that a community college transfer student would earn a baccalaureate degree. However, earning other types of associate degrees decreased the likelihood that a community college transfer student would graduate compared to those students who did not earn a degree prior to transfer.

Another way of determining whether a student completed general education requirements is to count the number of credits in certain subjects. Alfonso (2006) found that the more college math and science courses completed prior to transfer, the more likely a student would be to graduate. Adelman (2005) reported that a higher than 20% withdrawal rate from courses and repeat grades in college-level math prior to transferring had a statistically significant, negative effect on bachelor’s degree completion.

The results of research into transfer student success are beginning to be evident in policy decisions concerning transfer students admissions requirements. For example, at MRU a new admissions policy for transfer students went into effect the 2006 fall semester. The new admissions policy requires students who wish to be granted admission as a transfer student to complete 24 or more semester hours, have at least a
2.5 GPA, and have completed the course equivalent of college algebra and freshmen level English exposition with a C- or better. If these requirements are not met, students must meet the first-time college admission requirements. In this study, a variable was constructed based on whether a student completes a college Algebra course and/or freshmen composition prior to transfer.

**Student Demographic Variables**

Student demographic variables are often included in retention and persistence models. These variables are included to act as control variables, but for many of them, there are no practical implications for including these variables in the model. For example, assume that men graduate at a higher rate than women and that being male has a significant positive effect on graduation. It is not possible for students to change their gender to increase their likelihood of graduating. Nor is it reasonable for institutions to adapt admissions requirements to exclude perspective students based upon the results of the research. The following student demographic variables have been found to have an effect on transfer student baccalaureate attainment.

**Gender.** Research has shown that women are more likely than men to attain a baccalaureate degree. When controlling for minority status, transfer hours, transfer GPA and other variables, Mullen and Eimers (2001) found that women were 1.26 times as likely to graduate than males. Schmidtke and Eimers (2004) found that in particular for students who transfer from a community college, women are 1.158 times as likely to graduate as men. Both Mullen and Eimers, and Schmidtke and Eimers utilized an
institutional data set. Freeman (2007) utilized a national survey, Beginning Postsecondary Students (BPS) longitudinal study and found that women were 2.29 times as likely to graduate as men when controlling for age, risk factor index, high school locale (rural), and first institution locale (rural). Freeman utilized a risk factor index developed by Horn and Premo (2005, as cited in Freeman, 2007). The risk factor index was a count of seven risk factors including delayed enrollment, lack of a high school diploma, part-time attendance, financial independence, a dependent other than a spouse, single parenthood, and full-time employment.

*Ethnicity.* Regardless of type of institution attended, research has shown that minority transfer students are less likely to graduate than non-minority transfer students. Whereas some studies show a comparison of effect on graduation between different ethnicities, other studies create two groups of students, minorities and non-minorities. Koker and Hendel (2003) found that Asian students were 1.41 times as likely to graduate as were African-American students. The effect of being white as compared to African-American was not significant. Carlan and Byxbe (2000) found that when predicting the effect of race on a transfer student’s upper division grade point average, being white increased his or her GPA a small, positive, significant amount when controlling for transfer GPA, college of major, and age.

Mullen and Eimers (2001) introduced a minority categorical variable into their logistic model. The underrepresented minority category consisted of African-American, Hispanic, and Native American students. Mullen and Eimers found that minority
transfer students were 0.591 times as likely to graduate as non-minority students. Schmidtke and Eimers (2004) found similar results; however, the effect was slightly less for minority transfer students from a community college (odds ratio, 0.711, p<0.05) than it was for minority students who transferred from a four-year institution (odds ratio, 0.761, p<0.05).

In some studies minority status affects one group of students but not another. Pascarella, Smart, and Ethington (1986) found being a minority had a negative effect on degree completion for men, whereas it was not a significant effect for women. When comparing the variables that significantly affect transfer student success of career-oriented graduates and liberal arts graduates, Deng (2006) found ethnicity was not a significant effect for career-oriented graduates. The author did find that being Hispanic had a statistically significant negative effect on GPA at the university to which community college liberal arts graduates transferred.

*Enrollment status.* Full-time enrollment has been shown to be a positive predictor of transfer student success. Alfonso (2006) utilized a structural equation model to measure the effects of certain variables on baccalaureate attainment. The author found that full-time enrollment was a significant, positive indicator (B = 0.2173, p<0.001). Although not all studies include a variable specifically for enrollment status, there are other variables that may act as a proxy for enrollment status, including full-time employment. Full-time employment has also been shown to affect transfer student persistence.
*Low income status.* Financial aid variables typically measure the amount of financial aid a student receives, the amount of need met, or the type of loans students receive. Financial aid can also act as a proxy for socio-economic status. St. John, Paulsen, and Starkey (1996) included measures of both financial aid and socio-economic status in their nexus model. They found that neither the level of income nor the amount of grant dollars or loans to be a significant effect of persistence for transfer students or first-time freshmen. St. John, Paulsen, and Starkey did, however, find that the amount of tuition, cost of housing, and cost of food and travel all had a significant negative effect on within-year persistence. Additionally, Alfonso (2006) did find that when comparing students in the first quartile of socio-economic status to students in each of the three other quartiles, those in the upper three quartiles were more likely to graduate than students in the first or lowest quartile.

*Age.* There have been conflicting results as to the effect of age on transfer student success. Freeman (2007) found that traditional aged students were more likely to attain the baccalaureate degree than were non-traditional aged students. Schmidtke and Eimers (2004) found that regardless of whether a student transferred from a community college or a four-year institution, non-traditional aged student were less likely to graduate. Conversely, Carlan and Byxbe (2000) found that being over the age of 25 positively increased a student’s predicted upper division grade point average by 0.19 points (p<0.01).
Discipline of study. Research has shown that discipline of study does have an effect on transfer student success. Discipline of study is typically measured as the major into which a student transfers. Carlan and Byxbe (2000) found that students who enrolled in psychology or education had higher upper division GPAs than students who transferred into the liberal arts, business and administration, science and technology, or the health sciences. Mullen and Eimers (2001) found that students who entered into a science discipline were 0.60 times as likely to graduate as students who entered into other disciplines. Entering into an institution with a declared major does increase a student’s likelihood of graduating. Alfonso (2006) found that not declaring a major decreased one’s likelihood of graduating by 25%.

College Choice

Along with entering academic history factors and student demographic factors, the proposed study also investigated the effects of college choice and first-semester GPA on baccalaureate attainment. St. John, Paulsen, and Starkey (1996) utilized both college choice and persistence theory to develop their college choice-persistence nexus model. When testing the model, the authors found there to be several interactions between finance-related college choice variables and the cost to attend college. Tuition at community colleges is typically lower than that at four-year institutions and is often a deciding factor for perspective students who choose to attend a community college over a four-year institution (Cohen & Brawer, 2003; Cejda, Kaylor, & Rewey, 1998). For the 2005-2006 academic year the average in-state tuition and fees at a public community
college was $1,935, whereas it cost $5,351 on average to attend a four-year institution (U. S. Department of Education, National Center for Education Statistics, 2007).

St. John, Paulsen, and Starkey (1996) noted that financial considerations are not the only factors taken into consideration when choosing a college and stated that “inquiry into other aspects of the college choice-persistence nexus would have merit” (p. 204). Descriptive statistics have shown that the population of students who attend community colleges differs from the population that attends four-year institutions (Cohen & Brawer, 2003; Adelman, 2005, Freeman, 2007). For example, community college students are more likely to attend part-time (Cohen & Brawer, 2003). Utilizing the Beginning Postsecondary Students Longitudinal Study, 1996-2001, Freeman (2007) found that 60% of students who attend community colleges are older than 18 years old, whereas only 21% of students who attend four-year institutions are older than 18 when they first enroll. The author also found that 75% of students who first enroll at a four-year institution had zero out of seven risk factors, where only 21% of the students who first enroll at a community college were risk-factor free. Adelman (2005) noted 52% of first-generation students in the graduating high school class of 1992 first enrolled in a community college. Additionally, 38% of white and African-American students of this class first enrolled in a community college while 50% of Latino and American Indian students first enrolled in a community college. Adelman (2005) tested a similar model to determine whether a student was more likely to attend a four-year institution. He
found that higher educational expectation, more academic resources, and a higher SES quintile all increased the likelihood that a student would attend a four-year institution.

Adelman (2005) analyzed the factors that are associated with first enrolling in a community college utilizing logistic regression. He found the following factors to be statistically significant indicators of community college attendance: 1) education expectations (odds ratio = 0.60), no delay of entry (odds ratio = .57), highest math in high school (odds ratio = 0.69), academic resources (odds ratio = 0.71), SES quintile (odds ratio = 0.75), and occupational major (odds ratio = 2.20). As is shown, the higher a student’s educational expectation, level of math attained in high school, academic resources, and SES quintile, the less likely he or she is to attend a community college. Additionally, if there is no delay of entry he or she is less likely to enroll in a community college unless they are interested in an occupational major.

*Transfer Shock and First-semester GPA (Academic Integration at Receiving Institution)*

The proposed study investigated the effects of entering academic history and student demographics on first-semester GPA, and in turn, the effect of first-semester GPA on baccalaureate attainment. First-semester GPA for transfer students has been studied as a measurement of transfer shock. The phenomenon of transfer shock has been considered since Hills (1965) first mentioned the issue in detail as a drop in GPA during the first-semester a student transfers to a new institution. Transfer shock has typically been viewed solely as an issue that community college transfer students experience. Townsend, McNerny, and Arnold (1993) found the average GPA of
community college transfer students to drop half a grade point from the community college to the first-semester at the university. Cejda, Kaylor, and Rewey (1998) analyzed the amount of transfer shock by the academic discipline into which a student transferred. The authors reported a drop in first-semester GPA for students in the fields of the professions (business administration, elementary education, and journalism) and mathematics and sciences (mathematics, biology, chemistry, and physics). Conversely, Cejda et al found a slight increase in post-transfer GPA for students in the fields of fine arts and humanities (art, music, theater, English, foreign language, history, and religious studies) and social sciences (economics, government, psychology, and sociology). This increase in GPA is known as “transfer ecstasy” (Nickens, 1972, as cited in Cejda et al, 1998).

Keeley and House (1993) also studied transfer shock and the factors that affect a transfer student’s first-semester GPA. The authors found that female transfer students had a slightly larger drop in first-semester GPA than male transfer students. In addition, students who transferred into the institution when they were 20 years old or younger on average saw a 0.417 point drop their first-semester. Minority students showed larger drop in GPA (0.397 points) compared to non-minority transfer students (0.341 points). Many of the same student demographic variables that affected first-semester GPA also effect baccalaureate attainment. For this study, first-semester GPA is included in the model as a mediating variable between entering academic characteristics (transfer hours, transfer GPA, credit in College Algebra, GPA in transferred College
Algebra, credit in Freshman English, and GPA in transferred Freshman English) and baccalaureate attainment. The final model also includes the student demographic variables mentioned previously.

In sum, previous research has shown that several entering academic history variables and student demographics have affected first-semester GPA and baccalaureate attainment of transfer students. It is also important to note that graduation rates differ depending upon the definition of transfer student that is utilized.

Significance of Study

This study utilized St. John, Paulsen, and Starkey’s (1996) college choice-persistence nexus model to frame questions pertaining to transfer student baccalaureate attainment. Previous studies have focused on persistence theories, but have neglected to take into account the college choice decision. By including the choice of initial enrollment in a community college versus a four-year institution as a moderating variable, this study controlled for the factors that affect college choice in analyzing the effects of entering academic history on baccalaureate attainment. Additionally, by including transfer students from other four-year institutions instead of native students as a comparison group to community college transfer students, the effect of transferring was controlled for in both groups. This is not the case in societal analysis studies which compare baccalaureate attainment between community college transfer students and native first-time college students. In order to control for the swirling student phenomenon (de los Santos & Wright, 1990), students who attended
more than one type of institution (community college and four-year institution) will not be included in the sample.

Previous research has studied the factors that affect first-semester GPA, and many of these factors have also been included in persistence research. However, rarely is first-semester GPA included as a mediating variable between the factors that affect first-semester GPA and baccalaureate attainment. By including first-semester GPA, there is a middle measurement of academic integration at the receiving four-year institution. Additionally, the effects of student demographics and entering academic history can be broken out as direct and indirect effects.

Lastly, this study includes a measurement of coursework completed prior to transfer. Admissions policies for transfer students are beginning to widen their scope to include specific course requirements for transfer students. Not enough research has been done to show that completing certain courses prior to transfer increases the chances of baccalaureate attainment. Moreover, including this variable provides academic advisors with information concerning when it is best for students to transfer to another institution.

Summary

Varying definitions of transfer students have yielded differing levels of success for transfer students. However, previous literature has shown that there are certain student demographic and academic ability variables that affect overall student persistence. More complex models of student success also include measurements of
academic and social integration. These factors have also been shown to affect baccalaureate attainment. For transfer students there are certain academic variables that can be measured prior to transfer to predict baccalaureate attainment. This study sought to show the direct and indirect effects of transfer hours, transfer GPA, credit in college algebra, and credit in freshman English on first-semester GPA and baccalaureate attainment taking into account the effects of student demographic characteristics on entering academic history variables, first-semester GPA, and degree attainment at a Midwestern, public, research institution. Additionally, it sought to determine if there was a difference in these effects for students who solely attend one or more community colleges prior to transfer as compared to students who solely attended one or more four-year institutions prior to transfer.
Chapter 3

RESEARCH METHOD

Introduction

Transfer student admission standards at four-year institutions are influenced by research on transfer students and the variables that affect whether or not these students persist to graduation. Much of the research on transfer students’ persistence to graduation has focused on the number of hours transferred and the GPA earned prior to transfer. Additionally, the traditional conception of transfer as being vertical transfer from a community college to a four-year institution dominates the literature and shapes admissions standards. In reality, four-year to four-year transfer and the “swirling” student have become increasingly dominant in postsecondary education. These students must adhere to the same four-year college transfer admissions standards as their community college counterparts. In this study, the effects of selected variables on persistence to graduation for community college transfer students were examined at a public, Midwestern research university (MRU) to determine if there are similar effects on persistence to graduation for four-year to four-year transfer students. In order to explore this comparison between community college and four-year transfer students the type of sending institution was included in a two-group path analysis as a moderating variable.
Another gap in the literature is the exclusion of first-semester GPA as a mediating variable. First-semester GPA is either considered a dependent variable, and the effects of explanatory variables on it are explored. Or it is included as an explanatory variable in a model to predict persistence to graduation. Alternatively, the first-semester GPA at a four-year institution in comparison to transfer GPA is often examined as evidence of transfer shock for community college transfer students. Rarely is this relationship explored for four-year transfer students. In this study, initial descriptive analysis was used to examine if transfer shock exists for four-year transfer students. Additionally, the model included first-semester GPA as a mediating variable. Including first-semester GPA as a mediating variable allowed the researcher to determine how much of the effect of first-semester GPA on graduation is direct, and how much of it is a reflection of the indirect effects of transfer GPA, transfer hours, and completion of entering mathematics and English transfer admissions requirement on first-semester GPA. This analysis provides useful information to admissions counselors and academic advisors as to the relationship between entering characteristics and initial performance on persistence to graduation.

This chapter provides a discussion of data available from the institution, the variables that are included in the model and their relationships to one another, the method utilized to answer the research questions, and the strengths of utilizing this method.
Research Design

A quantitative approach was utilized to analyze the direct and indirect effects of transfer GPA, number of hours transferred, completion of entering mathematics and English transfer admissions requirement prior to transfer, and first-semester GPA at MRU upon persistence to graduation. The effects were analyzed for two groups of students (those who solely attended community colleges prior to transfer, and those who solely attended four-year institutions prior to transfer) while taking into account the effects of student demographic variables on entering academic history variables, first-semester GPA, and degree attainment. The effects between the two groups were also analyzed to determine if the effects differed depending upon the type of institutions attended prior to transfer. These variables included enrollment status, gender, ethnicity, Pell Grant status, age, fall enrollment, and initial program of study. The number of demographic variables included is limited by the number of cases available in the data (Kline, 1998). The conceptual framework for this study is shown in Figure 4.
Path analysis was utilized to study the effects of entering academic history on first-semester GPA and baccalaureate attainment. The model simultaneously analyzed the effect of first-semester GPA on baccalaureate attainment. An advantage of path analysis over multiple regression is that it allows a variable to be entered as both a predictor and criterion variable (Kline, 1998). When the dependent variable in path analysis is continuous, the estimated parameters are synonymous with regression coefficients in linear regression. Mplus software was utilized because it is compatible with using a categorical dependent variable (i.e., baccalaureate attainment) and a continuous mediating variable (i.e., first-semester GPA) with multiple groups (community college and four-year college transfer students). When maximum likelihood estimation is utilized to estimate parameters onto a dichotomous variable, the parameter estimates produced by Mplus are synonymous with logistic regression.
coefficients (Muthen and Muthen, 2007b). Additionally, the parameter estimates generated utilizing maximum likelihood with standard errors and a chi-square statistic are robust to non-normality. This was beneficial due to the fact that so many of the predictor variables were non-normal dichotomous.

Several different methods have been suggested as fit indices in path analysis. This study utilized the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) to determine the model of best fit. For both measures, the lower the value, the better the model (Cohen, Cohen, West, & Aiken, 2003; Kline, 1998). The AIC has been known to be extremely sensitive to sample size. The BIC was developed to correct for this sensitivity.

Data Source

According to the Carnegie Foundation (2007), the institution under study is a large four-year, primarily residential university located in the Midwest. The Foundation also categorizes the institution as a Research University, with very high research activity. The undergraduate profile is full-time four-year, more selective, higher transfer-in. The higher transfer-in categorization is assigned to institutions where the undergraduate population is composed of 20% or more transfer students (Carnegie Foundation, 2007). According to the Carnegie Foundation, the total enrollment for Fall 2004 was 27,003 undergraduate and graduate students.

Prior to obtaining data, the researcher sought Institutional Review Board (IRB) approval to obtain non-directory information for each student. This information was
needed to determine type of previously attended institution and mathematics/English admissions requirement earned prior to transfer. After review, the Institutional Review Board determined that this study was not subject to IRB review. Coded course level records of students’ course credits earned prior to transfer and these courses equivalencies at the receiving four-year institution were provided by the institution’s registrar. A random number was assigned to each student so that the two datasets could be merged without the use of an institutional student number or a social security number.

Population

The population for this study was students who transferred to the institution during the fall semesters from 1993 to 2001. There were 14,337 transfer students in the original population. Only students who completed 24 hours prior to transfer, and who had at least a 2.0 transfer GPA were included in the population. These restrictions are in line with the admission requirements for transfer students to this institution during the selected time period. If a transfer student did not meet these admissions requirements, he or she would have had to meet first-time freshmen admissions requirements. Thus this restriction controls for varying entrance requirements. After taking the transfer student admissions requirements into consideration, there were 11,862 students in the study’s population. The mathematics/English admissions requirement had not yet been implemented during the period from which the population is being drawn. Therefore the researcher did not utilize the mathematics/English admissions requirement to
exclude subjects from the study, but instead tested the appropriateness of utilizing this variable as an admissions requirement for transfer students.

The population was limited to students who solely attended community colleges prior to transfer and students who solely attended four-year institutions. As more and more students are attending multiple institutions, there is a chance that some of the students who transferred to the institution during this period transferred in credit from both two-year and four-year institutions. In past studies at the institution, the type of sending institution was determined by the type of the most recent institution attended. By collecting course level data of students’ course credits earned prior to entrance at the institution under study, I was able to exclude students who attended more than one type of institution. This is beneficial particularly because this study examined the differences in effects between students who transferred from community colleges and those who transferred from four-year institutions. Of the transfer students who met the transfer student admissions requirements, 31% (3,634 students) solely attended community colleges, 17% (1,964 students) solely attended four-year institutions, 3% (358 students) solely attend other institutions within MRU’s system, less than 1% (47 students) solely attended technical schools, and 49% (5859 students) would be considered “swirling” students. The transfer students who solely attended other institutions within MRU’s system were included with the transfer students who solely attended four-year institutions for the purpose of this study. Thus the final population of students for this study was 5,956 transfer students with 3,634 (61%) solely attending
community colleges and 2,322 (39%) solely attending four-year institutions prior to enrolling at MRU.

Data Collection

Student demographic information including transfer GPA, number of hours completed prior to transfer, first-semester GPA at the receiving institution, baccalaureate attainment status, ethnicity, gender, Pell Grant status, initial major at the receiving institution, and enrollment status were provided from the institution’s registrar. Additionally, courses taken prior to transfer and their course equivalencies at the receiving institution, MRU, were provided. These data were merged with the statistical software package, SAS, version 9. The course file was utilized to determine the enrollment pattern of students prior to transfer. This information was utilized to separate the subjects into those who solely attended community colleges and those who solely attended four-year institutions. Subjects who attended more than one type of institution prior to transfer were not included in the study.

Research Questions

Although this study was based upon two overarching questions, in order to address the questions thoroughly, they were broken out into three questions that can be addressed specifically through structural equation modeling. The original two overarching questions were:

1. What effect do the number of hours transferred, transfer GPA, and meeting the mathematics/English admissions requirement (entering academic history) have
on first-semester GPA and baccalaureate attainment when taking into account the effects of gender, minority status, entering enrollment status, Pell Grant status, age, Fall enrollment, and entering discipline (student demographic variables) on entering academic history variables, first-semester GPA, and degree attainment?

2. Is there a difference in these effects between students who solely attend one or more community colleges prior to transfer and those who solely attend one or more four-year institutions prior to transfer?

In order to address these questions through path analysis, the following three questions were developed:

1. What effect do the number of hours transferred, transfer GPA, credit in college algebra, and credit in freshman English (entering academic history) have on first-semester GPA and baccalaureate attainment for students who solely attended one or more community colleges prior to transferring to MRU when taking into account the direct effects of gender, minority status, enrollment status, Pell Grant status, age, fall enrollment, and initial major at receiving institution in comparison to no major declared (student demographic variables) on entering academic history variables, first-semester GPA, and degree attainment?

2. What effect do the number of hours transferred, transfer GPA, credit in college algebra, and credit in freshman English (entering academic history) have on first-semester GPA and baccalaureate attainment for students who solely attended
one or more four-year colleges prior to transferring to MRU when taking into account the direct effects of gender, minority status, enrollment status, Pell Grant status, age, fall enrollment, and initial major at receiving institution in comparison to no major declared (student demographic variables) on entering academic history variables, first-semester GPA, and degree attainment?

3. Is there a difference in the effects of the number of hours transferred, transfer GPA, credit in college algebra, and credit in freshman English (entering academic history) on first-semester GPA and baccalaureate attainment for students who solely attended one or more community colleges compared to students who solely attended four-year institutions prior to transferring to MRU?

Variables in Study

In previous studies of transfer student success, both baccalaureate attainment and first-semester GPA have been utilized as measurements of student success (e.g. Alfonso, 2006; Glass & Harrington, 2002; Mullen & Eimers, 2001; Schmidtke and Eimers, 2004; Townsend & Barnes, 2002; Townsend, McNerny, & Arnold, 1993). Predictor variables utilized in previous research have been categorized as student demographics and entering academic history. Below is a description of these variables and an explanation of how they were coded in this study. All missing data were coded as 999.

Demographic Variables

Demographic variable were utilized in this study to account for characteristics that have been found to affect baccalaureate attainment. These demographic variables
included gender, ethnicity, enrollment status, Pell Grant status, age, fall enrollment, and initial major at receiving institution in comparison to no major declared.

**Gender.** Previous research has shown that female transfer students are more likely to graduate than male transfer students. According to Mullen and Eimers (2001) in a study of four-institution system, women are 1.26 times as likely to graduate as men. In this study, gender was coded as 1 for female subjects, and 0 for male subjects.

**Ethnicity.** Minority status has also been shown to affect student success, regardless of the type of institution attended. Schmidtke and Eimers (2001) found that minority students who transferred from a community college were 0.711 times as likely to graduate as non-minority students who transferred from a community college. In the same study of a system of institutions, minority students who transferred from a four-year institution were 0.761 times as likely to graduate as their non-minority counterparts. In this study, students who are white were categorized as non-minority and coded as 0. Students who identified themselves as an ethnicity other than white were categorized as a minority and coded as 1. There were 240 students who refused to report their ethnicity or for whom their ethnicity was unknown. These students were excluded from the analysis.

**Low income status.** Financial aid status has been utilized as a method to determine socioeconomic status, or amount of unmet need. Although St. John, Paulsen, and Starkey (1996) did not find the amount of aid to be significant indicators of persistence for first-time freshmen or transfer students, the authors did find that the
cost of housing, and cost of food and travel had a negative effect on student success. In this study, financial aid status was based upon the Pell grant. If a student was qualified to receive a Pell Grant during the time he or she was enrolled at the institution under study, the low income variable was coded 1. Otherwise, the low income variable was coded 0. It is important to note that the Pell Grant is awarded to undergraduate students with the most need.

Discipline of study. When entering an institution, students who declare a major have a greater likelihood of graduating as compared to those students who do not choose a major or enter undecided (Alfonso, 2006). Additionally, students who major in a science discipline when entering an institution are less likely to graduate than students who enter into other disciplines (Mullen & Eimers, 2001). For this study, majors were grouped into three categories: (a) science, technology, engineering and mathematics (STEM), (b) non-STEM major, and (c) undecided. Each category was included in the model as a dichotomous variable. If the subject entered into the institution in a major that fits within a variable’s category, that variable was coded as 1. Otherwise, it was coded as 0. The undecided variable was not included in the model to serve as a reference. Thus, the other two categories were compared to entering undecided.

Enrollment status. Alfonso (2006) found that full-time enrollment was a significant predictor of baccalaureate attainment. Additionally, enrollment status may have an effect on college choice, as more community college students attend part-time compared to students who attend four-year institutions (Cohen & Brawer, 2003).
Enrollment status was coded as a 1 for students who attended full-time and 0 for those who attended part-time.

*Age.* Similar to enrollment status, age differs between students who attend a community college and those who attend a four-year institution. Freeman (2007) found that 21% of students who first enroll in a four-year institution are 21 or more years old while 60% of students who first enroll in a community college are 21 or more years old. Additionally, Schmidtke and Eimers (2004) found that non-traditional aged transfer students were less likely to graduate than traditional aged transfer students. For this study, students were grouped as traditionally aged students (18-23 years old) and non-traditionally aged students. The variable for this measurement was coded 1 for traditionally aged students and coded 0 for non-traditional age students.

*Fall enrollment.* An additional demographic variable was entered into the model to control for any effect that may be contributed due to transferring into the institution during a semester other than a fall semester. The population was not limited to students who initially enrolled in the fall semester and it is unknown whether or not this has an effect on first-semester GPA or graduation. The variable was coded as 1 for students who entered in the fall and 0 for those who entered during a winter or summer semester.
Entering Academic History

In addition to student demographics, entering academic history of transfer students has been widely utilized in studies of transfer student success. Pragmatically, these variables are also present in admissions requirements for transfer students.

**Mathematics/English admissions requirement.** Alfonso (2006) found that a student was more likely to graduate if he or she completed a higher number of math and science courses prior to transfer. At the institution under study, the following transfer admissions policy has been instituted:

An applicant who has completed 24 or more semester hours of college-level course work from a regionally accredited college or university must meet one of the following criteria:

- Meet Institution’s freshmen admission requirements and have at least a 2.0 overall GPA on a 4.0 scale.
- Have a 2.5 GPA or better and have completed the equivalent of college algebra or freshman English with grades of C- or better.
- Have at least a 2.0 GPA and transfer from a campus within MRU’s system. (MRU, 2007)

Transfer student transfer course level data were analyzed for course equivalencies at the institution under study. A variable for each course requirement (college algebra and freshman English) was included in the model. The variables were coded 1 if the course was transferred in for credit. Otherwise the variables were coded 0, respectively.
Transfer GPA. Transfer GPA has been found to be one of the strongest predictors of transfer student success. Carlan and Byxbe (2000) found that upper division GPA increases 0.67 points for every 1 point increase in transfer student GPA. In a similar study, Schmidtke and Eimers (2004) utilized a categorical measure of transfer GPA in a logistical regression analysis of transfer students at the institution under study and found that for every 0.5 increase in GPA a four-year transfer student was 1.484 times as likely to graduate and a community college transfer student was 1.529 times as likely to graduate. In this study, transfer GPA was entered into the model as a continuous variable. Additionally, transfer GPA was multiplied by ten to enhance the interpretability of the regression coefficient.

Transfer hours. Another strong predictor of transfer student success is the number of credit hours a student completes prior to transfer. Mullen and Eimers (2001) found that the more hours a transfer student brought with them into a four-year institution within a four-university system, the more likely the student was to graduate. In this study, transfer hours were entered into the model as a continuous variable.

First-Semester GPA-Mediating Variable

One of the unique aspects of path analysis is that it allows a researcher to utilize mediating variables and decompose effects of predictor variables into direct and indirect effects. In this study, first-semester GPA was included as a mediating, or intervening endogenous variable. There were exogenous variables (entering academic history variables) that affected first-semester GPA, which in turn affected baccalaureate
attainment. The effects of entering academic history variables were decomposed into indirect and direct effects on baccalaureate attainment. The entering academic history variables were mediated by first-semester GPA.

Entering academic success, or first-semester GPA, has been analyzed as both an exogenous and endogenous variable. First-semester GPA has been analyzed as a measurement of transfer shock (Hills, 1965). Conversely, in student retention studies, entering academic ability has been utilized as a measurement of academic integration. For this study first-semester GPA represented both a variable of transfer student ability and a variable that effects baccalaureate attainment. First-semester GPA was entered into the model as a continuous variable. Additionally, transfer GPA was multiplied by ten to enhance the interpretability of the regression coefficient.

College Choice – Moderating Variable

St. John, Paulsen, and Starkey (1996) theorized that college choice does have an effect on baccalaureate attainment. In this study, multiple group path analysis was utilized to determine if the effect of the entering academic history variables and first-semester GPA on baccalaureate attainment differs for community college transfer students and four-year transfer students to the institution under study. Students were grouped into two categories based on transfer course level data: (a) those who solely attended community colleges prior to entering the institution under study, and (b) those you solely attended four-year institutions prior to enrolling at the institution under study. Two different data sets were created based upon the groups of students
mentioned above. As will be explained below, the same model was analyzed for both
data sets separately. Then, the model was run with both datasets combined. This
measurement model did not constrain the effects of the entering academic history
variables on first-semester GPA and baccalaureate attainment between the two groups
of transfer students. A second model with both datasets was run with the effects of the
entering academic history variables on first-semester GPA and baccalaureate
attainment between the two groups of transfer students constrained. The Akaike
Information Criterion, Bayesian Information Criterion, and difference in chi-square were
analyzed to determine the best model. Then, each constrained effect was released one
by one. For each model, a difference in chi-square test developed by Muthén and
Muthén (2007a) was utilized to determine which constraints, if released, would
contribute the most statistically significant amount of chi-square to the final structural
model. This process was continued until there were no longer any significant
constraints. If a certain constrained effect was released it signified that the effect was
different for students who solely attended community colleges and students who solely
attended four-year institutions.

Analysis of the Data

Two-group path analysis was utilized to analyze the data. This approach allowed
the researcher to investigate type of sending institution as a moderating variable.
Specifically, the differences between the effects of number of hours transferred,
transfer GPA, percent of general education completed, and first-semester GPA on
graduation for transfer students from community colleges and transfer students from four-year institutions are examined. Another advantage of this method and proposed model is that first-semester GPA was included as a mediating variable. Therefore, the effects of the number of hours transferred, transfer GPA, credit in college algebra, and credit in freshman English on graduation were measured as direct effects upon first-semester GPA and indirect effects on graduation while taking into account the effect of student demographic variables on entering academic history variables, first-semester GPA, and degree attainment. Additionally, the effects of the number of hours transferred, transfer GPA, credit in college algebra, and credit in freshman English were measured as direct effects on baccalaureate degree attainment.

Path analysis and structural equation modeling require a large number of subjects (Kline, 1998). According to Kline, there should be 10 subjects for each observation, with the number of observations defined as “the number of variances and covariances among the observed variables” (Kline, 1998, p. 104). If the number of variables in the model is known, the following equation can be utilized to determine the number of observations, as defined by Kline:

$$\text{Number of observations} = \frac{v(v-1)}{2},$$

where $v$ is the number of observed variables. Each group of transfer students was taken separately; thus there was a total of fourteen variables (transfer hours, transfer GPA, credit in college algebra, credit in freshman English, first-semester GPA, degree status,
gender, minority status, enrollment status, Pell Grant status, age, two categories of initial major without undeclared as the reference group, and fall enrollment). Therefore each group should have minimally contained at least 910 cases. There were 3,634 community college transfer students and 2,322 four-year transfer students.

The statistical package Mplus, designed by Muthén and Muthén (1998-2007), allows a researcher to utilize categorical variables as well as continuous variables in the model. Logistic regression can be utilized to estimate parameters by setting the estimator to maximum likelihood with standard errors (Muthén & Muthén, 2007b). Mplus also allows a researcher to examine the differences in estimated parameters between two groups utilizing the mixture analysis. Mplus was used to analyze the data for this study.

**Question 1: Baccalaureate Attainment of Community College Transfer Students**

To determine the effects of the number of hours earned prior to transfer, transfer GPA, credit in college algebra, credit in freshman English, and first-semester GPA on graduation, the measurement model was used, as shown in Figure 5. This model was analyzed for students who solely attended community colleges prior to transfer while taking into account student demographic variables. This analysis determined the estimated parameter for community college transfers. In Figure 5, the parameters that were estimated are marked with an asterisk.
Question 2: Baccalaureate Attainment of Four-year Transfer Students

To determine the effects of the number of hours earned prior to transfer, transfer GPA, credit in college algebra, credit in freshman English, and first-semester GPA on graduation, the measurement model was used, as shown in Figure 6. This time the model was analyzed for students who solely attended four-year institutions prior to transfer while taking into account student demographic variables. Again, this analysis determined the estimated parameters for four-year transfer students. In Figure 6, the parameters that were estimated are marked with an asterisk.
Figure 6. The four-year transfer student measurement model.

Question 3: Difference Between Community College and Four-year Transfer Students

To determine if there is a difference between community college and four-year transfer students concerning the effects of the number of hours earned prior to transfer, transfer GPA, credit in college algebra, credit in freshman English, and first-semester GPA on graduation, the model was analyzed for both groups of students while taking into account student demographic variables. This model is known as the two-group measurement model and is represented in Figure 7. A second model was run with the effects of the number of hours earned prior to transfer, transfer GPA, credit in college algebra, credit in freshman English, and first-semester GPA on graduation constrained between the two-groups while taking into account student demographic variables. In order to constrain an effect between two groups, they were set equal to...
each other for both groups. For example, in Figure 7, \(a = j, b = k, c = l\) and so on.

Each constrained effect was released iteratively in a separate model. The models were compared utilizing a difference of chi-square test (Muthén and Muthén, 2007a). For effects with the greatest statistically significant difference in chi-square, the constraint was released, thus signifying that the effect is different for students who solely attended one or more community colleges and students who solely attended one or more four-year institutions prior to transferring to MRU.
Figure 7. The two-group measurement model.
Summary

In summary, two-group path analysis was utilized to determine the effects of number of hours transferred, transfer GPA, credit in college algebra, credit in freshman English, and first-semester GPA on graduation while taking into account the effect of student demographic variables on entering academic history variables, first-semester GPA, and degree attainment for community college and four-year transfer students separately. In addition, it was determined if there was a difference in these effects for the two groups of students.
Chapter 4

RESULTS

Introduction

This study utilized an initial college choice-persistence model to analyze and compare the effects of entering academic history on first semester GPA and graduation from a public, Midwestern research university (MRU). Specifically, students who solely attended community colleges were compared to students who solely attended four-year institutions prior to transferring to MRU. First, the effects of entering academic history (transfer GPA, transfer hours, taking college algebra prior to transfer, and taking freshmen English prior to transfer) on first semester GPA and baccalaureate attainment while taking into account the effect of student demographic variables on entering academic history variables, first-semester GPA, and degree attainment were estimated separately for each group of transfer students (community college and four-year). Then it was determined whether the differences in the effects between the two groups were statistically significant.

Descriptive statistics of the attendance patterns of transfer students to MRU are provided, along with descriptive statistics of the entering academic history measures, demographic variables, and success variables. Each of the four research questions is then addressed and the results for each model are provided below.
Descriptive Statistics

Data provided by the registrar of the institution in this study were imported into SAS version 9.1 (2003) in order to prepare the data files that would be utilized to analyze the data in Mplus (Muthén and Muthén, 1998-2007). Two separate data files were provided by the registrar. One file contained individual student information with a unique random number assigned to each student. The second file contained transfer course information for each student. The course file was utilized to determine the type of attendance pattern, transfer GPA, number of transfer hours, and status of college algebra and freshmen English. This information was then merged with the student information file. The descriptive statistics of the attendance patterns, student demographic variables, and entering academic ability variables are provided below.

Attendance Patterns Prior to Transfer to MRU

The transfer population was first aggregated by the type of attendance pattern prior to transferring to MRU. Of the 11,682 transfers students with at least a 2.00 GPA and at least 24 transfer hours, 3,634 (31%) solely attended one or more community colleges prior to attending MRU. Transfer students who solely attended one or more four-year institutions made up 20% (2,322 transfer students) of the original population. Less than 1% (47 transfer students) solely attended technical schools prior to attending MRU. In other words, the largest group of transfer students attended multiple types of institutions prior to attending MRU. These “swirling students” made up 49% (5,859 transfer students) of the transfer student population. Of the “swirling” transfer
students, only 75 (1%) attended a technical school as one of their previously attended institutions.

*Student Demographic Variables*

The population for this study was limited to only the transfer students who solely attended one or more community colleges (3,634 transfer students) and those who solely attended one or more four-year institutions (2,322 transfer students) prior to attending a public, Midwestern research university. As can be seen in Table 1 below, the population of transfer students who solely attended community colleges differs from the population of transfer students who solely attended four-year institutions. For continuous student demographic variables, analysis of variance (ANOVA) was utilized to determine if there was a statistically significant difference between the two groups. For dichotomous student demographic variables, chi-square analysis ($\chi^2$) was utilized to determine if there was a statistically significant difference between the two groups.

*Gender.* For the overall population, men were 56% of the population whereas women made up 44% of the population. Men made up a larger proportion (59%) of the community college population than they did of the four-year college population (51%). The difference in proportion between the two-groups (community college transfer students and four-year college transfer students) was statistically significant. It is interesting to note that women were more likely to be “swirling” students (51% of total population) compared to men (46% of total population).
Ethnicity. Students were placed into three ethnic categories: 1) white, non-minority; 2) minority; 3) refused to indicate or unknown. There was no statistically significant difference in the ethnicity of the group who attended community colleges and the group who attended four-year institutions. Overall, 85% (5,088 transfer students) were white, non-minorities. Of the group of transfer students who solely attended community colleges, 11% (391) were minority students, while 10% (237 transfer students) of the transfer students who solely attended four-year institutions were minority students. The 240 students with an unknown ethnicity were not included in the analysis. Therefore, there were 146 community college transfer students and 94 four-year college transfer students excluded from the analysis.

Low income status. Transfer students included in the study were aggregated into two groups: those who received a Pell Grant at anytime while in attendance at MRU and those who did not. Overall, 33% (1,953 transfer students) of the transfer students were awarded a Pell Grant at some time during their enrollment at the public, Midwestern research university (MRU). There was a statistically significant difference in the proportion of transfer students from the community college who earned a Pell Grant (35%) and the proportion of transfer students from a four-year college who earned a Pell Grant (29%). This is evidence that the population of transfer students who attend community colleges have more financial need after transfer to a four-year institution than those who previously attended other four-year colleges.
**Discipline of study.** The initial discipline of study into which a transfer student entered at MRU was included in the group of student demographic variables. There groups of discipline were defined: 1) Science, Technology, Engineering, and Mathematics (STEM), 2) Non-STEM field, and 3) Undeclared. Overall, 66% (3,937 transfer students) of the population enrolled in a Non-STEM field while 23% (1,368 transfer students) entered into MRU without a major. There was a statically significant difference in the proportion of community college transfer students within the three groups (10% - STEM, 67% - Non-STEM, and 23% - Undeclared) and the proportion of four-year college transfer students within the three groups (12% - STEM, 65% - Non-STEM, and 23% - Undeclared).

**Fall enrollment.** Transfer students are allowed to initially enroll at MRU during a fall, winter, or summer semester. For the purpose of this study, transfer students were grouped into those who initially enrolled during a fall semester (77%) and those who initially enrolled during a winter or summer semester (23%). There was a statistically significant difference in the proportion of community college transfer students who initially enrolled during a fall semester (79%) and the proportion of four-year college transfer students who initially enrolled during a fall semester (75%).

**Enrollment status.** The majority of the transfer students included in this study (71%) enrolled as a full-time student when they initially attended MRU. Seventy percent (2,558 transfer students) of the community college transfer students enrolled at MRU full-time while 73% (1,691 transfer students) of the four-year college transfer students enrolled at MRU full-time. This was a statistically significant difference.
Age. The students who transfer to MRU are typically traditional-age (18 – 23 years old). In the study population, 86% (5,115 transfer students) of the transfer students were traditional age. Of the students who solely attended community colleges, 85% (3,080 transfer students) were traditional age while 88% (2,035 transfer students) of the students who solely attended four-year colleges were traditional age. This difference was statistically significant.
Table 1.

**Student Demographic Variables by Type of Attendance: Percent (Counts)**

<table>
<thead>
<tr>
<th>Demographic variables</th>
<th>Community College</th>
<th>Four-year College</th>
<th>Total</th>
<th>X²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size of Population</td>
<td>N = 3,634</td>
<td>N = 2,322</td>
<td>N = 5,956</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>59% (2,136)</td>
<td>51% (1,194)</td>
<td>56% (3,330)</td>
<td>31.08*</td>
</tr>
<tr>
<td>Female</td>
<td>41% (1,498)</td>
<td>49% (1,128)</td>
<td>44% (2,626)</td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White, Non-minority</td>
<td>85% (3,097)</td>
<td>86% (1,991)</td>
<td>85% (5,088)</td>
<td>0.46</td>
</tr>
<tr>
<td>Minority</td>
<td>11% (391)</td>
<td>10% (237)</td>
<td>11% (628)</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>4% (146)</td>
<td>4% (94)</td>
<td>4% (240)</td>
<td></td>
</tr>
<tr>
<td>Pell Grant Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Awarded Pell</td>
<td>35% (1,271)</td>
<td>29% (682)</td>
<td>33% (1,953)</td>
<td>20.19*</td>
</tr>
<tr>
<td>Not Awarded Pell</td>
<td>65% (2,363)</td>
<td>71% (1,640)</td>
<td>67% (4,003)</td>
<td></td>
</tr>
<tr>
<td>Discipline of Study</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STEM field</td>
<td>10% (361)</td>
<td>12% (290)</td>
<td>11% (651)</td>
<td>9.61*</td>
</tr>
<tr>
<td>Non-STEM field</td>
<td>67% (2434)</td>
<td>65% (1,503)</td>
<td>66% (3,937)</td>
<td></td>
</tr>
<tr>
<td>Undeclared</td>
<td>23% (839)</td>
<td>23% (529)</td>
<td>23% (1,368)</td>
<td></td>
</tr>
<tr>
<td>Semester Enrolled</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>79% (2,880)</td>
<td>75% (1,734)</td>
<td>77% (4,614)</td>
<td>16.98*</td>
</tr>
<tr>
<td>Winter or Summer</td>
<td>21% (754)</td>
<td>25% (588)</td>
<td>23% (1,342)</td>
<td></td>
</tr>
<tr>
<td>Enrollment Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time</td>
<td>70% (2,558)</td>
<td>73% (1,691)</td>
<td>71% (4,249)</td>
<td>4.11*</td>
</tr>
<tr>
<td>Part-time</td>
<td>30% (1,076)</td>
<td>27% (631)</td>
<td>29% (1,707)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traditional-age</td>
<td>85% (3,080)</td>
<td>88% (2,035)</td>
<td>86% (5,115)</td>
<td>9.72*</td>
</tr>
<tr>
<td>Nontraditional-age</td>
<td>15% (554)</td>
<td>12% (287)</td>
<td>14% (841)</td>
<td></td>
</tr>
</tbody>
</table>

*p < 0.05
Entering Academic Ability Variables

Transfer GPA, transfer hours, completion of college algebra, completion of freshmen English, and first-semester GPA were included in the analysis. Table 2 below shows that there was a difference in completion of college algebra and average first-semester GPA between the two groups of students. For continuous student demographic variables, analysis of variance (ANOVA) was utilized to determine if there was a statistically significant difference between the two groups. For dichotomous student demographic variables, chi-square analysis \( \chi^2 \) was utilized to determine if there was a statistically significant difference between the two groups.

Transfer GPA. The overall average transfer GPA was 2.95. There was no statistically significant difference in the average transfer GPA of community college transfer students (2.96) and the average transfer GPA of four-year college transfer students (2.95).

Transfer hours. The average number of transfer hours for the population included in the analysis was 53.19. Similar to transfer GPA, there was no statistically significant difference in the average number of transfer hours between community college transfer students (53.53 transfer hours) and four-year college transfer students (52.68 transfer hours).

Completion of college algebra. Fifty-five percent of transfer students included in the analysis completed college algebra prior to enrolling at MRU. There was a statistically significant difference in the proportion of community college transfer
students (49%) who completed college algebra prior to transferring compared to the proportion of four-year college transfer students (38%) who completed college algebra prior to transferring.

*Completion of freshmen English.* Unlike college algebra, there was not a statistically significant difference in the proportion of community college transfer students who completed freshmen English (71%) and the proportion of four-year college transfer students who completed freshmen English (73%). Overall, 72% of transfer students completed freshmen English prior to transferring to MRU.

*First-semester GPA.* The average transfer GPA for community college transfer students was 2.96 while the average first-semester GPA for community college transfer students was 2.33. Four-year college transfer students’ average transfer GPA was 2.95 while the average first-semester GPA for this group was 2.58. While there was not a statistically significant difference in transfer GPA between these two-groups, there was a statistically significant difference in first-semester GPA.

*Graduation Rate*

Table 2 also shows the difference in graduation rate between community college transfer students (50%) and four-year college transfer students (59%). This difference was statistically significant. The overall graduation rate for the transfer students included in the study was 54%.
Table 2.

**Entering Academic Ability Variables and Graduation Rate by Type of Attendance**

<table>
<thead>
<tr>
<th>Entering Academic Ability Variables</th>
<th>Community College</th>
<th>Four-year College</th>
<th>Total</th>
<th>(X^2)</th>
<th>ANOVA, F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size of Population</td>
<td>N = 3,634</td>
<td>N = 2,322</td>
<td>N = 5,956</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfer GPA</td>
<td>2.96</td>
<td>2.95</td>
<td>2.95</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Transfer Hours</td>
<td>53.53</td>
<td>52.68</td>
<td>53.19</td>
<td>1.71</td>
<td></td>
</tr>
<tr>
<td>College Algebra</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed</td>
<td>49%</td>
<td>38%</td>
<td>45%</td>
<td>69.39*</td>
<td></td>
</tr>
<tr>
<td>Did Not Complete</td>
<td>51%</td>
<td>62%</td>
<td>55%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshmen English</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed</td>
<td>71%</td>
<td>73%</td>
<td>72%</td>
<td>1.39</td>
<td></td>
</tr>
<tr>
<td>Did Not Complete</td>
<td>29%</td>
<td>27%</td>
<td>28%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First Semester GPA</td>
<td>2.33</td>
<td>2.58</td>
<td>2.42</td>
<td>93.60*</td>
<td></td>
</tr>
<tr>
<td>Graduation Rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baccalaureate Degree</td>
<td>50%</td>
<td>59%</td>
<td>54%</td>
<td>49.42*</td>
<td></td>
</tr>
<tr>
<td>No Degree</td>
<td>50%</td>
<td>41%</td>
<td>46%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*\(p < 0.05\)

**Research Questions**

The following three questions were addressed in the analysis of the data:

1. What effect do the number of hours transferred, transfer GPA, credit in college algebra, and credit in freshman English (entering academic history) have on first-semester GPA and baccalaureate attainment for students who solely attended one or more community colleges prior to transferring to MRU while taking into account the effect of gender, minority status, enrollment status, Pell Grant status, age, fall enrollment, and initial major at receiving institution in
comparison to no major declared (student demographic variables) on entering academic history variables, first-semester GPA, and degree attainment?

2. What effect do the number of hours transferred, transfer GPA, credit in college algebra, and credit in freshman English (entering academic history) have on first-semester GPA and baccalaureate attainment for students who solely attended one or more four-year colleges prior to transferring to MRU while taking into account the effect of gender, minority status, enrollment status, Pell Grant status, age, fall enrollment, and initial major at receiving institution in comparison to no major declared (student demographic variables) on entering academic history variables, first-semester GPA, and degree attainment?

3. Is there a difference in the effects of the number of hours transferred, transfer GPA, credit in college algebra, and credit in freshman English (entering academic history) on first-semester GPA and baccalaureate attainment while taking into account the effect of gender, minority status, enrollment status, Pell Grant status, age, fall enrollment, and initial major at receiving institution in comparison to no major declared (student demographic variables) on entering academic history variables, first-semester GPA, and degree attainment for students who solely attended one or more community colleges compared to students who solely attended four-year institutions prior to transferring to MRU?
Data Screening

The data were screened for univariate outliers, homogeneity of variance, normality, multivariate outliers, and multicollinearity prior to analysis as recommended by Tabachnik and Fidell (2001). Univariate outliers were determined to be those values greater than 3.29 standard deviations from the mean for the variable. There were forty community college transfer students with transfer hours greater than 122; therefore, the number of transfer hours for these students was set to 122. There were twenty-six four-year college students with transfer hours greater than 148; therefore, the number of transfer hours was set to 148 for these students.

Levene’s test was utilized to test for homogeneity of variance. First-semester GPA, ethnicity, age, and science, technology, engineering, and mathematics (STEM) discipline of study were significant indicating that the variability in these variables is not equal between community college transfer students and four-year college transfer students. To follow up, the Fmax test was utilized to determine if indeed these variables would be an issue. The following is an example of how the Fmax test was utilized on first-semester GPA. The standard deviation of first-semester GPA for community college transfer students was squared and divided by the square of the standard deviation of first-semester GPA for four-year college transfer students. The value was less than ten; therefore, the test for homogeneity of variance was met. This was true of ethnicity, STEM discipline of study, and age as well.
The variables were tested for normality as well. Ethnicity, STEM discipline, and age all had a kurtosis greater than three which is an indicator of non-normality. As the estimator utilized in the models (MLR) is robust to non-normality, the non-normality of variables is not a significant issue (Muthén & Muthén, 2007b). The leverage value in SAS v9.1 (2003) was utilized to screen the data for multivariate outliers. There were no multivariate outliers in the data.

Table 3 below contains the correlations, means, and standard deviations for the variables included in the analysis for both groups of transfer students (community college and four-year). None of the correlations were greater than 0.90; therefore, it can be assumed that multicollinearity between the variables does not exist (Tabachnik & Fidell, 2001).
<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>Community</th>
<th>Four-Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Transfer GPA</td>
<td>-----</td>
<td>0.16</td>
<td>0.14</td>
<td>0.08</td>
<td>0.45</td>
<td>0.21</td>
<td>-0.04</td>
<td>0.04</td>
<td>0.01</td>
<td>0.11</td>
<td>-0.01</td>
<td>-0.01</td>
<td>-0.14</td>
<td>29.58</td>
<td>4.82</td>
</tr>
<tr>
<td>2. Transfer hours</td>
<td>0.03</td>
<td>-----</td>
<td>0.18</td>
<td>0.16</td>
<td>0.14</td>
<td>0.02</td>
<td>0.01</td>
<td>0.07</td>
<td>0.13</td>
<td>0.10</td>
<td>-0.09</td>
<td>-0.11</td>
<td>-0.28</td>
<td>53.37</td>
<td>20.4</td>
</tr>
<tr>
<td>3. College algebra</td>
<td>0.01</td>
<td>0.01</td>
<td>-----</td>
<td>0.32</td>
<td>0.04</td>
<td>0.03</td>
<td>-0.05</td>
<td>-0.01</td>
<td>-0.05</td>
<td>0.08</td>
<td>0.06</td>
<td>0.03</td>
<td>0.02</td>
<td>0.49</td>
<td>0.50</td>
</tr>
<tr>
<td>4. Freshmen English</td>
<td>0.04</td>
<td>-0.03</td>
<td>0.18</td>
<td>-----</td>
<td>0.01</td>
<td>0.04</td>
<td>-0.07</td>
<td>0.01</td>
<td>-0.07</td>
<td>0.10</td>
<td>0.04</td>
<td>0.01</td>
<td>0.07</td>
<td>0.71</td>
<td>0.45</td>
</tr>
<tr>
<td>5. 1st semester GPA</td>
<td>0.42</td>
<td>0.18</td>
<td>-0.07</td>
<td>-0.04</td>
<td>-----</td>
<td>0.14</td>
<td>-0.03</td>
<td>0.04</td>
<td>-0.06</td>
<td>0.11</td>
<td>-0.05</td>
<td>0.11</td>
<td>-0.10</td>
<td>23.33</td>
<td>9.64</td>
</tr>
<tr>
<td>6. Gender</td>
<td>0.18</td>
<td>0.02</td>
<td>0.02</td>
<td>0.03</td>
<td>0.12</td>
<td>-----</td>
<td>0.00</td>
<td>-0.01</td>
<td>-0.18</td>
<td>0.12</td>
<td>-0.03</td>
<td>-0.04</td>
<td>-0.04</td>
<td>0.42</td>
<td>0.49</td>
</tr>
<tr>
<td>7. Minority</td>
<td>-0.01</td>
<td>-0.04</td>
<td>0.02</td>
<td>-0.09</td>
<td>-0.05</td>
<td>0.01</td>
<td>-----</td>
<td>0.14</td>
<td>0.06</td>
<td>0.01</td>
<td>-0.04</td>
<td>-0.02</td>
<td>-0.03</td>
<td>0.11</td>
<td>0.32</td>
</tr>
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<td>8. Pell grant status</td>
<td>0.04</td>
<td>-0.01</td>
<td>0.01</td>
<td>-0.01</td>
<td>-0.03</td>
<td>0.01</td>
<td>0.02</td>
<td>-----</td>
<td>0.01</td>
<td>0.05</td>
<td>-0.01</td>
<td>-0.02</td>
<td>-0.25</td>
<td>0.35</td>
<td>0.48</td>
</tr>
<tr>
<td>9. STEM discipline</td>
<td>-0.04</td>
<td>0.06</td>
<td>-0.07</td>
<td>-0.10</td>
<td>-0.06</td>
<td>-0.24</td>
<td>0.05</td>
<td>0.01</td>
<td>-----</td>
<td>-0.48</td>
<td>0.03</td>
<td>-0.05</td>
<td>-0.06</td>
<td>0.10</td>
<td>0.30</td>
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<tr>
<td>10. Non-STEM</td>
<td>0.09</td>
<td>0.08</td>
<td>0.02</td>
<td>0.08</td>
<td>0.09</td>
<td>0.16</td>
<td>-0.02</td>
<td>0.04</td>
<td>-0.51</td>
<td>-----</td>
<td>-0.03</td>
<td>0.03</td>
<td>-0.01</td>
<td>0.67</td>
<td>0.47</td>
</tr>
<tr>
<td>11. Fall enrollment</td>
<td>-0.06</td>
<td>-0.11</td>
<td>-0.02</td>
<td>0.06</td>
<td>-0.06</td>
<td>-0.04</td>
<td>-0.04</td>
<td>-0.01</td>
<td>-0.02</td>
<td>0.03</td>
<td>-----</td>
<td>0.18</td>
<td>0.13</td>
<td>0.79</td>
<td>0.41</td>
</tr>
<tr>
<td>12. Full-time</td>
<td>0.01</td>
<td>-0.17</td>
<td>-0.06</td>
<td>0.05</td>
<td>0.08</td>
<td>-0.08</td>
<td>-0.07</td>
<td>-0.01</td>
<td>-0.03</td>
<td>0.06</td>
<td>0.24</td>
<td>-----</td>
<td>0.20</td>
<td>0.71</td>
<td>0.46</td>
</tr>
<tr>
<td>13. Traditional age</td>
<td>-0.06</td>
<td>-0.34</td>
<td>0.01</td>
<td>0.13</td>
<td>-0.10</td>
<td>-0.07</td>
<td>-0.04</td>
<td>-0.11</td>
<td>-0.01</td>
<td>0.03</td>
<td>0.13</td>
<td>0.28</td>
<td>-----</td>
<td>0.85</td>
<td>0.36</td>
</tr>
</tbody>
</table>

**Four-Year College**

<table>
<thead>
<tr>
<th>Community</th>
<th>Four-Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>29.51</td>
</tr>
<tr>
<td>SD</td>
<td>4.90</td>
</tr>
</tbody>
</table>
Community College Transfer Students

In order to determine the effects of transfer GPA, transfer hours, completion of college algebra, completion of freshmen English and first-semester GPA while taking into account student demographic variables, a path analysis model was run which included first-semester GPA as a mediating variable. The path loadings onto first-semester GPA were interpreted as unstandardized linear regression coefficients. For every increase of one in the independent variable there would be an increase in first-semester GPA equal to the path factor. The path loadings onto degree attainment were interpreted as unstandardized logistic regression coefficients. Odds ratios were calculated from these logistic coefficients. For every increase of one in the independent variable, the likelihood of graduation would increase by a factor of the odds ratio calculated from the coefficient. If there were no effect of one variable on another, the odds ratio would be equal to one. Another way to describe it is that for every increase in one in the independent variable, the subject is as likely to graduate as any other subject. Figure 8 below is the estimated community college measurement model and Table 4 contains the regression coefficients and odds ratios for community college transfer students.
Figure 8. Community college measurement model.

Table 4.

Summary of Linear Regression and Logistic Regression Coefficients for Community College Transfer Students

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>Log B</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Onto 1st semester GPA</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>-3.97*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfer GPA</td>
<td>0.85*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfer hours</td>
<td>0.04*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>College algebra</td>
<td>-0.53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshman English</td>
<td>-0.75*</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Onto degree attainment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threshold</td>
<td>5.55*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st semester GPA</td>
<td>0.11*</td>
<td>1.11</td>
<td></td>
</tr>
<tr>
<td>Transfer GPA</td>
<td>0.02*</td>
<td>1.02</td>
<td></td>
</tr>
<tr>
<td>Transfer hours</td>
<td>0.01*</td>
<td>1.01</td>
<td></td>
</tr>
<tr>
<td>College algebra</td>
<td>0.16*</td>
<td>1.17</td>
<td></td>
</tr>
<tr>
<td>Freshman English</td>
<td>0.41*</td>
<td>1.51</td>
<td></td>
</tr>
</tbody>
</table>

* p < 0.05
Direct Effects on Degree Attainment for Community College Transfer Students

For community college transfer students, the greatest statistically significant direct effect on degree attainment was completing freshmen English prior to transfer. Community college transfer students who completed freshmen English prior to transfer were 1.50 times more likely to graduate as community college transfer students who did not complete freshmen English prior to transfer. Additionally, the second largest statistically significant direct effect on degree attainment was completion of college algebra prior to transfer. Community college students who completed college algebra prior to transfer were 1.2 times more likely to graduate.

First-semester GPA also had a statistically significant effect on degree attainment. First-semester GPA was multiplied by ten in order increase the level of interpretability. Therefore, for every tenth of a grade point increase, community college transfer students were 1.11 times more likely to graduate. Transfer GPA was also multiplied by ten before being entered into the model. Although the effect of transfer GPA on degree attainment is statistically significant, it is also rather small. For every tenth of an increase in transfer GPA, a student was 1.01 times as likely to graduate. Transfer hours had a similarly small, yet statistically significant, effect on degree attainment. For every extra transfer hour brought in, community college transfer students were 1.02 times as likely to graduate.
Direct Effects on First-Semester GPA for Community College Transfer Students

The direct effects on first-semester GPA can be interpreted as linear regression coefficients. For every increase of one in the independent variable, first-semester GPA will increase by the amount of coefficient. Again, first-semester GPA was multiplied by ten prior to being included in the model, therefore every increase of one in first-semester GPA is equal to an increase of one-tenth of a grade point. It is also beneficial to be aware of the intercept calculated for first-semester GPA.

Transfer GPA had the largest statistically significant effect on first-semester GPA for community college transfer students to MRU. For every one tenth of an increase in transfer GPA, first-semester GPA increased 0.85 tenths of a grade point or 0.085 grade points. Although community college transfer students appear to experience transfer shock when they transfer to MRU, their transfer GPA does have a positive effect on first-semester GPA. Completion of freshmen English had a negative effect on first-semester GPA. Students who completed freshmen English had a first-semester GPA that was 0.079 lower than community college transfer students who did not complete freshmen English. It is also interesting to note that although completion of freshmen English had a negative effect on first-semester GPA, it had a positive effect on degree attainment.

Indirect Effects on Degree Attainment for Community College Transfer Students

To determine if there is an indirect effect on degree attainment for an independent variable, there must be a direct effect on first-semester GPA and first-semester GPA must have a direct effect on degree attainment. However, since the
coefficients onto first-semester GPA are linear and the coefficients onto degree attainment are logistic, it is not possible to determine the value of the indirect effect on degree attainment.

Since first-semester GPA had a direct effect on degree attainment, any independent variable that had a direct effect on first-semester GPA also had an indirect effect on degree attainment. Therefore, transfer GPA and completion of freshmen English all had an indirect effect on degree attainment for community college transfer students to MRU. Because there are two different types of coefficients, it is difficult to determine if the negative effect of completion of college algebra on first-semester GPA is mediated by the positive effect of first-semester GPA on degree attainment.

Four-Year Transfer Students

In order to determine the effects of transfer GPA, transfer hours, completion of college algebra, completion of freshmen English, and first-semester GPA on degree attainment for four-year transfer students, the same model that was analyzed for community college transfer students was analyzed for four-year transfer students. The results are shown below in Figure 9 and Table 5.
Figure 9. Four-year transfer student measurement model

Table 5.

<p>| Summary of Linear Regression and Logistic Regression Coefficients for Four-Year Transfer Students |</p>
<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>Log B</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onto 1st semester GPA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>-0.49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfer GPA</td>
<td>0.82*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfer hours</td>
<td>0.06*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>College algebra</td>
<td>-1.33*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshman English</td>
<td>-1.02*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Onto degree attainment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threshold</td>
<td>4.10*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st semester GPA</td>
<td>0.10*</td>
<td>1.10</td>
<td></td>
</tr>
<tr>
<td>Transfer GPA</td>
<td>0.02</td>
<td>1.02</td>
<td></td>
</tr>
<tr>
<td>Transfer hours</td>
<td>-0.01</td>
<td>0.99</td>
<td></td>
</tr>
<tr>
<td>College algebra</td>
<td>0.01</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Freshman English</td>
<td>0.16</td>
<td>1.17</td>
<td></td>
</tr>
</tbody>
</table>

* p < 0.05
Direct Effects on Degree Attainment for Four-Year Transfer Students

First-semester GPA was the only independent variable that had a statistically significant effect on degree attainment for four-year transfer students to MRU. For every increase of one tenth grade point in first-semester GPA, a four-year transfer student was 1.10 times as likely to graduate. Although there were no statistically significant effects of transfer GPA, transfer hours, completion of college algebra, and completion of freshmen English, the statistically significant effect of first-semester GPA allows for an indirect effect of these variables on degree attainment.

Direct Effects on First-Semester GPA for Four-Year Transfer Students

Transfer GPA, transfer hours, completion of college algebra, and completion of freshmen English all had statistically significant direct effects on first-semester GPA. Transfer GPA and transfer hours had a positive effect while both completion of college algebra and freshmen English had a negative effect. For every one tenth increase in transfer GPA, first-semester GPA increased 0.082 grade points. For four-year transfer students first-semester GPA increased by 0.006 grade points for every additional transfer hour. Completion of college algebra resulted in a drop of 0.133 grade points in first-semester GPA while completion of college algebra resulted in a drop of 0.102 grade points.

First-semester GPA had a statistically significant direct effect on degree attainment and transfer GPA, transfer hours, completion of college algebra, and completion of freshmen English all had a statistically significant direct effect on first-
semester GPA. Therefore, transfer GPA, transfer hours, completion of college algebra, and completion of freshmen English had an indirect effect on degree attainment.

**Difference in Effects for Community College and Four-Year Transfer Students**

To determine if there were differences in the effects of transfer GPA, transfer hours, completion of college algebra, completion of freshmen English, and first-semester GPA on degree attainment a measurement model was created and analyzed. In this initial measurement model, the effects of transfer GPA, transfer hours, completion of college algebra, completion of freshmen English, and first-semester GPA were allowed to be estimated freely for community college transfer students and four-year college transfer students. In other words, for the core model (excluding error paths and control variables) all nine paths for the community college transfer students were estimated separately from the nine paths for the four-year transfer students. Thus, eighteen paths were estimated.

Next a model with the effects of transfer GPA, transfer hours, completion of college algebra, completion of freshmen English onto first-semester GPA and the effects of transfer GPA, transfer hours, completion of college algebra, completion of freshmen English, and first-semester GPA on degree attainment were constrained between the two groups of transfer students to MRU. In other words, nine paths were estimated in the core model for both the community college and four-year transfer students. In path analysis, the goal is to estimate the most parsimonious model as possible, or the model with the least number of parameters estimated, without losing explanatory value (Kline,
1998). In order to determine if too much explanatory value is lost by using the more parsimonious model, the researcher analyzed the difference in chi-square between the two models. The Satorra-Bentler scaled chi-square was used to determine if there was a significant difference in chi-square, or significance of the model, between the measurement model and the constrained model (Muthén & Muthén, 2007).

A similar process was utilized to determine if there was a significant difference in chi-square by releasing specific constraints between the two-groups of transfer students. Starting with the fully constrained model, each individual constrained path was released and the model was analyzed. For this first round of releasing constraints, each core model estimated ten different paths: eight that were equal for both community college and four-year transfer students and two that were separately estimated for each group that measured the same effect. The difference in chi-square test was utilized to determine the difference in chi-square for each individual effect. The path with the largest statistically significant difference in chi-square was released. The process was repeated on the most recent constrained model until none of the constraints to be released provided a statistically significant difference in chi-square, or that adding more paths to the model would not increase the explanatory value of the model. The results of this process with the iterative models in order of the paths as they were released are shown below in Table 6.
Table 6.

*Difference in Chi-Square for Nested Sequence of Two-Group Model*

<table>
<thead>
<tr>
<th>Model</th>
<th>Loglikelihood</th>
<th>AIC</th>
<th>BIC</th>
<th>$X^2_{\text{diff}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Measurement model</td>
<td>-77,609.82</td>
<td>155,483.64</td>
<td>156,361.57</td>
<td></td>
</tr>
<tr>
<td>2. Freshmen English onto first-semester GPA released</td>
<td>-77,625.16</td>
<td>155,498.32</td>
<td>156,323.05</td>
<td>30.33*</td>
</tr>
<tr>
<td>Difference between Model 2 &amp; Model 1</td>
<td></td>
<td></td>
<td></td>
<td>30.33*</td>
</tr>
<tr>
<td>3. Transfer GPA onto degree attainment released</td>
<td>-77,624.76</td>
<td>155,499.53</td>
<td>156,330.91</td>
<td></td>
</tr>
<tr>
<td>Difference between Model 3 &amp; Model 1</td>
<td></td>
<td></td>
<td></td>
<td>29.55*</td>
</tr>
<tr>
<td>4. Transfer GPA onto first-semester GPA released</td>
<td>-77,624.60</td>
<td>155,501.191</td>
<td>156,339.22</td>
<td></td>
</tr>
<tr>
<td>Difference between Model 4 &amp; Model 1</td>
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<td></td>
<td></td>
<td>28.78*</td>
</tr>
<tr>
<td>5. First-semester GPA onto degree attainment released</td>
<td>-77,624.17</td>
<td>155,503.33</td>
<td>156,347.01</td>
<td></td>
</tr>
<tr>
<td>Difference between Model 5 &amp; Model 1</td>
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<td></td>
<td></td>
<td>27.52*</td>
</tr>
<tr>
<td>Difference between Model 6 &amp; Model 1</td>
<td></td>
<td></td>
<td></td>
<td>25.37*</td>
</tr>
</tbody>
</table>

*p < 0.05
<table>
<thead>
<tr>
<th>Model</th>
<th>Loglikelihood</th>
<th>AIC</th>
<th>BIC</th>
<th>$X^2_{\text{diff}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. College algebra onto degree attainment released</td>
<td>-77,621.17</td>
<td>155,500.34</td>
<td>156,358.33</td>
<td>21.46*</td>
</tr>
<tr>
<td>Difference between Model 7 &amp; Model 1</td>
<td></td>
<td></td>
<td></td>
<td>21.46*</td>
</tr>
<tr>
<td>8. Freshmen English onto degree attainment released</td>
<td>-77,619.18</td>
<td>155,498.35</td>
<td>156,362.98</td>
<td>17.69*</td>
</tr>
<tr>
<td>Difference between Model 8 &amp; Model 1</td>
<td></td>
<td></td>
<td></td>
<td>17.69*</td>
</tr>
</tbody>
</table>

$p < 0.05$

Table 6 also contains the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC). Smaller values of AIC and BIC indicate better model fit. However, in this case, it was more important to determine the constrained effects that should be released.

In the final structural model, the only two effects that remained constrained between the two groups of transfer students were the effect of transfer hours on first-semester GPA and the effect of transfer hours on degree attainment. Therefore there is no difference in the effect of transfer hours on degree attainment and first-semester GPA for community college and four-year transfer students to MRU. However, the effects of transfer GPA, completion of college algebra, completion of freshmen English, and first-semester GPA on degree attainment and the effects of transfer GPA, completion of college algebra, and completion of freshmen English on first-semester GPA do differ between community college and four-year transfer students.
Summary of Results for Final Structural Model

The effects of the final structural model can be seen in Figure 10 below.

Figure 10. Final Structural Model

* $p < 0.05$
The effect of transfer hours on first-semester GPA and degree attainment was the same for community college and four-year transfer students. The effects were also statistically significant for both groups of transfer students. For every additional credit hour a transfer student earned prior to transfer to MRU, the likelihood of graduating for the student increased by a factor of 1.003. In addition, for each additional transfer hour a student’s first-semester GPA increased by 0.0053 grade points.

The effect of first-semester GPA on degree attainment was statistically significant for both community college transfer students and four-year college transfer students. However, the effect was larger for community college transfer students to MRU. For every one tenth increase in first-semester GPA, a community college transfer student was 1.11 times as likely to graduate while a four-year transfer student was 1.10 times as likely to graduate for the same increase in first-semester GPA.

For four-year transfer students, there were no other effects on degree attainment that were statistically significant. However, for community college transfer students transfer GPA, completion of college algebra, and completion of freshmen English had a statistically significant positive direct effect on degree attainment. For every one tenth increase in transfer GPA, the likelihood of graduating increased by a factor of 1.02 for community college transfer students. Community college students who completed college algebra prior to transfer were 1.21 times as likely to graduate while those who completed freshmen English prior to transfer were 1.55 times as likely to graduate.
For both community college transfer students and four-year transfer students, completion of college algebra and freshmen English prior to transfer had a statistically significant negative effect on first-semester GPA. The effects were smaller for community college transfer students than for four-year transfer students. Community college students who completed college algebra experienced a 0.0592 grade point drop in first-semester GPA while four-year transfer students experienced a 0.1329 grade point drop in first-semester GPA. Additionally, community college transfer students who completed freshmen English experienced a 0.0825 grade point drop in first-semester GPA while four-year transfer students who completed freshmen English experienced a 0.1014 grade point drop in first-semester GPA.

The effect of transfer GPA on first-semester GPA was a statistically significant positive effect for both community college transfer students and four-year transfer students. The effect was stronger for community college transfer students than it was for four-year transfer students. For every one tenth increase in transfer GPA, there was an increase in first-semester GPA of 0.0844 grade points for community college transfer students while four-year transfer students experienced an increase of 0.0819 grade points in first-semester GPA for the same increase in transfer GPA. A summary of the effects of the community college measurement model, four-year measurement model, and the final structural model are provided in Table 7 below.
Table 7.

**Summary of Linear Regression and Logistic Regression Coefficients for Two-Group Model**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Community College</th>
<th>Four-Year College</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$B$</td>
<td>Log $B$</td>
</tr>
<tr>
<td><strong>Onto 1st semester GPA</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>-4.53*</td>
<td>0.29</td>
</tr>
<tr>
<td>Transfer GPA</td>
<td>0.84*</td>
<td>0.82*</td>
</tr>
<tr>
<td>Transfer hours</td>
<td>0.05*</td>
<td>0.05*</td>
</tr>
<tr>
<td>College algebra</td>
<td>-0.59*</td>
<td>-1.33*</td>
</tr>
<tr>
<td>Freshman English</td>
<td>-0.83*</td>
<td>-1.01*</td>
</tr>
<tr>
<td><strong>Onto degree attainment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threshold</td>
<td>5.25*</td>
<td>4.48*</td>
</tr>
<tr>
<td>1st semester GPA</td>
<td>0.11*</td>
<td>1.11</td>
</tr>
<tr>
<td>Transfer GPA</td>
<td>0.02*</td>
<td>1.02</td>
</tr>
<tr>
<td>Transfer hours</td>
<td>0.01*</td>
<td>1.01</td>
</tr>
<tr>
<td>College algebra</td>
<td>0.19*</td>
<td>1.21</td>
</tr>
<tr>
<td>Freshman English</td>
<td>0.44*</td>
<td>1.55</td>
</tr>
</tbody>
</table>

* $p < 0.05$

**Effects of Student Demographic Variables**

In the final structural model the effects of the student demographic variables were never constrained, therefore it is not possible to determine whether the differences in the effects of the student demographic variables differ statistically significantly between community college and four-year transfer students. The effects of the student demographic variables on first-semester GPA and degree attainment are found in Table 8.

Community college transfer students enrolled full-time had a statistically significant positive effect on both first-semester GPA and degree attainment. However,
entering into a STEM discipline and enrolling at MRU in the fall, as compared to the winter or summer, had a negative effect on first-semester GPA and a positive effect on degree attainment. Being female had a statistically significant positive effect on first-semester GPA for community college transfer students. Degree attainment was positively affected by receiving a Pell Grant and being a traditional-age student.

Four-year transfer students did not have as many statistically significant effects as community college transfer students. Full-time enrollment had a positive effect on both first-semester GPA and degree attainment for four-year transfer students. Being a traditional-age student was also a positive effect on degree attainment. First-semester GPA was affected negatively by both receiving a Pell Grant and entering into a STEM discipline for four-year transfer students.
Table 8.

Summary of Effects of Demographic Variables in Two-Group Structural Model

<table>
<thead>
<tr>
<th>Variables</th>
<th>Community College</th>
<th>Four-Year College</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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* p < 0.05

Summary

Transfer GPA and transfer hours had a positive effect on first-semester GPA while completion of college algebra and completion of freshmen English had a negative effect on first-semester GPA for both community college and four-year transfer.
students. Additionally, first-semester GPA, transfer GPA, transfer hours, completion of
college algebra, and completion of freshmen English had a positive effect on degree
attainment for community college transfer students. Four-year transfer students’
degree attainment was affected positively by first-semester GPA and transfer hours.
There were two effects that were not different between community college transfer
students and four-year transfer students: the effect of transfer hours on first-semester
GPA and the effect of transfer hours on degree attainment. All other effects differed
between the two groups.
Chapter 5

DISCUSSION OF RESULTS

Introduction

Transfer students are an important aspect of enrollment management for four-year institutions. This group of students supplements enrollments of first-time freshmen and continuing native students with students who enter the institution with credits earned at another institution. It is in the best interest of both the receiving institution and transfer students to have as many transfer students graduate as possible from the receiving institution. This study analyzed the effects of variables included in a public, Midwestern research university’s (MRU) transfer student admissions policy (transfer GPA, transfer hours, completion of college algebra, and completion of freshmen English) on baccalaureate attainment. Institutional data were utilized for 2,228 transfer students who solely attended one or more four-year institutions and 3,488 transfer students who solely attended one or more community colleges before entering the institution from the fall of 1992 through summer of 2001. Path analysis was utilized to determine the effects of transfer GPA, transfer hours, completion of college algebra, completion of freshmen English, and first-semester GPA on baccalaureate attainment and transfer GPA, transfer hours, completion of college algebra, and completion of freshmen English on first-semester GPA while taking into account the direct effects of gender, ethnicity, low income status, discipline of study, fall
enrollment, full-time enrollment, and age on entering academic history variables, first-
semester GPA, and degree attainment.

The results presented in Chapter 4 will be summarized below, with comparisons of these results to previous research that was presented in Chapter 2. The two overarching research questions will then be discussed as well as limitations of the study and implications for future research and institutional policy.

Discussion of Results

This study utilized a student-centered revised nexus model of college choice and persistence (St. John, Paulsen, & Starkey, 1996). The St. John, Paulsen, and Starkey (1996) model included the financial factors that influence college choice along with student persistence factors including college experience and aspirations. The initial college choice nexus model in this study utilized type of initial college as a college choice measurement and transfer GPA, transfer hours, completion of college algebra, completion of freshmen English, and first-semester GPA as measurements of academic integration. Academic integration has been shown to affect persistence in persistence models (Astin, 1975; Tinto, 1975, 1987, 1993; Bean, 1980; Bean & Mezner, 1985). Initial college choice was included in the model because there are certain factors that have been found to influence whether a student initially enrolls in a community college, including education expectations, delay of postsecondary entry, highest math course in high school, academic resources, socio-economic quintile, and occupational major (Adelman, 2005). Adelman (2005) defined academic resources as “a quintile rendering
of the student’s secondary school academic curriculum intensity, class rank/GPA, and senior year test score (from a 90 minute mini enhanced SAT)” (p. 45). These factors may also affect persistence to graduation.

In Chapter 2, several student demographic variables were discussed because they have also been shown to affect baccalaureate attainment of transfer students. These student demographic variables (gender, ethnicity, enrollment status, low income status, age, discipline of study, and fall enrollment) were included in the model. The effects of these variables on first-semester GPA and degree attainment were provided in Chapter 4. Whereas some of the variables’ effect on first-semester GPA and degree attainment was similar to what had been found in previous research, some of the variables in this study were not found to be statistically significant, or the effects on first-semester GPA and degree attainment were contradictory to previous research.

Gender

In this study, being female was only a statistically significant effect on first-semester GPA for community college transfer students. Female community college transfer students had a first-semester GPA that was 0.079 grade points higher than their male counterparts. Gender did not have an effect on baccalaureate attainment. This finding differs from previous research showing that female transfer students were more likely to graduate than male transfer students (Freeman, 2007). Freeman (2007) examined data from a national survey, Beginning Postsecondary Students (BPS) Longitudinal Study, and found that women were 2.29 times as likely to graduate as men.
when controlling for age, risk factor index, high school locale (rural), and first institution locale (rural).

**Ethnicity**

There was no statistically significant affect of ethnicity on first-semester GPA or degree attainment. This finding is in contrast to previous research that minority transfer students are less likely to graduate than non-minority students (Carlan & Byxbe, 2000; Koker & Hendel, 2003; St. John, Paulsen, & Starkey, 1996). Additionally, this finding contradicts the research of Carlan and Byxbe (2000), who found that upper division GPA showed a small increase for white students when controlling for transfer GPA, college of major, and age.

**Enrollment Status**

Of all the student demographic variables, being enrolled full-time had the greatest statistically significant affect on first-semester GPA for both community college and four-year transfer students. Additionally, full-time enrollment had a positive statistically significant effect on degree attainment for both community college and four-year transfer students. In her national study, Alfonso (2006) also found that full-time enrollment had a positive effect on baccalaureate attainment.

**Low Income Status**

As regards the effects of low income status, the findings of this study are somewhat contradictory. Being awarded a Pell Grant had a statistically significant negative affect on first-semester GPA for four-year transfer students; however, for
community college transfer students, being awarded a Pell Grant had a statistically significant positive affect on degree attainment. In contrast St. John, Paulsen, and Starkey (1996), found in their national study that neither the level of income nor amount of grants and loans had significant effects of persistence for transfer students or first-time freshmen.

Age

In this study, being a traditional-aged student had a statistically significant positive affect on degree attainment for both community college and four-year transfer students. This finding is similar to what has been found in previous research. For example, in a national study, Freeman (2007) found that traditional-aged students were more likely to graduate. Using a population similar to the one in this study, Schmidtke and Eimers (2004) found that non-traditional aged transfer students were less likely to graduate. However, they defined the type of sending institution by the most recent institution attended prior to transfer to the system. Being a traditional-age student did not have an effect on first-semester GPA. However, Carlan and Byxbe (2000) found that being over the age of 25 positively increased a student’s predicted upper division grade point average by 0.19.

Discipline of Study

For this research, discipline of study was divided into three categories: (a) science, technology, engineering, and mathematics (STEM) field, (b) non-STEM field, and (c) undecided. Being in a STEM discipline resulted in a lower first-semester GPA for both
community college and four-year transfer students. However, being in a STEM discipline had a positive effect on degree attainment in comparison to students who were undecided for community college transfer students. This is similar to a finding by Alfonso (2006) that not declaring a major has a negative affect on baccalaureate attainment.

Research Question One: Effects of Entering Academic History Variables

The student demographic variables were included in the model when analyzing the data to address the first research question: What effect do the number of hours transferred, transfer GPA, and meeting the mathematics/English admissions requirement (entering academic history) have on first-semester GPA and baccalaureate attainment when taking into account the effects of gender, minority status, entering enrollment status, Pell Grant status, age, and entering discipline (student demographic variables) on entering academic history variables, first-semester GPA, and degree attainment for community college and four-year transfer students to a public, Midwestern research-extensive university?

Transfer GPA. Similar to previous research, transfer GPA had a statistically significant positive affect on first-semester GPA and degree attainment for both community college and four-year transfer students. Townsend, McNerny, and Arnold (1993) found that the most significant predictor of the university cumulative GPA for a community college transfer student was transfer GPA. Carlan and Byxbe (2000) found that transfer GPA accounted for 27% of the variance in upper division GPA for
community college transfer students and that for every one point increase in transfer GPA, upper division GPA increased 0.67 points.

The positive effect of transfer GPA on first-semester GPA and degree attainment also supports the persistence theories of Astin (1975), Tinto (1975), Bean (1980), Bean and Metzner (1985), and St. John, Paulsen, and Starkey (1996). Transfer GPA is a measurement of academic integration at the sending institution. The more academically integrated a student becomes, the more likely he or she is to succeed at the receiving institution. The initial college choice-persistence nexus model utilized in this study was also supported by the finding that transfer GPA has a positive effect on transfer student success. Academic integration at the sending institution supports transfer student success at the receiving institution. Additionally, the positive effect of transfer hours on first-semester GPA and degree attainment supports the effect of academic integration on transfer student success.

Transfer hours. Similar to transfer GPA, transfer hours were found to have a statistically significant positive affect on first-semester GPA and degree attainment for both community college and four-year transfer students. Koker and Hendel (2003) found that the more hours a transfer student completed prior to transfer, the more likely the student was to graduate. As the number of hours transferred in to an institution represents a certain level of academic integration at a sending institution, the positive effect of transfer hours on first-semester GPA and degree attainment supports
longstanding theories on college student persistence (Astin, 1975; Bean, 1980; Bean & Metzner, 1985; St. John, Paulsen, & Starkey, 1996; Tinto, 1975).

Completion of college algebra and freshmen English. There were conflicting results regarding the completion of college algebra and freshman English prior to transfer. Both variables had a statistically significant negative affect on first-semester GPA for both community college and four-year transfer students. However, for community college transfer students, completion of college algebra and freshmen English had a statistically significant positive affect on degree attainment. This finding is similar to what has been found in previous research. Alfonso (2006) found that the more college mathematics and science courses completed prior to transfer, the more likely a student is to graduate. Adelman (2005) provided a different measure of course completion prior to transfer. He reported that for students with a higher than 20% withdrawal rate and repeat grades in college level math, there was a negative effect on baccalaureate degree attainment. The measure for course completion in this study did not take into account the number of times the course had been attempted prior to transfer.

First-semester GPA. Similar to previous research, there was a drop in average first-semester GPA from average transfer GPA for both community college and four-year transfer students. For community college transfer students there was a drop of 0.63 grade points from the average transfer GPA to the average first-semester GPA, compared to a drop of 0.37 grade points for four-year transfer students from the
average transfer GPA to the average first-semester GPA. Similarly, Townsend, McNerny, and Arnold (1993) found that the average GPA of community college transfer students dropped half a grade point from the community college to the first semester at a university.

Societal analyses in the past were critical of community colleges and would have utilized the larger drop in first-semester GPA of community college transfer students as evidence against these institutions. However this study was grounded in a student-centered initial college choice-persistence nexus model that attributes the drop in first-semester GPA to the same factors that affect the initial decision to attend a community college. These factors may include delay of entry into higher education after high school, low level of educational expectations, low level of high school math, low socioeconomic status, and an occupational major (Adelman, 2005).

Additionally, first-semster GPA was found to have a positive statistically significant effect on degree attainment for both community college and four-year transfer students. Thus, for variables that had a statistically significant effect on first-semester GPA, the variable acted as a mediating variable on degree attainment. In previous studies that did not include first-semester GPA as a mediating variable, the affects of the variables that were included in the model on degree attainment may be larger compared to the affects found in this model due to the fact that the effects on first-semester GPA in previous models were not taken into account.
The inclusion of first-semester GPA provides a measurement of academic integration during the first-semester at the receiving institution. Similar to transfer GPA and transfer hours, the positive effect of first-semester GPA on degree attainment supports previous research on baccalaureate attainment and persistence (e.g., Astin, 1975; Bean, 1980; Bean & Metzner, 1985; St. John, Paulsen, & Starkey, 1996; Tinto, 1975). By including first-semester GPA as a mediating variable, this study also found that academic integration at the sending institution, or transfer hours and transfer GPA, has an affect on academic integration at the receiving institution, or first-semester GPA, for both community college and four-year transfer students. This mediating effect has rarely been included in studies on transfer student success.

Research Question Two: Difference in Effects for Community College and Four-Year Transfer Students

The second research question for this study was: Is there a difference in these effects between students who solely attended one or more community colleges prior to transfer and those who solely attended one or more four-year institutions prior to transfer? In this study, the only affects that were found to be similar for both community college and four-year transfer students were the effect of transfer hours on first-semester GPA and the effect of transfer hours on degree attainment. For every transfer hour a student earns prior to transfer, first-semester GPA increases by 0.005 for community college and four-year transfer students. Additionally, for every transfer
hour a student earns prior to transfer, he or she is 1.01 times more likely to graduate.
Although it is a small amount, it is positive and statistically significant.

Previous research has investigated the differences in effects on degree attainment between community college and four-year transfer students (Koker & Hendel, 2003). Koker and Hendel (2003) found that the type of sending institution does affect degree attainment, and that community college transfers had an increased risk of noncompletion. However, this study is different in that it framed these similarities and differences in the form of college choice theory. It was a student-centered framework which assumed that the factors affecting whether a student initially chooses to attend a community college or a four-year college also affect the likelihood a student earned a baccalaureate.

Institution-centered explanations focus on the mission of the community college and its effect on degree attainment while societal analyses take a critical view of the community college and its mission to prepare students for an occupation as well as transfer (Townsend, McNerny, & Arnold, 1983). Other student-centered models have measured the effects of academic preparation, educational aspirations, academic integration, and social integration on persistence to graduation without couching the differences between community college transfer students and four-year transfer students in college choice theory (e.g., Koker & Hendel, 2003; Pascarella, Smart, & Ethington, 1986). By asking the question in this student-centered conceptual framework, the affect of differences between community college transfer students and
four-year transfer students may be attributed to the factors that affected the initial college choice.

The student-centered approach focuses on choices made by a student, as opposed to institutional mission. In addition, just as a student’s decision to remain at an institution is affected by factors such as academic and social integration, his or her decision to attend a community college or four-year institution may have been affected by certain factors. In a college choice student persistence nexus model, it is presumed that the same factors that affect college choice also affect persistence. Whereas this study did not determine what factors contributed to both college choice and persistence, it did show that it is likely that there are factors that affect both college choice and persistence. The difference in effects between the group of students who solely attended one or more community colleges and the group of students who solely attended one or more four-year institutions supports this likelihood.

Limitations

There are several limitations to this study. First of all it was conducted utilizing the data from one large public, Midwestern research university. The results cannot be generalized to all transfer students, only to those who transfer to this institution or ones like it. Another limitation is the lack of a consistent measurement of whether a course that was transferred in was taken as a dual-credit course. In this study, if a course was taken prior to a student’s high school graduation date, it was considered to be dual-credit. However, high school graduation date and course term were only available for
899 of the initial 13,744 students included in the study. Thus it is likely that there were
dual-credit courses that were not marked as such and were included in the calculation
of transfer GPA.

Another limitation of this study is the large number of students who were not
included in the study because they had attended more than one type of institution prior
to enrolling at MRU. Almost half of the original 13,744 students were not included
because they attended both a community college and a four-year institution before
transferring to MRU. The effects of transfer GPA, transfer hours, completion of college
algebra and freshmen English, and first-semester GPA on degree attainment may be
quite different for this group of students. Thus the ability to determine practical
implications of this study may be somewhat limited by the fact that the results are
limited to 50% of the transfer students who matriculated to MRU.

In order to determine a transfer student’s attendance pattern prior to
attendance at MRU, course records were reviewed and coded with type of institution
attended on a course-by-course basis. It is not possible to determine in the data
whether the institution from which the course was transferred was in fact the
institution from which the course was taken, or whether the course was taken at a
previous institution and transferred to the institution reported for the course. For
example, a student may have taken a course at a community college and transferred the
course to a four-year institution. The four-year institution may be the institution that
reported the course to MRU. Thus another limitation is that the institution from which
a course was taken may be masked at times due to transferring of credit prior to attendance at MRU. It is not possible to determine the magnitude of this limitation.

Yet another limitation is that this study utilized a path analysis model that included both a continuous endogenous variable, first-semester GPA, and a dichotomous endogenous variable, degree attainment. Therefore, the effects on first-semester GPA were reported as unstandardized linear regression coefficients while the effects on degree attainment were reported as logistic regression coefficients. This approach limited the ability of the researcher to compare the size of effects on first-semester GPA to the size of effects on degree attainment. Additionally, although the researcher was able to determine if an indirect effect existed between exogenous variables and degree attainment, it was not possible to calculate an amount for the indirect effect.

In addition, the variables in this study did not reflect the number of times the course was taken, a factor that has been shown to affect degree attainment (Adelman, 2005). The variables for completion of college algebra and freshmen English should include a measure for the number of times the course was repeated prior to transfer. Nor was there an indicator of whether a student completed an associate’s degree prior to transferring to MRU. This is another limitation.

Implications for Future Research

The results of this study suggest several directions for future research about transfer student success. Research could include first-semester GPA as an initial
measurement of academic integration at the receiving institution. In the past, first-semester GPA has been utilized in part to measure transfer shock; however, this study showed that it also has an effect on degree attainment. Additionally, future research could include as a variable participation in programs designed to assist transfer students in their transition to a new institution. For example, the effects of participation in these programs upon first-semester GPA and degree attainment should be researched.

For this study, dichotomous variables were utilized to measure the effects of completion of college algebra and completion of freshmen English on first-semester GPA and degree attainment. Future research could include a categorical variable with different levels based on the grade earned in college algebra and freshmen English. The different levels of success may contribute to understanding the effects of completion of college algebra and freshmen English on first-semester GPA.

Future research on transfer student success should continue to analyze the effects of prior attendance patterns of transfer students on their success after transfer to their last institution. Although this study analyzed two groups of students who solely attended a single type of institution prior to transfer, many students attend more than one type of institution in a variety of patterns. It is important to understand how these attendance patterns affect attainment of the baccalaureate.

This study did show that the factors that affect initial college choice may also affect transfer student success. Future research should focus on specific factors that have been shown to affect whether a student initially chooses to attend a community
college or a four-year institution and whether these specific factors also affect baccalaureate attainment. These factors may include proximity to a community college, educational expectations, delay of entry into higher education after high school, and socioeconomic status.

Implications for Institutional Policy

The findings of this study have three major implications for institutional policy. The first is related to the transfer student admissions policy at MRU, the institution in the study. With conflicting results for the effect of completion of college algebra and freshmen English on first-semester GPA and degree attainment, this requirement may need to be reconsidered. Although the requirement had a positive effect on degree attainment, it had a negative effect on first-semester GPA. Although the number of times a math course is repeated prior transfer has a negative effect on degree attainment (Adelman, 2005), it would be difficult to include the number of times a course is taken in an admissions policy.

Second, critical views of community colleges should be tempered with the knowledge that transfer student success is affected by factors that affect initial college choice. Enrollment managers, administrators, and faculty members at four-year receiving institutions may have a critical view of community colleges. This perception may affect transfer student admission requirements or the treatment of community college transfer students and representatives. If transfer student success is valued, the factors that affect initial college choice should be targeted as avenues to assist transfer
students at the receiving institution. Transfer student success may be positively affected by utilizing a more student-centered approach to recruitment and retention of transfer students, whether from two-year or four-year institutions.

Third, the importance of a transfer student’s first-semester performance at the receiving institution should be considered. First-semester GPA was one of the strongest predictors of degree attainment. For every one-tenth grade point increase in first-semester GPA, a community college transfer student was 1.11 times as likely to graduate while a four-year transfer student was 1.10 times as likely to graduate. Although completion of college algebra and completion of freshman English had a larger effect these variables were based on a dichotomous variable, as compared to first-semester GPA, which was based on a continuous variable measuring first-semester GPA in one-tenth increments. Practically speaking, academic advisors at both sending and receiving institutions should educate transfer students on support services available to students as well as encourage transfer students to seek assistance when necessary.

In conclusion, transfer student success is determined in part by experiences at previous institutions as well as experiences at the final receiving institution. The first-semester at the new institution is a crucial period in the transition process. Receiving institutions should be cognizant of this and simplify the transition process as much as possible for transfer students. The receiving institutions should continue to support initiatives in place to support a smooth transition for transfer students during their first-semester.
REFERENCES


Kathy Felts has been involved in various facets of secondary and postsecondary education for the past thirteen years. In 1995, she graduated from Westminster College with a bachelor’s degree in mathematics and secondary education. She taught eighth and ninth grade mathematics in public schools for five years before earning a master’s degree in mathematics from the University of Missouri. While working on her master’s degree Kathy gained experience inside the classroom as a graduate teaching assistant and outside the classroom as an assistant coach for the University of Missouri soccer team. After completing her master’s degree in 2001, she continued on in college athletics as the head women’s soccer coach at Westminster College. In 2002, she returned to the University of Missouri as a graduate assistant to the University of Missouri women’s soccer team and began her doctoral work in Educational Leadership and Policy Analysis. In the spring of 2003, Kathy found a career path that combined her love of mathematics and her passion for higher education. As a graduate research assistant and assistant analyst in the University of Missouri Office Of Institutional Research, she gained valuable experience and grew professionally through numerous professional development opportunities. Kathy attended the 2005 Association for
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