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Effect of Pre-College Factors on Students’ Retention During the First Two Years at a Small Private University in Ecuador

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EFFECT OF PRE-COLLEGE FACTORS ON STUDENTS’ RETENTION DURING THE FIRST TWO YEARS AT A SMALL PRIVATE UNIVERSITY IN ECUADOR

By

Marcelo X. Fernández

A DISSERTATION

Submitted to the Faculty of the University of Miami in partial fulfillment of the requirements for the degree of Doctor of Education

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Doctor of Education

EFFECT OF PRE-COLLEGE FACTORS ON STUDENTS’ RETENTION DURING
THE FIRST TWO YEARS AT A SMALL PRIVATE UNIVERSITY IN ECUADOR

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College graduation has known to have long-term effects on individuals, institutions, and countries’ economies. Even though the issue of students leaving college before graduation has been studied for almost a century, retention rates have remained almost stagnant. In many studies conducted in the United States, students’ pre-college traits have been found to predict student’s retention during the first two years of college. However, research on retention is lacking in Ecuador. The current study examined how a number of pre- and in-college characteristics were related to college student retention during the first two years of post-secondary studies in Ecuador.

Using data about 1480 freshmen that attended a small private university in Ecuador between 2006 and 2012, this study examined a number of factors related to students’ retention. In particular, the effects of pre-college factors (type of high school, gender, age, high school grade point average [GPA], and entry exam score) and college GPA on second- and third-year enrollment were examined using a series of sequential logistic regression models. Study findings indicated that most of the independent variables were found to be significant in predicting student’s retention for at least one of the cohorts studied. However, college GPA and age was the factors that were found as the stronger predictors of retention in the first year, while college GPA was the most
powerful in both first and second year. The influence of pre- and in-college variables was stronger in magnitude on the first year, losing predicting power on the second year with the exception of college GPA.

In spite of some limitations inherent to the study that might limit its generalizability due to the use of secondary data, the current study shed light on the student retention issue in higher education in Ecuador. In particular, the study would help higher education administrators identify at-risk students and provide effective interventions that might help prevent students’ dropout from the university. Furthermore, it is hoped that this study would guide researchers to conduct more similar studies using the data from different Ecuadorian universities so that students’ retention issues in Ecuador can be better understood.
DEDICATION

I dedicate this work to my beloved Mother who lives in my heart forever.

Love you Mom
ACKNOWLEDGMENTS

I have to start thanking my father Marcelo for giving me the inspiration and the Universidad Internacional del Ecuador for the opportunity to accomplished today’s goal.

Before the end of my first semester at UM, back in December 2011, I lost my beloved Mother to cancer. I thought about quitting the program multiple times but thanks to a great teacher, my now dear friend and mentor Dr. Carol Ann Phekoo, I stayed and succeeded. Thank you Carol Ann!!

I like to thank my beloved wife, Carla, for her incredible support and love during this long journey. Thanks to my sons Carlita, Xavier, and Emilio for their love and understanding. I love you all!!

Finally, I need to recognize my dear dissertation chair, Dr. Soyeon Ahn, for her understanding, support and dedication. Thanks a lot Soyeon!!
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Chapter One: Introduction

Dependents, but also post-secondary institutions and society in general (Pascarella & Terenzini, 2005).

Improving graduation rates helps universities manage their limited budgets. For some institutions, more than for others, low levels of student retention affected their economic sustainability (Alkandari, 2008). Small private universities, in particular, are among the institutions with high dependency on tuition income to finance their operations (Altbach, 1999), and thus they are much more dependent on effective retention practices. On average, universities lose an estimate of $50,000 per capita when students decided to leave (Ackerman & Schibrowsky, 2008). Moreover, at the macro-level, high attrition rates affect not only institutions’ economic stability but also their quality public image (Braxton, Sullivan, & Johnson, 1997), which is key in the recruitment of quality students. However, because it is less expensive to retain existing students than to recruit new ones (Hossler & Bean, 1990), higher education administrators should recognize an opportunity in retention practices to maintain institutional well-being and help students succeed in their life.

The literature has pointed out the beneficial role of higher education in economic and political development: graduation seems to be the key for progress in these areas (Baum & Ma, 2007; Pascarella & Terenzini, 2005; Renn & Reason, 2013). In many underdeveloped regions, like Latin America, higher education is considered crucial for regional development, which requires specialized professionals and “applied knowledge” (Gazzola & Didriksson, 2008, p. 18). This link between college success and economic development has been recognized at the government level in the United States (U.S.). In
2009, President Obama described the goal of increasing the number of college graduates as a central task to his government policy (Renn & Reason, 2013). In the U. S., the economic cost of college student attrition was disturbing. For instance, students who entered college in 2002 and subsequently left resulted in a loss of approximately $3.8 billion per year. The estimated total life loss for an individual student is $158 billion, and federal and state administrations also lost $566 million and $164 million, respectively, in income tax each year because of the 2002 cohort’s non-completion rates (Renn & Reason, 2013). These figures suggested that governments should consider retention issues seriously because of its implications for the development of nations.

The acknowledgement of the implications of retaining students suggested that retention might be one of the most important areas in higher education. According to Tinto (2012), efforts to understand student departure started approximately a century ago. However, the problem of student departure from higher education institutions still persists even after many years of research, theory development, and interventions. One of the biggest contemporary challenges in student retention is the increased diversity of colleges’ student bodies. This growing diversity, along with the arrival of a new generation of students (Millenials), has imposed changes on the way that universities handle the issue of retention. Since they have profound background differences it is expected that interventions that worked for students in the past would not necessarily be applied to assist the needs and expectations of new millennium students.

The task of graduating a large majority of students is not an easy job for most universities. Even though most retention studies have been conducted in the United States, many colleges and universities are still struggling to reach the ultimate goal of
keeping a large majority of students enrolled in college until graduation. The graduation rates of freshmen in the U.S. within the standard time frame (four years) or six years are only 33%, and 60% respectively (Tinto, 2012). Furthermore, only 60% of students who are still enrolled after six years will graduate (Tinto, 2012). Six-year graduation (of 4-year degrees) rates has remained stagnant for several decades (Berkner, He, & Cataldi, 2002). Researchers (American College Testing, 2007; Braxton, Brier, & Steele, 2007; Terenzini, Cabrera, & Bernal, 2001) suggested that the scholarship and institutions of higher education have failed to solve the retention issue in higher education. However, if take into account the fact that today’s student populations include a much larger representation of traditionally underserved and underrepresented groups (REF), thereby differing significantly from previous student’s generations, it could also be argued that attrition rates have not increased due to this accumulated empirical knowledge (Renn & Reason, 2013). It seems that retention will continue to be an important issue in the United States for years to come, and that an understanding of different kinds of students might help increase retention rates in the near future (Renn & Reason, 2013).

**Higher Education in Latin American Countries**

Latin American countries differ in terms of their higher education development (García Guadilla, 1997). Access to higher education in Latin America has grown dramatically in the last 60 years, as demonstrated in the rapid increase in student enrollments from 276,000 in 1950 to approximately 12 million in 2004 (Fernández Lamarra, 2004) and 14 million in 2005 (UNESCO, 2005). Higher education institutions have also flourished during the same period, increasing in its number from 75 in 1950 to over 1,500 in 2004 (Fernández Lamarra, 2004). However, student enrollment in Latin
American countries are still far behind North America and Western Europe, which
doubled their enrollment ratio per ten thousand habitants (Centro Interuniversitario de
Desarrollo [CINDA], 2007). This, as suggested by González, Uribe, and González
(2005), might be because most Latin Americans are excluded from higher education.
González et al. (2005) stated that in Latin America and the Caribbean, less than 20% of
people aged 25 and above have some type of higher education experience, and less than
10% hold a post-secondary degree.

Although Latin America possesses some of the world’s oldest universities, most
universities within this region are still lacking in its structural characteristics of modern
higher learning institutions. The region has suffered from many economic crises in the
last century, forcing governments to cut spending on public services, including higher
education (Fernández Lamarra, 2004). Far from affecting the growth of demands for
higher education, these crises led to the emergence of a fast growing private sector in a
market traditionally dominated by government services (Fernández Lamarra, 2004). Many of these new universities were created mainly to accommodate more students
without the minimal structure to help students succeed in college.

The International Institute for Higher Education in Latin America and the
Caribbean (IESALC), at the 2008 Regional Conference for Higher Education, reported
that the majority (57%) of undergraduate students within the region do not graduate
within five years. This figure may be seen as positive if compared with the U.S where
four-year attrition rates are 67% (Tinto, 2012). However, these figures observed in Latin
America may provide an inaccurate picture of retention (L. González, Uribe, & S.
González, 2005). Moreover, it seems obvious that if well-established higher education
institutions in the developed markets are struggling with student retention, universities with structural deficiencies in Latin America will also experience the same difficulties in dealing with such issues.

**Higher Education in Ecuador**

In Ecuador, where this current study was conducted, the government has recognized the importance of improving graduation rates as a critical piece to reducing poverty. Like other Latin American countries, Ecuador’s higher education system has grown remarkably in the last two decades (Consejo Nacional de Educación Superior, 2006). The steady increase in demand for higher education in Ecuador has promoted the creation of many new small private universities, as demonstrated in the increased number of universities, from 24 in 1986 to 73 in 2006. However, as Ecuadorian president Rafael Correa argued, many of these new universities were created with the sole objective of making money rather than serving the public. This has negatively affected the image of Ecuador’s higher education system, both inside and outside the country (El Redacción Sociedad, 2009).

This alleged commercialization of Ecuadorian higher education was wrongly generalized and applied to all institutions, and pinpointed as the consequence of allowing corruption into the system (Consejo Nacional de Evaluación y Acreditación, 2009), a circumstance that paved the way for politics to get into higher education matters. Therefore, the current government of President Correa intervened and radically changed Ecuadorian higher education by successfully passing a bill in the Asamblea Nacional Constituyente, which eliminated the important additional sources of income that universities once had. The financial status of universities was negatively affected and
thus the effect of student attrition became an even more serious issue for some Ecuadorian private universities, as there was no longer any support from the private sector.

As a result, private universities in Ecuador have sought a way to survive by promoting open access and attracting a different kind of student to their campuses. They realized the need to help students persist and complete their college careers. In this way, universities would have been able to increase enrollment and thereby help their economic situation; most importantly, they would have helped students live better lives while contributing to the development of the country. Likewise, the use of current empirical knowledge and the implementation of retention practices (research and practice) might prove vital to keeping the doors of Ecuadorian private universities open.

Due to a lack of available information on many aspects of student college life in Ecuador, finding factors to increase retention rates might be more challenging in Ecuadorian universities. However, it is believed that using available information to understand the factors that make students leave college would be a good starting point. Therefore, research that examines the relationships among pre-college characteristics (individual background and academic preparation information), in-college characteristics, such as college grades, and student attrition will help higher education institutions in Ecuador better understand and deal with students’ attrition. Since many studies have established the importance of pre-college traits for student attrition in the U.S. (Reason, 2003), it should be of great interest to university administrators in Ecuador to determine whether such findings can be applied to Ecuador so that appropriate intervention can be provided to help students with their specific needs in a timely manner.
Assumptions and Definition of Terms for the Current Study

Assumptions. Tinto (2012) and Renn and Reason (2013) suggest that individuals hold different motives when attending a college or university. Some students may not enroll in higher education institutions with the objective of completing a degree (Renn & Reason, 2013; Tinto, 2012). They may enroll in college only to take a few courses to update their knowledge; others attend college in order to transfer to another institution, or to earn only a two-years degree. This is why community college administrators argue that students’ success in college should not be based solely on degree attainment, but whether or not a student accomplished his/ her objectives (Renn & Reason, 2013). Unfortunately, it is almost impossible to assess students’ ultimate goals because their objectives tend to change from the moment they first enter the institution (Renn & Reason, 2013). Since there was no information regarding what were the final objectives of freshmen enrolled in the examined institution for the purpose of this study the underlying assumption was that all undergraduate students aimed to enroll and graduate from the institution they originally entered.

Definition of terms. Although student retention has been considered a student’s experience variable in many studies, most higher education and policy-related research recognized it as an outcome variable (Renn & Reason, 2013). Therefore, since the 1930s, many different terminologies such as student mortality, student attrition, college retention, and student persistence have been used in student retention research (Berger, Ramirez, & Lyons, 2012). In the literature, these terms have been used interchangeably to describe the process of student departure from post-secondary institutions without making much distinction between them (Renn & Reason, 2013). Renn and Reason (2013)
warned about possible confusion caused by the careless use of retention terminologies, and thus it is important to clarify how each term is defined.

In general, retention has been assessed from two different perspectives: institution and student perspectives. Reason (2009) differentiated these views by defining retention as an organizational phenomenon, while persistence is viewed as an individual phenomenon. Tinto (2012) defined retention and graduation as the rate at which a college or university retains and graduates freshmen who enter the institution in the first semester. On the other hand, he defined persistence and completion as “the rate at which students who begin higher education at a given point in time continue in higher education and eventually complete their degree, regardless of where they do so” (Tinto, 2012, p. 127). Other commonly used terms in retention research are attrition, educational attainment, non-completion (or non-completer), dropout, stopout, or involuntary departure (Renn & Reason, 2013). The term student attrition will herein be used as the termination of a student membership in a college or university (Bean, 1980), or when a student fails to re-enroll at an institution in consecutive semesters. The term departure will be used to describe the opposite of retention in regard to college year-to-year persistence.

For the current study, as suggested by Tinto (2012), hereafter retention and graduation are terms that are used from the institution’s perspective, while persistence and completion should be considered from the student’s point of view. In other words, universities retain and graduate students, while students persist and complete their education (Renn & Reason, 2013). In addition, year-to-year persistence is the continued
enrollment in a higher education institution, from the end of one academic year to the next.

**Importance of Pre- and In-College Characteristics on Student Retention**

Research has suggested different factors that influence a college student’s decision to leave school. In an effort to help students attain their degrees, literature has tried to identify a distinctive student profile of potential non-completers. Understanding the influential factors affecting student’s attrition is a key to help students persist through the first year of college. However, it is important to note that knowing why students leave does not necessarily mean that the techniques or interventions to help them graduate will be mastered. Many higher education administrators, when implementing retention programs, incorrectly assume that knowing why students leave will help them understand the reasons they persist and graduate (Tinto, 2012). In the literature, of the many factors affecting student retention in college, pre-college characteristics have demonstrated a strong correlation to student attrition (Braxton, 2000; Reason, 2003).

**Importance of the Student’s Transition from High School to College**

It is noted that the transition from high school to college is a stressful period for incoming college freshmen, and thus the first year is considered a critical period in determining students’ success in college. The attention to the transition experiences of college freshmen at the point of entry actually began with a group of students at the University of South Carolina in 1970. These students persuaded the institution to develop a seminar to assist freshmen during the first year. Some called this initiative the “First-Year-Experience (FYE)” movement, which eventually evolved into important research on first-year college retention (Renn & Reason, 2013). In fact, research has
shown that most of the students (67%) who depart from college do so during the first two years (Tinto, 2012). Furthermore, 29% of freshmen leave during the first year at four-year institutions (Terenzini & Reason, 2005).

Similarly, the first year at college has been recognized as an important period in the student learning process and decisive in determining persistence (Keup & Barefoot, 2005; Tinto, 2012; Upcraft, Gardner, & Barefoot, 2004). Although researchers and institutions have focused their retention efforts mainly on the first year of the college experience, it would be a mistake to think there is not much to be done afterward (Tinto, 2012). Student retention requires institutions to study and work on the entire college student experience, from the point of entry until graduation (Bowen, Chingos, & McPherson, 2009; Fowler & Boylan, 2010; Tobolowsky & Cox, 2007). However, students’ first-year college experiences have been found responsible for later attrition as well, especially for a good part of second-year attrition (Tinto, 2012). Hence, the current study will be focused on first- and second-year retention.

To better contextualize the current study, it is important to consider the unique characteristics of the higher education system in Ecuador as compared to the United States, where most of retention’s empirical evidence comes from. There are clear differences between the Ecuadorian and US higher education systems. Besides the fact that a vast majority of college students in Ecuador commute to college and come from the same city or region where the campus is located, there are differences worthy of further discussion. Student bodies in Ecuadorian universities are much more homogeneous in terms of socioeconomic status, religion, and cultural capital than their US counterparts. For example, with few exceptions, students from mid, mid-high, and high socioeconomic
strata attend private institutions, while students from low socio-economic strata attend mainly public universities. Another peculiarity of the Ecuadorean higher education system, compared to regular practice in the United States, is the length of undergraduate programs. Before 2010, bachelor degrees in Ecuador required an approximate of 180 credits in a timeframe of 4 years, 50% more credits than the US bachelor program requirements in the same timeframe. After 2010, this difference grew even more, when the higher education regulatory agency mandated all undergraduate programs to require no less than 225 credits for graduation in a five-year period. Also, worth mentioning is the fact that to attain an undergraduate degree in Ecuador, students must defend a thesis, which in the United States is normally required at the graduate level.

Although there are obvious differences in terms of higher education between Ecuador and the United States, a number of similarities exist as well. It could be argued that the situation of Ecuador’s tertiary education today shares many characteristics with the US system of the late 1960s and early 1970s when, after a pronounced period of sustained growth, the system suffered an important reduction in the demand for higher education. This crisis was produced by the exit of the baby boom generation, which brought serious economic concerns to colleges and universities. Even though the Ecuadorian system has consistently raised undergraduate student enrollment in the last few decades, strong government regulation coupled with an adverse political environment for private universities has also caused a negative economic scenario for universities, especially for private ones. Another comparable characteristic is, of course, the attrition problem. Although retention research is precarious in Ecuador, few studies pointed out retention rates similar to the U.S. Maybe the most relevant for this work is the
strong influence the first two years of college have on students, with similar retention rate
to those shown in the US, which is approximately 70.5% overall in the first two years
(79.3% of freshmen in the first year and 88.9% of students who enrolled after their
freshmen year in the second year). Finally, also worth mentioning is the commonality
between Ecuadorian students and their US counterparts in terms of both having to
manage more adult responsibilities than in the past.

**Purpose of the Current Study**

The current study aims to explore the role of various factors as significant
predictor of college student retention in Ecuador with a focus on the initial college
experience and its effects on students in Ecuador. More specifically, this study
investigated the effect that a number of pre- and in-college characteristics had on college
student retention during the first two years of post-secondary studies in Ecuador, which
has been identified as the most critical period when most students depart from college
(Tinto, 2012). The aforementioned primary research goal was obtained by exploring six
research questions regarding the influence of pre-college and in-college traits on either
first- or second-year college retention.

First, regarding the first- to second-year college retention, the following three
research questions were explored:

1. How is second-year enrollment predicted by pre-college background
   variables, age, gender, and type of high school?
2. How do pre-college academic variables, high school GPA, and admission test
   scores predict second-year enrollment after controlling for pre-college
   background variables?
3. How does first-year college GPA predicts second-year enrollment after controlling for student pre-college background and academic preparation variables?

Second, regarding second- to third-year college retention, the following three research questions were explored:

4. How is third-year enrollment predicted by pre-college background variables (age, gender, type of high school)?

5. How is third-year enrollment predicted by pre-college academic preparation variables (high school GPA, admission test scores) after controlling for student background variables?

6. How does first-year college GPA predicts third-year enrollment after controlling for student pre-college traits and academic preparation variables?

**Significance of the Current Study**

This study provided valuable information to help the target institution in Ecuador deal with students’ retention issues. It adds to and enhances the limited empirical knowledge base in retention research in Ecuador and in other Latin American countries. This study is expected to provide an opportunity to compare study findings in Ecuador to different countries, including the United States, where most retention research has been conducted. It should also bring awareness to Ecuadorian universities of the importance and usefulness of retention practices. Hopefully, the results from this study will promote a discussion within the country about the positive effects that retention practices could have on students, communities, states, and the country as a whole.
Chapter Two: Literature Review

The main focus of this chapter was to summarize retention theories that are particularly relevant to the current study. This chapter briefly described how research on retention has evolved. The next section described the relevant retention theories related to this study, followed by discussions on various pre- and in-college variables that have been considered to significantly affect student retention. Lastly, the research on retention specific to Latin America and Ecuador is reviewed.

Knowledge Base on Retention Research

Although there could be different views on when retention research began, it was not until the 1930s when the first study on retention appeared in the literature (Berger, Ramírez, & Lyons, 2012). On behalf of the U.S. Department of the Interior and the Office of Education, McNeely (1938) published his study “College Student Mortality.” Even though retention was not an important issue back then, this was one of the first well-known studies in which different reasons related to students leaving higher education institutions were explored (Berger, Ramírez, & Lyons, 2012). During those years in the United States, higher education was all about access, selectivity, and expansion. Access for women and minorities became an issue as students’ enrollment increased, despite difficult times marked by economic depression and war. Government policy including the Morril Acts, the GI Bill, the National Education Act of 1958, and the Higher Education Act of 1965. Policy helped colleges and universities recover from the impact of the Great Depression and post-World War II slowdown (Cohen & Kisker, 2010). The GI Bill alone inspired 1.1 million returning soldiers to further their education.
(Berger, Ramírez, & Lyons, 2012), even exceeding the capacity of many institutions. Along with the increase in enrollment came a greater diversification of student bodies (women, minorities) at colleges and universities, which made the retention picture much more complex. Most institutions were not ready or willing to deal with this diversity and its intrinsic complexities. Besides the prevalent racial and social discrimination, most minority students arrived to college underprepared victims of a deficient secondary education.

New colleges and universities came along to respond to the abrupt rise of the demand for higher education. However, the well-established universities still had enough applicants to choose from, allowing them to raise admission requirements as a way of gaining prestige and shutting the door to “undesirables” (Berger, Ramírez, & Lyons, 2012, p. 18). During this flourishing period, colleges and universities began to think about the issue of retention (Berger, Ramírez, & Lyons, 2012). However, in those days, retention was mainly approached from an academic perspective, inferring poor academic performance as the cause of student attrition (Berger, Ramírez, & Lyons, 2012).

This perspective changed in the 1960s, a time of civil unrest, when other possible causes of student attrition were included in the retention research. Students began to protest against the established academic, political, and functional aspects of campus life (Berger, Ramírez, & Lyons, 2012). Nevertheless, it was not until the decline of demand for higher education, in the early 1970s, that retention became an issue and is still a very important issue for the higher education community. Higher education administrators became aware that retention was not only about academic performance but also about student’s satisfaction with campuses’ academic content, rules, and environment. Research
in the early 1960s started focusing on the relationship between individual student traits and academic failure. By the end of the decade, some attempts were made to understand the association between students’ affective characteristics/social contexts and student departure (Seidman, 2012).

The decrease in demand for higher education—when baby boomers began exiting the system, universities and colleges finding fewer replacements in the incoming generation—brought economic crisis to higher education institutions in the early 1970s. Suddenly, there were empty seats in classrooms that needed to be filled if many institutions were to survive, especially small private colleges. Only then did the importance of the retention issue surface and come to be understood as key for the economic sustainability of colleges and universities. Such needs pushed research toward constructing a more systematic and coherent body of empirical knowledge. Spady (1971) found the need for what he called “analytical-exploratory” studies. In his seminal article, “Dropouts from Higher Education: An Interdisciplinary Review and Synthesis,” after reviewing and categorizing past research, the author suggested the use of existing research to develop a more reasoned empirical knowledge base to specifically understand the issue of retention. Spady (1971) “was the beginning of an ongoing movement in which retention would become a major focus of theory, research, policy, and practice throughout American Higher Education” (Berger, Ramírez, & Lyons, 2012, p. 22).

The pioneering effort of McNeely (1938), Spady (1971), and other researchers such as Summerskill (1962) and Kamens (1971) inspired the core retention theorists Vincent Tinto and Alexander Astin, whose works have motivated a succession of different theoretical views. Tinto and Astin’s sociological perspectives marked what
probably could be identified as the turning point in the study of retention, giving new light upon the field with more cohesive theories of retention.

**Conceptual Framework of Retention Relevant to the Current Study**

Since the extensive body of retention literature has already been reviewed and organized by a number of renowned scholars (Braxton, 2000; Pascarella & Terenzini, 2005; Reason, 2003, 2009), only those theories and research relevant to the current study will be reviewed. The current study is based on the above mentioned theories: Tinto’s (1975) Interactionalist Theory of Student Retention, Astin’s Theory of Involvement, Bean and Eaton’s Psychological Model, and Braxton et al.’s (2004) Theory of Student Persistence in Commuter Colleges and Universities. These theories were selected for the following reasons: first, it is hard to imagine a retention study without Tinto’s work. Second, Astin’s research focused on predicting student departure from college, measuring the predictive power of personal characteristics of college entrants, among others. Finally, since there are cultural differences between Ecuador and the U. S., and most Ecuadorian students traditionally commute to college two more theories were selected to frame the study. Bean and Eaton’s and Braxton, Sullivan, and Johnson’s theories, which emanated from critiques of Tinto’s theory, suggested inconsistencies of Tinto’s seminal work, especially for the need to account for nontraditional students (commuters and traditionally underrepresented) with different origins and experiences.

**Vincent Tinto (1975, 1987, 1993).** Proposed in 1975, Tinto’s Interactionalist Model of Student Retention was a groundbreaking work that different authors (Braxton et al., 2014; Pascarella & Terenzini, 2005, Renn & Reason, 2013) described as unique and
“paradigmatic” (Braxton & Lien, 2000, p. 11). With more than 775 citations, Tinto’s work has been the most cited one in the field of retention research (Braxton et al., 2014).

Tinto based his theory on the works of Arnold Van Gennep and Emile Durkheim. Van Gennep, a Dutch anthropologist, who studied the process of becoming a member in a tribal society, “was concerned with the movement of individuals and societies through time and with the mechanisms which promote social stability in times of change” (Tinto, 1993, p. 92). Tinto was interested in different crises that individuals or groups might experience during their lifetime. He paid special attention to ceremonies and rituals around birth, entrance to adulthood, marriage, and death that help individuals and groups through difficult times in life.

Van Gennep’s (1960) study, *The Rites of Passage*, describes three stages in the process of transmission of relationships among separation, transition, and incorporation. Each stage helps individuals and groups move from the early stages of life toward adult membership. The first stage, *separation*, describes the need to break apart from previous associations in order to move on toward the sought membership of adulthood. The second stage, *transition*, is marked by new ways of interaction with members of the new group. During this stage, the individual learns the necessary skills to be recognized as a member of the new group. The last stage, *incorporation*, is marked by ceremonies that not only reward and recognize the individual as a member of the new group, but also announce the responsibilities linked to full membership (Tinto, 1993).

Tinto (1993) found similarities between the process of college student persistence and Van Gennep’s rites of passage, especially in the first year of college. Although the higher education journey is no longer marked by many symbols and ceremonies, Van
Gennep’s work contributed to an improved understanding of the process of student persistence. Tinto (1993) stated: “Our interest in the concept of rites of passage is that it provides us with a way of thinking about the longitudinal process of student persistence in college and, by extension, about the time-dependent process of student departure” (p. 94). The process of integration into the college community has functional parallels with that of incorporation into the life of human communities (Tinto, 1993), especially in the first year of college. When college students move from their high schools and family circles to an unknown college community, they “too must separate themselves, to some degree, from past associations in order to make the transition to eventual incorporation in the life of college” (Tinto, 1993, p. 94). While seeking this transition, college students encounter different crises that must be resolved in order to have better opportunities to persist. Although other factors do influence students’ departure decisions, failure in resolving adaptation issues enhances the chances of departure (Tinto, 1993).

Tinto warned about the complexity of the stages of passage within the college context. First, students may experience the stages in different ways and times. Furthermore, the stages (separation, transition, and incorporation) are not always as clearly sequenced as Van Gennep’s rites of passage. They could overlap; some elements of one stage might be repeated along the way and could occur at the same time as elements of other stages. However, Tinto suggested that students’ experiences of passage could differ considerably due to multiple factors. Individual student traits (age, gender, education preparation, cultural capital, family traditions, and values) influence the way students go through the stages.
Tinto was also influenced by Emile Durkheim’s study of suicide. Durkheim, a prominent French intellectual, was recognized as the “founding father of sociology” (Tinto, 1993, p. 100). In his classic work on suicide, Durkheim sought to explain why rates of suicide differed, between and within countries, using principles of sociology (Durkheim, 1951). Durkheim found four forms of suicide: altruistic, anomic, fatalistic, and egotistical.

The first three forms of suicide are useful to understand behavior in specific societies or during specific time periods; however, they are limited in explaining differences in suicide rates between societies (Durkheim, 1951). To account for these differences, the author referred to what he called “egotistical” suicide. This form of suicide arises when individuals are not able to integrate into the group or community where membership is sought. It was precisely in this last form of suicide that Tinto found another analogy for his model. Though Tinto does not intend to compare student departure with suicide, he identified “intriguing analogies” (p. 99) between the two constructs. The most evident one is that both behaviors represent, in most circumstances, a form of voluntary withdrawal from local communities with signs of some type of rejection toward their community’s norms (Tinto, 1993). Tinto (1975, 1987, 1993) hypothesized that student departure is similar to Durkheim’s egotistical suicide in that college students’ failure to integrate (or to progress through the stages) into college communities (social and academic) is directly linked to the decision to leave.

It is important however to highlight the difference between student departure and both Van Gennep’s *rites of passage* and Durkheim’s *study of suicide*. Tinto (1993) pointed out that,
unlike the study of suicide, it is important in studying departure from higher education to distinguish not only between the differing types of individual departure (e.g., forced and voluntary), but also between the varying forms of intellectual and social integration (membership) which occur in the academic and the social systems of the institution (p. 107).

In other words, Tinto’s theory intended to explain student departure from college through a process of transition and eventual integration to a new environment. Since colleges are made up of academic and social systems, both concepts, academic and social integration are central in Tinto’s theory. Each system has its own set of student, faculty, and staff communities interacting within formal and informal structures. The academic system centers on interactions between faculty members and students within the formal setting of classrooms and laboratories, whereas the social system entails mostly informal interactions between members outside the formal academic settings (Tinto, 1993). Tinto proposed that students’ experience in college is an important factor for student persistence. He suggested that the more interactions students have within college academic and social communities, the greater their chances to succeed. Tinto called this process “integration.”

Tinto (1993) defined academic integration as membership in an institution’s academic system. Academic integration could also be explained as a student’s perception of different academic experiences in college, and it is normally measured by grades (Ishitani & DesJardins, 2002). Social integration, on the other hand, is described by Tinto as a student’s membership in the social system of the college (Tinto, 1993) and it is characterized by the daily interactions of members, especially students, and goes on
mainly outside the classroom (residential halls, cafeterias, parties, sporting events, among other places).

In summary, Tinto’s theory of departure suggests that increasing student integration into campus life enhances a student’s commitment to the institution and to the goal of graduation, thus increasing the probability of persisting. However, membership in one system does not necessarily imply the same degree of integration in the other. An individual could be fully integrated in the social domain of the college and still be forced to leave because of low grades and the subsequent inability to establish competent membership in the academic system of the institution. Conversely, an academically competent—but socially isolated—student may decide to leave voluntarily (Tinto, 1987, 1993).

Likewise, Tinto’s departure model is sociological in nature in that it views the social and intellectual context of the institution, its formal and informal interactional environment, as playing a central role in the longitudinal process of individual departure. Tinto (1975, 1987, 1993) recognizes the importance of individual traits or pre-entry attributes (background and academic) students bring to college, which predispose them to react differently to given environments or situations. Though Tinto’s theory accepts as a given the fact that individuals have much to do with their own leaving, and argues that the impact of individual attributes cannot be understood without reference to the social and intellectual context within which individuals find themselves (Tinto, 1993).

**Empirical and theoretical critiques of Tinto’s model.** Two major critiques of Tinto’s theory arise from the fact that his model might be applicable mainly to white students in residential institutions. According to Renn and Reason (2013), Tinto’s first
major critique was found in Tierney (1999). The primary concern raised by Tierney (1999) was that Tinto’s model does not necessarily apply in the same way to the diverse types of students that currently attend college. Tinto’s model seems to be better aligned with traditional colleges that serve wealthy and white students. Tierney (1999) suggested that Tinto’s idea did not include the experience of “traditional underrepresented and underserved racial and ethnic populations” (Renn & Reason, 2013, p.181), which was later reaffirmed by Rendón, Jalomo, and Nora (2000), Kuh and Love (2000), and Tierney (2000).

These theoretical critiques were based on two of Tinto’s assumptions: (1) the analogy made with Gennep’s rites of passage, and (2) the idea that in order to succeed in college, students must sever ties with previous communities. Tierney (1999) called the process of separation from communities of the past “cultural suicide” (p. 82) for students of color. He proposed instead the concept of “cultural integrity” (p. 84), suggesting that students of color who refused to leave their previous communities would have a better chance to persist (Tierney, 1999). Moreover, students who separate completely from their home culture may feel alienated and thus finally leave college (Kuh & Love, 2000).

Braxton, Sullivan, and Johnson (1997)’s study was another of the latest major critique of Tinto’s interactionalist theory. Based on Tinto’s core formulation, Braxton et al. formulated 13 testable propositions (Appendix A) to revise Tinto’s interactionalist theory of student departure, Braxton et al. (1997) further analyzed the extent of the empirical support that these propositions have by college or university type: residential, commuter, liberal arts colleges, and two-year institutions. Using the “box score” method, they explored the amount of support for each proposition. They categorized propositions
into four segments: strong, moderate, weak, or indeterminate support. The analysis showed that indeterminate support was given to students in the liberal arts and two-year colleges because of the insufficient volume of research that had been conducted on those types of schools. However, Braxton et al. (1997) did find important differences between residential and commuter institutions. They concluded that Tinto’s theory had only partial support in residential colleges and minimal or no empirical backing in the case of commuter colleges and universities (Braxton et al., 1997).

**Alexander Astin (1975, 1984, 1999).** Much like Tinto, Astin in his theory of involvement, studied student retention from a sociological perspective. Astin (1975, 1985) acknowledged that there were many factors affecting retention, but two were considered the most influential: personal and environmental. Personal factors being age, marital status, family background, academic background, educational aspirations, study habits, and expectations about college, while environmental factors are residence, employment, academic environment, and characteristics of the college (Astin, 1975).

Astin’s main hypothesis is that students learn by getting involved in activities. The more involved students are in the academic and social life of a college, the more likely they would learn and persist. Astin contributed in developing the student involvement construct, which he defined as the amount of physical and psychological energy a student dedicates to the academic and social life of college. Due to the strong relationship found in the previous research between past academic records/academic ability and persistence, Astin (1975) measured academic involvement using grade point average, as Tinto’s model does with academic integration. Astin (1975) also suggested that extracurricular activities and on-campus work and living were also positively
correlated with students’ persistence, thus establishing the basis for the social involvement construct, equally as important as academic involvement.

In a longitudinal and multi-institutional study, Astin analyzed college freshmen’s personal background data, their experiences from the moment they enroll and how well they fit into the institution. He selected subjects from a sample of 358 two- and four-year colleges. Subjects were initially surveyed in the fall of 1968 and followed up during the summer and fall of 1972 (Astin, 1975). Astin, among other findings, suggested that personal factors are significant predictors of students’ retention. These factors listed in descending order of impact are: past academic grades, students’ degree plans at the time of college entrance, religious background, religious preference, college finances, study habits, parents’ level of education, and marital status (Astin, 1975).

**Bean and Eaton (2000).** Building on the earlier works of Fishbein and Ajzen’s (1975) theory of reasoned action and Bean’s student attrition model (Bean, 1982, 1983, 1985), and distinct from Astin and Tinto’s sociological standpoint, Bean and Eaton (2000) explored student departure from a psychological perspective. Bean and Eaton’s main critique of Tinto’s model is that its sociological view may not be directly applicable to students with different backgrounds and that it is more useful at the institutional policy level. Bean and Eaton’s psychological model borrows concepts from the psychological theories of self-efficacy, coping mechanism, and locus of control (Renn & Reason, 2013). The authors suggest, “that student departure is the direct result of student intent to leave, which is influenced by precollege behavior and attitudes, interactions with the institutional and external environments, and attitudes about the school experience” (p. 183). Because of its psychological nature, students’ preexisting attitudes about
themselves as students and toward the institution are central (Bean & Eaton, 2000). As demonstrated in Figure below, the model is formulated with the assumption that students come to college with the baggage of an “existing set of experiences, attitudes, and behaviors” (Renn & Reason, 2013, p. 183).

When students are enrolled, they start to assess their fit with the college based on the quality of interaction with the institution and external environment (Bean & Eaton, 2000). Bean and Eaton (2000) proposed four types of interactions: bureaucratic, academic, social, and external. The model emphasizes academic interactions because of their influence on academic integration. Academic interactions are those occurring in the classroom, between faculty and peers. Moreover, it also recognizes the importance of the other three forms of interaction. Bureaucratic interactions, which are formal exchanges (financial or informative) with the institution. Social interaction, contrary to Tinto’s view, includes relationships with family and friends from the past. Once enrolled, social interaction directly influences social integration. Finally, external interactions are all experiences outside the campus (financial issues, work, family, or any other off-campus issue distracting students from college life), which may impact a student’s sentiment of belonging to the college community. Bean and Eaton summarize:

Students enter college with a complex array of personal characteristics. As they interact within the institutional environment several psychological processes take place that, for the successful student, result in positive self-efficacy, reduced stress, increased efficacy and internal locus of control. Each of these processes increases a student’s scholarly motivation. These internal processes are reciprocal and interactive with continuous feedback and adjustment (2000, p. 58).
Bean and Eaton’s Psychological Model of Student Departure

**Braxton, Hirschy, and McClendon (2004)**. Based on the mixed results found by Braxton, Sullivan, and Johnson (1997), Braxton, Hirschy, and McClendon (2004) proposed two different theories that explain student departure in residential and commuter colleges and universities.

Driven by the fundamental differences in the structure between residential and commuter universities found in Braxton et al. (1997), Braxton, Hirschy, and McClendon (2004) developed a new theory of student departure for commuter colleges and universities. More specifically, two main factors serve as the foundation for this work: (1) Braxton et al.’s (1997) conclusion regarding the lack of explanatory power of Tinto’s theory in commuter colleges and universities, and (2) the particular characteristics of these institutions’ social communities, along with the influence of the external environment in a commuter setting (Braxton et al., 2014). Braxton et al.’s new commuter model, which was developed in 2004, includes six components: student entry characteristics, external environment, internal campus environment (academic communities and institutional environment), academic integration, subsequent institutional commitment, and persistence, as shown next.
As in most retention theories, students’ pre-college traits or student entry characteristics (as named in the model by Braxton et al., 2004) play an important role in student persistence in commuter colleges and universities. However, it is important to mention that Braxton et al. used different pre-college traits, including motivation, control issues, self-efficacy, empathy, affiliation needs, parental education, anticipatory socialization, for their model. This model suggests a direct influence of students’ entry characteristics on the initial commitment to the institution (Braxton, Doyle, et al., 2014; Braxton, Sullivan, et al., 1997; Tinto, 1975, 1993) and persistence (Braxton et al., 2004) in commuter colleges and universities. The initial institutional commitment is the
students’ perception of the institution at the point of entry (Braxton et al., 2004). Thus, it is also considered as an entry characteristic in Braxton et al. (2004)’s.

The second component in this model has to do with how the persistence process is affected by the influence of the external environment, which is also impacted by entry traits. More specifically, out-of-college responsibilities, such as full-time employment and family, commonly interfere with academic responsibilities. For example, a student’s level of empathy, which is one of the pre-college characteristics in Braxton et al.’s commuter model, affects the way he or she perceives their out-of-college responsibilities such as work or family issues (Braxton et al., 2014). If the student has a high level of empathy, he or she is going to be more affected by external issues, a situation that will probably lead to the decision to leave. Consequently, “the greater the support the student receives from significant others for their college attendance, the greater their likelihood of their persistence in a commuter college and university” (Braxton et al., 2014, p. 112).

The internal campus environment in Braxton et al.’s commuter model, which is composed of academic communities and the institutional environment, plays a very important role in a student’s persistence process in commuter colleges and universities. “Without strong social communities on commuter campuses, the academic realm of the institution holds primary status” (Morrison & Silverman, 2005, p. 77). Academic communities are represented in the model by active learning and learning communities. Academic communities are associations between students, faculty, and peers that result from academic activities that take place mainly in classrooms and laboratories of commuter colleges and universities influencing students’ perception of academic integration. Braxton et al. (2004) suggest that students who are involved in learning
communities are more likely to persist in commuter colleges and universities, as represented in the model diagram (Figure 2). *Academic integration*, in turn, impacts the student’s *subsequent institutional commitment*, which is also directly influenced by *institutional environment* and the *initial institutional commitment*. Finally, the last proposition in Braxton et al. (2004) suggests that “the greater the student’s degree of subsequent commitment to their college and university, the greater the student likelihood of persistence in a commuter university” (Braxton et al., 2014, p. 117).

Braxton, Doyle, Hartley, Hirschy, Jones, & McClendon (2014) revised the theory of student persistence in commuter colleges and universities, suggesting the following adjustment, which is demonstrated in Figure 3. Braxton et al. replaced the *internal campus environment* component of the former model with *organizational characteristics*, leaving only the environment’s institutional elements (*institutional integrity* and *institutional commitment to student welfare*) of the *internal campus environment* component from Braxton et al. (2004). Braxton et al. (2014) argues that institutional integrity and institutional commitment to the welfare of the student also positively influences students’ academic and intellectual development. They removed the role of academic communities, learning communities, and active learning from the theory formulated in 2004 in an effort to reduce the number of constructs and propositions (Braxton et al., 2014).

Another modification that Braxton et al. (2014) proposed was to rename the *academic integration* construct in the former model to *academic and intellectual development*, because *academic integration* was found to lack face validity. These measures typically include student perceptions of their intellectual growth and
development and estimates of their grade point average. These measures provide face validity for the operationalization of academic and intellectual development and not academic integration (Braxton et al., 2014, p. 118).

The revised commuter model, as shown below places “academic and intellectual development as an antecedent to subsequent institutional commitment … This is a relationship that receives empirical affirmation in seven out of ten tests of it conducted in commuter institutions” (Braxton et al., 2014, p. 118). Two factors, commitment of the institution to student welfare and institutional integrity, constitute organizational characteristics in Braxton et al. (2014)”s revision of the 2004” theory. Students who perceive the commitment of an institution’s faculty and staff to student welfare develop a stronger subsequent level of commitment to the institution (Braxton et al., 2014). “Therefore, the more a student perceives that their college or university is committed to the welfare of its students, the greater the student’s degree of subsequent commitment to their college and university” (Braxton et al., 2014, p. 117).
Student retention has grown in its importance throughout the years since scholars began their studies and universities realized its relevance for the future. Some believed the interest in retention has reached an “all-time high” (Roach, 1999, p. 98). Students’ retention affects the budgets and services of colleges and universities, and thus their sustainability. All higher education stakeholders should be concerned about retaining their students (Parker, 1999). Higher learning institutions are not only affected by its immediate effect on their budgets, but also on their future income because “retention
rates are key indicators of institutional success” (Reason, 2003, p. 72). Students and parents often use retention rates to make decisions on whether or not to attend a specific institution. Furthermore, its importance has surpassed the context of higher education (Pascarella & Terenzini, 2005) and determines the well-being of students, their families, and even the economic future of states.

**First- and second-year retention.** As mentioned earlier, student departure occurs mostly during the first two years of college (Davidson & Muse, 1994; Murtaugh, Burns, & Schuster, 1999). Therefore, researchers and policy makers should pay special attention to those earlier periods of transition in students’ college life. Tinto (2012) indicates that retention programs or interventions should be directed primarily at the first year of college, even at the first quarter or semester of that year if possible. He also suggests that efforts should begin during the final year of high school and before the start of college classes. Moreover, students’ first-year college experiences are presumably responsible for later attrition as well, especially for a good part of second-year attrition (Tinto, 2012). Some views even incorporate into the conception of the first-year retention not only pre-entry periods (last year of high school) but also the second year of college (Reason, Terenzini, & Domingo, 2006).

Most of the reasons why students leave have to do with the experiences and interactions freshmen endure during the first year of college (Tinto, 1975, 1993), which affect their degree of involvement with the institution. Negative or limited interaction with college peers, faculty, and staff may result in isolation and departure. Freshmen experiences are also influenced by each student’s background traits, though their perceptions of interactions may vary depending on those pre-college characteristics
Pre-college traits have been traditionally pinpointed as a direct cause of student attrition. Although of research has supported the role of pre-college characteristics in student performance during the first year of college, there are also researchers who believed that difficulties extend beyond the first year (Reason, Terenzini & Domingo, 2006). For many sophomores, grades and attendance drop considerably after the first year (Gump, 2007). Wilder (1993) found that more than half (52%) of sophomores showed a 20% decline in GPA after the first year, consequently contributing to students’ attrition. This phenomenon is known as sophomore slump, which is caused by new stressors the second year presents to returning students. They usually miss the attention and warnings, about the do’s and don’ts; institutions provide freshmen about college life. Along with the absence of guidance, second year is a pressure time since students have to declare a major, which not everyone is ready to do.

**Pre-college characteristics and retention.** In predicting retention, students’ pre-college traits are known to be important factors. The influence of pre-college characteristics on student persistence is evident in most retention theories (Astin, 1975, 1977, 1984, 1991, 1993; Bean & Eaton, 2000; Braxton et al., 2004; Terenzini & Reason, 2005, 2010; Tinto, 1975, 1993; Wiedman, 1989). Although many factors have been tested as pre-college characteristics, high school grades, admission test scores, gender, and race have been commonly used and found to significantly predict student attrition (Astin, 1997; Peltier, Laden, & Matranga, 1999; Wohlgemuth, Cunningham, Monus, Miller, & Nguyen, 2006). These pre-college traits can be subcategorized into two components: a student’s demographics (e.g., gender, age, SES status, race) and pre-
college academic preparation (e.g., high school GPA, SAT, and Act scores), and experiences (George, Kuh, Cruce, Kinzie, & Gonyea, 2008).

Empirical research suggests that pre-college academic preparation factors are perhaps the most influential in predicting student’s retention. In many studies, past academic records and academic ability have been found to be the strongest predictor of retention (Astin, 1975; Astin, Green, & Korn, 1987; Tross, Harper, Osher, & Kneidinger, 2000; Tinto, 1975; Wohlgemuth et al., 2006). Astin (1975) suggested: “The most dropout-prone freshmen are those with poor academic record in high school, low aspirations, poor study habits, relatively uneducated parents, and small town backgrounds” (p. 45). Murtaugh, Burns, and Schuster (1999), in an effort to predict college student retention, found a significant relationship between academic preparation variables measured by college GPA and attrition rates at Oregon State University. This study suggested that student attrition is lower when high school GPA (HSGPA) and first-quarter college GPA were higher.

Astin (1997) stated that self-reported HSGPA and institution-reported SAT scores were also found to be strong predictors of students’ retention: “The student with high grades and test scores is better than three times more likely to complete college (79%) than is the student with low test scores and grades” (p. 651). Moreover, they asserted that students with an A average in high school reported a sevenfold higher likelihood of graduation within the program time frame (four years) than those students with a C average. Students with high SAT scores showed graduation rates within four years six times higher than students with a lower SAT. Levitz, Noel, and Richter (1999) also found a strong relationship between SAT/ACT scores and first- to second-year retention. They
suggested that institutions with the highest SAT/ACT averages reported a first- to second-year retention rate greater than 91%, while those institutions with the lowest average scores reported only 56%.

Finally, it is important to mention at this point that, although colleges and universities tend to rely more on standardized tests such as the SAT/ACT than on high school grades (HSGPA), there are empirical findings suggesting otherwise. In their study of 80,000 freshmen admitted to the University of California, Geiser, and Santelices (2007) asserted that HSGPA was consistently the strong predictor for all academic programs and all campuses. They even found that the predictive power of HSGPA on students’ retention increased after the first year of college and that giving more weight to this criterion over standardized scores would decrease the negative impact of entry examinations on underrepresented minorities.

As explained in the first chapter, student retention has grown in its complexity, mainly due to student diversity that characterizes today’s higher education reality. The influence of policy (the GI Bill and Morril Acts) and other factors (crisis, cost of education) have shaped the new configuration of college students in the United States. Two trends are clearly identified in the demographic composition of today’s colleges and universities: (1) a female majority; and (2) an increasing average age of students.

Students’ gender composition in colleges and universities has changed dramatically in the last four decades. In 1979, women surpassed men in U.S. higher education institutions (Woodward & Ross, 2000). The National Center of Education Statistics (2011-12) estimates that women account for 57% of the total number of U.S. college undergraduates. Likewise, Ecuadorian females also represent the majority (over
55% of undergraduate students (Consejo Nacional de Educación Superior, 2006). The literature shows contradictory empirical findings in regard to the relationship between gender and retention (Reason, 2003). Some researchers (Astin, 1975; Astin et al., 1987; Leppel, 2002; Murtaugh, Burns, & Schuster, 1999; Peltier, Laden, Matranga, 1999; Tinto, 1987) found gender to be significantly related to retention, while others either found mixed (Reason, 2001) or no relationship (Hu & St. John, 2001) between gender and retention. Reason (2001) found gender to be an insignificant predictor of retention, but significant in a simpler model. Reason suggested that more research should be conducted to clear up the interaction effect of gender between other variables and retention.

Another change in demographics within higher education is the average age of students in U.S. colleges and universities. Contrary to the tradition of having students between 17 and 22, almost 40% of college students were 25 or older before the turn of the twentieth century (Peltier, Laden, & Matranga, 1999). This trend suggests that much more attention should be paid to older students. Even though Astin (1975) suggested in his study (before age became an issue in higher education) that attrition was also associated with older students, very few studies have analyzed the effect of age on retention (Peltier et al., 1999). As contended by most of Tinto’s critics, non-traditional college students are affected differently by the distinct factors involved in college life. Moreover, in the case of older students, for example, there are many out-of-college factors intrinsic to their age that may affect retention (Braxton et al., 2004).

**College GPA and retention.** Several studies (Allen, 1999; Mitchel, Goldman, & Smith, 1999; Murtaugh et al., 1999) found a positive and significant relationship between first-year college GPA and retention. Murtaugh et al. (1999) used the first-quarter GPA
as an initial measure of success to predict the first- and second-year retention. The study suggests that the probability of students with college GPA of 3.3 or higher persisting through the first year to the second is 91%. On the other hand, only 57% of students with a college GPA of 2.0 or lower persist.

**Retention in Ecuador**

Since enrollment in college has consistently grown during the last decades in Latin America, higher education authorities and universities have focused their efforts on expanding infrastructure to fit more students, paying little attention to the retention problem. As a consequence, little research has been carried out on retention and some of the existing figures are contradictory or unreliable (González et al., 2005). However, in some Latin American countries, different circumstances (political or economic) have prompted an awareness of retention.

In the case of Ecuador, political influence has caused serious economic challenges for higher education institutions, especially for private ones (Fernandez & Silva, 2014). Therefore, Ecuadorian universities should be taking student attrition seriously. A few studies conducted on specific programs in Ecuador suggest that attrition rate range from 12% to 30% (Gómez, Garzón, & Guerra, 2012; Hinojosa Naranjo & Zambrano Montúfar, 2012; Montenegro López & Taco Casamen, 2012; Viteri Castro & Uquillas Narváez, 2011), which seem very low compared to the industry average in the literature. However, Fernandez and Silva (2014) reported that 12% of all first-time students left during the first semester, similar to the trend in the United States.

In 2007 and 2008, Viteri Castro and Uquillas Narváez analyzed attrition at the *Pontificia Universidad Catolica del Ecuador*, finding that student traits were among the
most influential factors affecting a student’s decision to leave. According to deans and department chairs, students tend to leave college shortly after they begin (Viteri Castro & Uquillas Narváez, 2011). The type of high school has also been identified as a significant predictor of first-year attrition. However this influence disappeared after the third year (Navarrete, Candia, & Puchi, 2013). Furthermore, Gómez, Garzón, and Guerra (2012) found that students who came from public high schools leave colleges at higher rates than those coming from private schools. Finally, age has also been found to be a significant predictor of student attrition in Ecuadorian universities. Fernandez and Silva (2014) studied the influence of freshmen students’ pre-college characteristics on first semester attrition, finding that students who were 20 year of age or older at the point of entry were 2.6 times more likely to drop out during the first semester.

**Summary**

Considering a lack of research on students’ retention, the current study is based on what we know in the U.S. on retention research. Although limited, the theories and research discussed in this chapter are applied to Ecuadorian higher education system. In particular, Tinto and Astin’s theory regarding the complexities of the transition from high school to college, which is also found to be critical in Ecuador, can be directly applied to Ecuador. Bean and Eaton suggest that college students’ psychological traits must also be considered when studying departure decisions. Braxton et al. adds the necessary commuter perspective, which fit the Ecuadorian context. Although the current study based on the existing student data collected by the institution might be limited to look at incorporate all the available theories to fully explain why students leave, this is our belief
that the current study helps the institution design interventions that assists students persistence until more empirical knowledge is gathered in Ecuador.
Chapter Three: Methodology

Research Design

This study was a quantitative analysis of the existing secondary data for students from the main campus of a university in Ecuador collected by the institution from 2006 to 2012. The use of secondary data has a number of strengths and weaknesses. One of the biggest strengths is its cost-efficiency (sometimes at no cost) in obtaining data. Data for the secondary analysis are already gathered and, in many instances, formatted in a way that is ready to be analyzed using most commercial statistical software such as SPSS, STATA, and SAS (Vartanian, 2011). As described by Vartanian (2011), other strengths in the use of secondary data include: (1) data on each subject is much larger than the data usually collected by one’s self, (2) secondary data sets are often created in great lengths of time, and (3) the use of secondary data sets brings new ideas or questions to researchers when they become familiar with a determined data set.

However, there are some limitations that might impede the use of secondary data. The major disadvantage might be due to a “lack of control over the framing and wording of survey items” (Vartanian, 2011, p. 15). Also, the researcher had limited information regarding whether or how the data was manipulated. For instance, no clear answers exist to the following questions: “Have missing data been imputed in some way? If so, how? Is this a good method for imputation?” (Vartanian, 2011, p. 17). Lastly, it is impossible to follow up on questions due to standard procedure for participants’ protection. Another limitation arises when the researcher intends to explore specific subpopulations that are part of the data set, but are not separated by subgroups. Sometimes the existing data sets might not include information that could answer new or contemporary issues. Therefore,
Vartanian (2011) argues that researchers who use secondary data might “trade control over the conditions and quality of the data collection for accessibility, convenience, and reduced cost in time, money, and inconvenience to participants” (Vartanian, 2011, pp.16-17).

Even though a number of aforementioned limitations exist, the use of the secondary data collected by an institution was chosen for this study. It is mainly because the data collected by an institution contain the most information regarding the pre- and in-college characteristics directly linked to retention for a large number of students, over a six-years time span.

**Study Settings**

The current study was based on students in a small and second oldest private university in Ecuador. The quality of education has been the main philosophy guiding the institutional vision - to become one of the best universities within the region in 2035 - and mission - to offer quality education for a successful life. The institution comprises a total of six campuses, including three in Quito, one in Guayaquil, one in Loja, and one on the Galapagos Islands, which offer both traditional full-time and online education.

Of the six campuses, the current study exclusively focused on the full-time students from the main campus of the university located in Quito, Ecuador, where approximately 2000 undergraduate full-time students are enrolled in 17 programs. This main campus has a number of successful programs, such as medicine and automotive engineering, with outcomes comparable to the premier schools in the United States. Currently, the main campus has 292 faculty members, including 144 full-time and 148 part-time employees. Administrators and visiting professors (around 300) teach courses,
but are not considered the regular faculty members by the government control agency. Admission is based on high school GPA (HSGPA), admission entry test scores, and an interview with the dean of each school, which is a standard procedure in most private universities in Ecuador. And, on average, approximately 500 full-time students, including transfer students, are enrolled each year at the main campus of the university.

**Participants**

The participants of this study were all first-time freshmen (approximately \( n = 2500 \)) enrolled at the institution’s main campus, from the fall of 2006 to the fall of 2012. The institution accepts an average of 416 freshmen per year across two-semester sessions. The percentage (43%) of male students on this campus is not different from the national or global gender distribution, even though the largest school (automotive engineering, accounting for about 30% of all students) on the main campus traditionally attracts mostly male students. Students are from a total of 354 high schools, with a great majority (\( n = 282 \)) from private high schools. Students are from twenty-one of the twenty-three Ecuadorian provinces, and a few other countries such as the United States, Germany, and the Ukraine. The average admission entry test score of freshmen is 77.45 out of 100 and their average HSGPA score is 17.15 out of 20.

**Variables**

In the current study, a number of students’ pre- and in-college characteristics were used to predict each of the following two dependent variables, the first- to second-year retention and second- to third-year retention.

**Independent variables.** As is the case for most universities in Ecuador, this university has only basic student information. These include students’ pre-college traits:
gender, age, type of high school, high school GPA, entrance test exam scores, and college GPA. Although it is certainly a limitation not having more information to understand the potential factors affecting student retention, those pre- and in-college variables may help identify at-risk students and further understand the reasons why they do not persist beyond the first two years, which are known to be the critical moments when they decide to leave. All data were obtained from the university registrar office.

Because of the mixed results found in the literature regarding whether gender predicts student persistence (Reason, 2003; Wohlgemuth et al., 2006), gender was included in the study to see if any relationship with past findings is found. Gender was a dummy-coded variable with female being a reference group (Male = 1; Female = 0). As stated in Chapter One, U.S. higher education should be prepared to serve a much more diverse student body, in age and socioeconomic status (SES), as the U.S. population grows older (Reason, 2003). College students’ age has been found to be a significant predictor of student’s retention (Orrantia & Silva, 2014), especially in the case of commuter students who are in different off-campus responsibilities (Braxton, Doyle, et al., 2014; Braxton, Hirschy, et al., 2004). Therefore, student’s age measured on the continuous scale was used as an independent variable as well.

Because the institution does not gather students’ socioeconomic status (SES), the type of high school attended, which is known to be a strong indicator of SES, was used as a proxy variable. Low and mid-low SES students usually attend public high schools, while mid-high and high SES students go to private schools. Therefore, type of high school attended was dummy-coded with private school being a reference group (0 = Private school and 1 = Public school). In addition, two pre-college academic
characteristics, high school GPA ranged from 0 to 100, and entrance exam score, ranged from 0 to 100, were treated as continuous variables. Both are strong predictors of student persistence (Wohlgemuth et al., 2006), with high school grade point average being the strongest (ACT, 2007). Finally, college GPA (first-year GPA and second-year GPA) ranged from 0 to 100.

**Dependent variables.** Two dependent variables were used in this study. The first was second-year enrollment, which is defined as the first-time students who enrolled in the main campus of the university for the first semester, and did consecutively enrolled in the second and third semesters. The second dependent variable was third-year enrollment, which refers to the first-time students who enrolled at the main campus of the university for the first semester, and did consecutively enroll up to the fifth.

For both dependent variables, an individual student was defined as being retained if he/she enters the institution in the first semester and persists for three and five consecutive semesters, respectively, for each outcome variable. Both variables were dummy-coded for all cohorts within the period of examination. A student was defined as being retained and coded as 1. And, if the student failed to register three or five consecutive semesters, he/she is considered not being retained and thus coded as 0. The study did not make any difference between students, no matter the academic period in which they started, whether they began in fall or spring semester.

**Power Analysis**

In order to determine the required minimum sample size necessary to find the significant effect of the independent variable in a multiple logistic regression model, a priori power analysis was conducted. The required sample size was computed based on a
significance level of .05 and a described statistical power of .80 that was recommended to be acceptable by Cohen (1992). In addition, since there is little research on retention in Ecuador and in order to be more conservative in statistical analysis, a small effect size that was represented by Odds Ratio (OR) of 1.8 was used in the estimation of the required sample size. As a result, a priori power analysis using G-POWER (Erdfelder, Faul, & Buchner, 1996) indicated that a sample size of 119 would be needed to find the significance of the overall model predicting first- and second-year attrition, using pre-college variables (gender, age, type of school) and college GPA based on a multiple logistic regression model.

**Data Analysis**

All data analysis was performed using Statistical Package for the Social Sciences (SPSS) (IBM Corp., 2013). First, the descriptive statistics or frequency table of all variables (age, gender, type of high school, high school GPA, entry exam, and college GPA) were examined to summarize the distribution of the variables. Then two separate sequential logistic regression models were performed to predict each of the two dependent variables, the second and third year enrollment, using all independent variables.

As shown in Figure 3, independent variables were entered in three subsequent blocks: gender, age, and type of school in Block 1; high school GPA and entry exam in Block 2; college GPA in Block 3. In each block, the importance of the added variable(s) was first examined based on the significance of the deviance scores using a likelihood ratio test that follows the chi-squared distribution. Second, the overall model fit was examined using *Pseudo-R* squared values such as Nagelkerke $R^2$ and the significance of each of the
individual predictors was examined based on the significance of the Wald’s score. Third, the goodness of fit test comparing predicted and observed cases was further assessed so as to address the validity of the logistic regression model in predicting students’ retention using a number of independent variables. Lastly, the importance of each variable was tested for its significance using the Wald’s statistics. The magnitude of the importance of an independent variable on the retention was addressed based on Odds ratio (OR). The OR indicates the increase in the odds of student’s retention for an additional unit increase in the independent variable, controlling for all other variables in the model. The OR can be used as an effect size measure using Rosenthal’s (1996) criteria as OR = 1.5 indicating a small effect; OR = 2.5 indicating a medium effect; OR = 4 indicating a large effect.
Chapter Four: Results

General Descriptive Statistics of Variables

A total of 1480 first-time freshmen who entered the university between 2006 and 2012 were included in the data analysis. Table C1 summarizes general descriptive statistics of the independent variables (type of high school, gender, age, HSGPA, entry exam, 1st year GPA, and 2nd year GPA) by students’ entrance year/cohort. As shown in Table C1, 1480 students were in seven cohorts, which range from 149 (10.1%) in 2006 to 270 (18.2%) in 2011, with the majority (62.4%) being males. Most of the students (89.9%) came from private high schools. The students’ mean age was 18.51 with a standard deviation (SD) of 1.94. The means of high school GPA and entry exam score were 17.16 out of 20 and 79.34 out of 100 with SDs of 1.20 and 6.19 respectively. First-year GPA mean was 71.98 (SD = 22.35) and second-year GPA mean was 58.80 (SD = 33.84). Table C2 displays retention rates by students’ cohort, which were on average 79.3% for first- to second-year and 88.9% for second-to third-year.

Logistic Regression Models with All Cohorts

A logistic regression model including all seven cohorts was first run on each dependent variable by including each cohort as a dummy variable. The estimated coefficients related to dummy variables were found to vary considerably, indicating that cohorts were different. Therefore, a series of separate logistic models by cohort were run on each dependent variable. The findings of each logistic regression model are discussed below by cohort as well.
Logistic Regression Models on the First- to Second-Year Retention

A series of the sequential logistic regression model (as shown in Figure B1) were performed on the first- to second-year retention including the independent variables (pre-college demographics [gender and type of high school] in block 1, pre-college academics [high school GPA and entrance exam score] in block 2, and college GPA in block 3) in three separate blocks. Therefore, the following three logistic regression models predicting the first- to second-year retention were compared: Model 1 with gender and type of high school; Model 2 with gender, type of high school, high school GPA, and entrance exam; Model 3 with gender, type of high school, high school GPA, entrance exam, and first-year college GPA. Results are summarized by cohort below.

**Descriptive statistics.** Table D1 summarizes the descriptive statistics of the independent variables (type of high school, gender, age, HSGPA, entry exam, 1st year GPA, and 2nd year GPA) and retention rates by cohorts (n = 1173, 74.24%) who stayed after 1 year. Majority (n = 740, 63.1%) were males and they mostly came from private high schools (n = 1049, 89.4%). Mean age was 18.40 (SD = 1.83). Means on high school GPA, entry exam score, and first-year GPA were 17.21/20 (SD = 1.20), 79.46/100 (SD = 6.18), and 74.73 (SD = 19.96), respectively.

**Results for 2006 cohort.** Based on the comparison of models (Δχ²(2) = 5.28, p = 0.07 for Model 2 vs. Model 1, and Δχ²(1) = 16.51, p < .01 for Model 3 vs. Model 2), a logistic regression model with all predictors (Model 3) was retained as a final model for 2006 cohort. The Nagelkerke R² for block 3 was 0.21, which shows improvements over that of blocks 1 (Nagelkerke R² = 0.01) and 2 (Nagelkerke R² = 0.06). Below, results from model 3 are summarized.
Model 3 was found to explain a significant amount of variance in the likelihood of retaining students, $\chi^2(6) = 23.05, p < .01$. In addition, model fit comparing predicted and observed cases shows that model 3 was an acceptable one, $\chi^2(8) = 8.84, p = 0.36$.

Specifically, after controlling for all other variables in the model 3, the first-year GPA was found to be a significant predictor, indicating that for a one-unit increase in the first-year GPA, the odds of retaining students was significantly increased by 3.1% (OR = 1.03, $b = 0.03, SE = 0.01, \chi^2(1) = 14.40, p < 0.01$). The effect was considered to be small. However, all other predictors were not significant as shown in Table D2.

Results for 2007 Cohort. Even though model 3 was not statistically better than model 2 or model 1, (Model 2 vs. Model 1, $\chi^2(2) = 3.69, p = 0.16$ and Model 3 vs. Model 2, $\chi^2(1) = 1.99, p = 0.16$), model 3 was chosen as a final model because the Nagelkerke $R^2$ obtained from model 3 was the largest at 0.06 compared to 0.01 for block 1 and 0.04 for block 2. Overall, Model 3 was found not to be significant, $\chi^2(6) = 7.15, p = 0.31$.

Results for 2008 Cohort. Based on the likelihood tests for comparing models (Model 2 vs. Model 1, $\chi^2(2) = 9.87, p < 0.01$), and (Model 3 vs. Model 2, $\chi^2(1) = 3.32, p = 0.07$) and Nagelkerke $R^2$ (Nagelkerke $R^2 = 0.16$ for model 3, Nagelkerke $R^2 = 0.08$ for model 1, and Nagelkerke $R^2 = 0.14$ for model 2), Model 3 was retained as a final model.

Overall, it was found that at least one of the slopes in Model 3 explains a significant amount of variance in the likelihood of retaining students, $\chi^2(6) = 24.75, p < 0.01$. In addition, model fit was found to be an acceptable one, $\chi^2(8) = 5.78, p = 0.67$.

Specifically, after controlling for all other variables in the model 3, age and high school
GPA were found to be significant. This indicates that, for a one-unit increase in age, the odds of retaining students significantly dropped by 30% (OR = 0.70, \( b = -0.35 \), \( SE = 0.14 \), \( \chi^2 (1) = 6.68, p = 0.01 \)). Also, for a one-unit increase in high school GPA, the odds of retaining students was significantly increased by 59% (OR = 1.59, \( b = 0.46 \), \( SE = 0.15 \), \( \chi^2 (1) = 9.57, p < 0.01 \)). The effects were considered to be small to medium. However, all other predictors were not significant as shown in Table D4.

**Results for 2009 Cohort.** Based on the likelihood test for comparing models (\( \Delta \chi^2(2) = 6.34, p = 0.04 \) for Model 2 vs. Model 1, and \( \Delta \chi^2(1) = 2.46, p = 0.12 \) for Model 3 vs. Model 2), and Nagelkerke \( R^2 \) (Nagelkerke \( R^2 \) = 0.11 for model 3, Nagelkerke \( R^2 \) = 0.05 for model 1, and Nagelkerke \( R^2 \) = 0.10 for model 2), Model 3 was retained as a final model.

Overall, it is found that at least one of the slopes in Model 3 is significant (\( \chi^2(6) = 15.74, p = 0.02 \)). In addition, model fit shows that model 3 with all predictors was an acceptable one (\( \chi^2(8) = 5.60, p = 0.70 \)). After controlling for all other variables in model 3, it was found that age was significant. This indicates that, for a one-unit increase in age, the odds of retaining students was significantly decreased by 24.1% (OR = 0.76, \( b = -0.28 \), \( SE = 0.12 \), \( \chi^2 (1) = 5.68, p = 0.02 \)). The effect was considered to be small. However, all other predictors were not significant as shown in Table D5.

**Results for 2010 Cohort.** Based on the comparisons of models (\( \Delta \chi^2(2) = 1.41, p = 0.50 \) for Model 2 vs. Model 1, and \( \Delta \chi^2(1) = 18.05, p < 0.01 \) for Model 3 vs. Model 2), a logistic regression model with all predictors (Model 3) was retained as a final model in 2010. The Nagelkerke \( R^2 \) obtained from block 3 was 0.16, which shows improvements
over that of blocks 1 (Nagelkerke $R^2 = 0.01$) and 2 (Nagelkerke $R^2 = 0.02$). Below, results from model 3 are summarized.

Overall, it is found that at least one of the slopes in Model 3 explained a significant amount of variance in the likelihood of retaining students ($\chi^2(6) = 20.43, p < 0.01$). In addition, model fit comparing predicted and observed cases shows that a model with all predictors was an acceptable one ($\chi^2(8) = 16.83, p = 0.03$). Specifically, after controlling for all other variables in model 3, it was found that first-year GPA was significant. This indicates that, for a one-unit increase in the first-year GPA, the odds of retaining students was significantly increased by 4\% (OR = 1.04, $b = 0.04, SE = 0.01, \chi^2(1) = 16.17, p < 0.01$). The effect was considered to be small. However, all other predictors were not significant as shown in Table D6.

**Results for 2011 Cohort.** Based on the comparisons of models ($\Delta\chi^2(2) = 2.92, p = 0.23$ for Model 2 vs. Model 1, and $\Delta\chi^2(1) = 33.89, p < 0.01$ for Model 3 vs. Model 2), a logistic regression model with all predictors (Model 3) was retained as a final model in 2011. The Nagelkerke $R^2$ for block 3 was 0.21, which shows improvements over that of blocks 1 (Nagelkerke $R^2 = 0.02$) and 2 (Nagelkerke $R^2 = 0.03$). Below, results from the retained model (model 3) are summarized.

Overall, it is found that at least one of the slopes in Model 3 explained a significant amount of variance in the likelihood of retaining students ($\chi^2(6) = 39.37, p < 0.01$). In addition, model fit comparing predicted and observed cases shows that a model with all predictors was an acceptable one ($\chi^2(8) = 28.74, p < 0.01$). After controlling for all other variables in Model 3, it was found that entry exam score and first-year GPA were found to be significant. This indicates that, for a one-unit increase in the entry exam
score, the odds of retaining students was significantly increased by 6% (OR = 1.06, \( b = 0.06, SE = 0.03, \chi^2 (1) = 4.27, p = 0.04 \)). Also, for a one-unit increase in the first-year GPA, the odds of retaining students was significantly increased by 4% (OR = 1.04, \( b = 0.04, SE = 0.01, \chi^2 (1) = 29.50, p < 0.01 \)). The effects were considered to be small.

However, all other predictors were not significant as shown in Table D7.

**Results for 2012 Cohort.** Based on the comparisons of models \( \Delta \chi^2(2) = 4.15 p = 0.13 \) for Model 2 vs. Model 1, and \( \Delta \chi^2(1) = 10.30, p < 0.01 \) for Model 3 vs. Model 2), a logistic regression model with all predictors (Model 3) was retained as a final in 2012. In addition, the Nagelkerke \( R^2 \) obtained from block 3 was the largest at 0.31, compare to 0.22 for block 1 and 0.25 for block 2. Below, results from the retained model (Model 3) will be only summarized. Overall, it was found that at least one of the slopes in Model 3 explains a significant amount of variance in the likelihood of retaining students \( \chi^2(6) = 49.33, p < 0.01 \). In addition, model fit comparing predicted and observed cases shows that a model with all predictors was an acceptable one (\( \chi^2(8) = 4.87, p = 0.77 \)). Specifically, after controlling for all other variables in Model 3, it was found that the gender, age, and first-year GPA were found to be significant. This indicates that, after controlling for all other variables in the model it was found that the odds of retaining students in the gender focal group was 74% significantly lower than the odds of retaining students in the reference group (OR = 0.26, \( b = -1.34, SE = 0.42, \chi^2 (1) = 10.30, p < 0.01 \)). Also, for a one-unit increase in age, the odds of retaining students significantly dropped by 29% (OR = 0.71, \( b = -0.34, SE = 0.09, \chi^2 (1) = 12.99, p < 0.01 \)). Furthermore, for a one-unit increase in the first-year GPA, the odds of retaining students was significantly increased by 3% (OR = 1.03, \( b = 0.03, SE = 0.01, \chi^2 (1) = 10.18, p < 0.01 \)). The effects were
considered to be small. However, all other predictors were not significant as shown in Table D8.

**Summary across cohorts.** As shown in tables D2 thru D8, type of high school was not found to be a significant factor of retention during the first year for any cohort. Other independent variables (gender, age, high school GPA, entry exam score, and first-year GPA) were found to be a significant factor of retention after the first year of college in at least one cohort. Gender was found significant only in 2012 (as shown in Figure D9), while age was in 2008, 2009, and 2012 (as shown in Figure D10). Furthermore, high school GPA was found to be significant only in 2008 (as shown in Figure D12), while entry score was found to be significant in 2007 and 2011 (as shown in Figure D13). Finally, first-year GPA was the only variable that was found to be significant in 2006, 2010, 2011 and 2012 cohorts (as shown in Figure D14).

**Logistic Regression Model on the Second- to Third- Year Retention**

A series of the sequential logistic regression model (as shown in Figure B1) were performed on second- to third-year retention including the independent variables (pre-college demographics [gender and type of high school] in block 1, pre-college academics [high school GPA and entrance exam score] in block 2, and college GPA in block 3) in three separate blocks. Therefore, the following three logistic regression models predicting second- to third-year retention were compared: Model 1 with gender and type of high school; Model 2 with gender, type of high school, high school GPA, and entrance exam; Model 3 with gender, type of high school, high school GPA, entrance exam, and first-year college GPA. Results are summarized by cohort below.
**Descriptive statistics.** Table E1 summarizes descriptive statistics of independent variables (gender, type of high school, age, HSGPA, entry exam, 1st year GPA, and 2nd year GPA) and retention rate by year for participants who stayed after the second year. As displayed in Table E1, 1043 (88.9%) participants continued in the third year after completing the second year, the majority of which were males. Most of the students ($n = 935, 89.6\%$) come from private high schools. Participants mean age was 18.36 ($SD = 1.79$). The means of high school GPA and entry exam score are 17.25/20 and 79.61/100 with a standard deviation of 1.20 and 6.15 respectively. Finally, the second-year GPA mean is 73.42 with a $SD$ of 20.40.

**Results for 2006 Cohort.** Based on the comparison of models ($\Delta\chi^2(2) = 2.12, p = 0.34$, for Model 2 vs. Model 1, and $\Delta\chi^2(1) = 3.88, p = 0.05$ for Model 3 vs. Model 2), Model 3 was retained as a final because the Nagelkerke $R^2$ obtained from block 3 was the largest at 0.09, compare to 0.01 for block 1 and 0.04 for block 2. However, Model 3 was found to be not significant, $\chi^2(6) = 6.58, p = 0.36$, and thus no further discussions will be made.

**Results for 2007 Cohort.** Based on the comparison of models ($\Delta\chi^2(2) = 5.97, p = 0.05$ for Model 2 vs. Model 1, and $\Delta\chi^2(1) = 0.83, p = 0.36$ for Model 3 vs. Model 2) and Nagelkerke $R^2$ (Nagelkerke $R^2 = 0.75$ for model 3, Nagelkerke $R^2 = 0.00$ for model 1, and Nagelkerke $R^2 = 0.07$ for model 2) Model 3 was retained as a final model.

Overall, it is found that at least one of the slopes in Model 3 is significant ($\chi^2(6) = 7.08, p = 0.31$). In addition, model fit shows that a model with all predictors was an acceptable one ($\chi^2(8) = 8.73, p = 0.40$). After controlling for all other variables in the model 3, it was found that the high school GPA was found to be significant. This
indicates that, for a one-unit increase in age, the odds of retaining students was significantly increased by 65% (OR = 1.65, b = 0.50, SE = 0.22, $\chi^2(1) = 5.04, p = 0.03$). The effect was considered to be small to medium. However, all other predictors were not significant as shown in Table E3.

**Results for 2008 Cohort.** Based on the comparisons of models ($\Delta \chi^2(2) = 0.17$, $p = 0.92$ for Model 2 vs. Model 1, and $\Delta \chi^2(1) = 2.33$, $p = 0.13$ for Model 3 vs. Model 2), and the Nagelkerke $R^2$ that was the largest from block 2 and 3 at 0.03, Model 3 was retained. However, Model 3 was found to be not significant, $\chi^2(6) = 2.64, p = 0.85$ and thus no further discussions will be made.

**Results for 2009 Cohort.** Based on the comparisons of models ($\Delta \chi^2(2) = 0.41$, $p = 0.82$ for Model 2 vs. Model 1, and $\Delta \chi^2(1) = 9.34$, $p < 0.01$ for Model 3 vs. Model 2), a logistic regression model with all predictors (Model 3) was retained as a final model in 2010. The Nagelkerke $R^2$ obtained from block 3 was 0.20, which shows improvements over that of blocks 1 (Nagelkerke $R^2 = 0.06$) and 2 (Nagelkerke $R^2 = 0.07$). Below, results from Model 3 are summarized.

Overall, it is found that at least one of the slopes in Model 3 explained a significant amount of variance in the likelihood of retaining students ($\chi^2(6) = 13.83$, $p = 0.03$). In addition, model fit comparing predicted and observed cases shows that a model with all predictors was an acceptable one ($\chi^2(8) = 2.82$, $p = 0.95$). Specifically, after controlling for all other variables in Model 3, it was found that second-year GPA was significant. This indicates that, for a one-unit increase in the second-year GPA, the odds of retaining students was significantly increased by 5% (OR = 1.05, $b = 0.05$, SE = 0.02,
χ² (1) = 8.68, \( p < 0.01 \). The effect was considered to be small. However, all other predictors were not significant as shown in Table E6.

**Results for 2010 Cohort.** Based on the comparisons of models (\( \Delta \chi^2(2) = 0.35, p = 0.84 \) for Model 2 vs. Model 1, and \( \Delta \chi^2(1) = 19.25, p < 0.01 \) for Model 3 vs. Model 2), a logistic regression model with all predictors (Model 3) was retained as a final model in 2010. The Nagelkerke \( R^2 \) obtained from block 3 was 0.31, which shows improvements over that of blocks 1 (Nagelkerke \( R^2 = 0.03 \)) and 2 (Nagelkerke \( R^2 = 0.03 \)). Below, results from Model 3 are summarized.

Overall, it is found that at least one of the slopes in Model 3 explained a significant amount of variance in the likelihood of retaining students (\( \chi^2(6) = 21.40, p < 0.01 \)). In addition, model fit comparing predicted and observed cases shows that a model with all predictors was an acceptable one (\( \chi^2(8) = 8.04, p = 0.43 \)). Specifically, after controlling for all other variables in Model 3, it was found that second-year GPA was significant. This indicates that, for a one-unit increase in the second-year GPA, the odds of retaining students was significantly increased by 7\% (\( OR = 1.07, b = 0.06, SE = 0.02, \chi^2 (1) = 12.65, p < 0.01 \)). The effect was considered to be small. However, all other predictors were not significant as shown in Table E6.

**Results for 2011 Cohort.** Based on the comparisons of models (\( \Delta \chi^2(2) = 0.438, p = 0.11 \) for Model 2 vs. Model 1, and \( \Delta \chi^2(1) = 4.24, p = 0.04 \) for Model 3 vs. Model 2), a logistic regression model with all predictors (Model 3) was retained as a final model in 2010. The Nagelkerke \( R^2 \) obtained from block 3 was 0.09, which shows improvements over that of blocks 1 (Nagelkerke \( R^2 = 0.02 \)) and 2 (Nagelkerke \( R^2 = 0.05 \)). Below, results from Model 3 are summarized.
Overall, it is found that at least one of the slopes in Model 3 explained a significant amount of variance in the likelihood of retaining students ($\chi^2(6) = 10.87, p = 0.09$). In addition, model fit comparing predicted and observed cases shows that a model with all predictors was an acceptable one ($\chi^2(8) = 7.54, p = 0.48$). Specifically, after controlling for all other variables in Model 3, it was found that second-year GPA was significant. This indicates that, for a one-unit increase in the second-year GPA, the odds of retaining students was significantly increased by 2% (OR = 1.02, $b = 0.02, SE = 0.01$, $\chi^2 (1) = 4.40, p = 0.04$). The effect was considered to be small. However, all other predictors were not significant as shown in Table E7.

Results for 2012 Cohort. Based on the comparison of models ($\Delta \chi^2(2) = 2.20, p = 0.33$ for Model 2 vs. Model 1, and $\Delta \chi^2(1) = 11.18, p < .01$ for Model 3 vs. Model 2) and Nagelkerke $R^2$ (Nagelkerke $R^2 = 0.29$ for model 3, Nagelkerke $R^2 = 0.18$ for model 1, and Nagelkerke $R^2 = 0.20$ for model 2, Model 3 was retained as a model. Below, results from the retained model (Model 3) are summarized.

Overall, it was found that at least one of the slopes in Model 3 is explaining a significant amount of variance in the likelihood of retaining students $\chi^2(6) = 33.61, p < 0.01$. In addition, model fit comparing predicted and observed cases shows that a model with all predictors was an acceptable one ($\chi^2(8) = 3.96, p = 0.86$). Specifically, after controlling for all other variables in Model 3, it was found that gender and second-year GPA was significant. Also this indicates that, after controlling for all other variables in the model, the odds of retaining students in the gender focal group was 89% lower than the odds of retaining students in the reference group (OR = 0.11, $b = -2.19, SE = 0.52$, $\chi^2 (1) = 17.66, p < 0.01$). Furthermore, for a one-unit increase in the second-year GPA, the
odds of retaining students was significantly increased by 4% (OR = 1.04, \( b = 0.04, SE = 0.01, \chi^2 (1) = 10.92, p < 0.01 \)). The effects were considered to be small. However, all other predictors were not significant as shown in Table E8.

**Summary across cohorts.** As shown in figures E9 thru E14 some independent variables, two from block 1 (age and type of high school) and one from block 2 (entry exam score) were not found to be significant factors of retention during the second year of college in any cohort year. Other independent variables (gender, high school GPA, and second-year GPA) were found to be significant factors of retention during the second year of college in at least one cohort year. Gender was found significant only in 2012 (shown in Figure E9), while high school GPA was in 2007 only (shown in Figure E12). Finally, second-year GPA was found to be significant in 2006, 2009, 2010, 2011 and 2012 (Shown in Figure E14).
Chapter Five: Discussion

As discussed in Chapter Two, literature has pointed out the many difficulties freshmen encounter during the transition from high school to college life. The long-lasting positive consequences of college success for society in general and specifically for students and universities provided motive to investigate the issue of college student retention. In Ecuador, for many different reasons, very few efforts have been made to explore the question of why students stay in or leave higher education. Even in the United States, after almost a century of research and intervention regarding students’ retention, the goal of reducing students’ attrition is still elusive for most colleges and universities. Furthermore, the particularities of the Ecuadorian system might provide a different perspective and new insights to the existing retention literature. In addition, the lack of empirical evidence and the absence of a rich data capable of addressing topical retention issues in Ecuador was another reason to pursue retention research based on students attending an Ecuadorian university.

The main research objective of the current study is to analyze the effects of students’ socioeconomic and academic traits on student persistence in the first two years of college in Ecuador. Furthermore, probably even more important would be to help promote a national debate in Ecuador about the potential implications of retention for students, universities, and society as a whole. To accomplish these goals, researchers need to try to set the stage for a long but necessary battle against college student attrition. In the current study, these two goals were addressed by investigating the effects of some widely used predictors such as students’ pre- and in-college traits have on students’ retention in the first two years of college in Ecuador.
Study findings indicated that most of the personal traits evaluated (gender, age, high school GPA, entry exam score, and college GPA) were positively related to retention in the logistic regression models for at least one cohort. Certainly, this study provides the subject institution with valuable information to help increase retention rates. It is also desirable that this study promote a vigorous debate about the implications of retention and the need to change academic philosophy toward a culture of research and practice to help students succeed in college.

A brief context of this work is given below. Study findings are then discussed within the context of existing empirical evidence in the field of retention research. Implications for different entities in Ecuadorian universities including students, faculty, administrators, and institutions themselves, particularly the subject of the study, are covered. Finally, recommendations for future research and some limitations encountered through the process of the study are also given.

**Study Context**

Tinto’s paradigmatic theory of student departure marked a turning point in the study of retention, establishing the foundation for much of the theory and research that followed. Although higher education has changed substantially since Tinto’s seminal work, it is still influential in contemporary retention literature. Among these changes, the new composition of university student bodies is probably the most influential. New types of students and lifestyles are probably the most challenging issues when dealing with students’ retention these days. The presence of more women, underrepresented populations, and older students has influenced the operation of traditional campuses, which now have to modify and adapt their practices to a more diverse student body.
Although American colleges and universities have been traditionally residential, today’s commuter students represent the majority (75%) of total undergraduates in the United States (Complete College America, 2011; Tinto, 2012). In particular, the increase of commuter students in the last 50 years has induced the emergence of new kinds of institutions, specially suited to individuals with adult responsibilities, like family and special schedule needs. This new proportion of commuter students is similar to the traditional composition of Ecuadorian student bodies, where only few students live on university campuses. This fact was the fundamental reason for including Braxton et al.’s (2004, 2014), theory of student departure in commuter colleges and universities, in the study’s conceptual framework.

As a preliminary precaution and to better understand the findings it is relevant to note that contrary to the global trend of a female majority in higher education institutions, on average, men represented 62.4% of participants in the study. In some cohort years, the proportion of men reached 70%. This is explained by the fact that a substantial amount (30%) of these students are enrolled in automotive engineering, which is largely popular among male students.

**Summary of Study Findings**

A number of research questions were addressed by performing a series of sequential logistic regression analyses to predict first- and second-year student retention. Samples were drawn from one campus of a university in Ecuador. Across the seven cohort years, the percentage of freshmen retained after the first year was on average 79.3%. The retention rate of seven cohort years analyzed fluctuated from 71.9% in 2008 to 83.6% in 2010. Furthermore, the percentage of returning students retained after the
second year improved to an average of 88.9% over the seven cohort years, ranging from 79.6% in 2006 to 96% in 2009. In the sequential logistic regression model, first, block 1 examined the influence of some students’ background traits (gender, type of high school, age). Second, block 2 analyzed the additional amount of variation explained by pre-college academic grades (HSGPA and entry exam score) beyond students’ background traits. Lastly, college GPA was added in the third block in order to examine whether college GPA significantly explains more variations after controlling for all the variables included in the previous blocks.

Research question 1 examined the unique effect of student background variables (age, gender, type of high school) on second-year enrollment in a small private Ecuadorian university. The influence of student background variables shown in block 1 was not consistently found throughout all cohort years. After controlling for the other two variables, age and gender were the only variables that were found to be significant in at least one of the cohort years analyzed. Specifically, age was found to be a predictor of second-year enrollment in 2008 and in 2012. In 2012, gender was also found to be a predictor of retention.

Research question 2 aimed to find the unique contribution of pre-college academic preparation variables (high school GPA, admission test scores) on second-year enrollment in a small private Ecuadorian university after controlling for student background variables included in block 1. The analysis of the influence of pre-college academic preparation variables on retention, added to the second block, showed that both variables were found to be significant predictors of first- to second-year retention in at least one cohort after controlling for students’ background variables. Specifically,
admission test score was found to be a significant predictor of retention in 2006 and 2009. HSGPA was found to be a significant factor of retention only in 2008.

It is worth noticing that the analysis of the second block in each cohort indicated that age and gender maintained their significance in the same cohort years as they did in the first block. In other words, these factors did not lose their influence after the inclusion of the pre-college academic preparation variables. Age was found to be significant in 2008, 2009 and 2012. Furthermore, gender was found to predict retention only in 2012.

Research question 3 addressed whether the first-semester college GPA predicts second-year enrollment in a small private Ecuadorian university after controlling for student pre-college traits and academic preparation variables in block 2. College GPA was found to significantly predict first- to second-year retention in four of the seven cohorts studied. Specifically, after controlling for background and pre-college preparation variables, college GPA was found to be a significant predictor of first- to second-year retention in 2006, 2010, 2011, and 2012. As they did in the two previous blocks, the background variables gender and age remained significant in the same cohort years after controlling for other variables in block 3. Gender was a predictor of retention in 2012, while age was found significant in 2008 and 2012.

Research question 4 gauged whether student background variables (age, gender, type of high school) predict third-year enrollment in a small private Ecuadorian university. Third-year enrollment was not significantly predicted by student background variables in most cohorts. However, gender was found to be significant only in 2012 after controlling for students’ background variables.
Research question 5 analyzed whether pre-college academic preparation variables (high school GPA, admission test scores), after controlling for student background variables, are significant predictors of third-year enrollment in a small private Ecuadorian university. The influence of the pre-college academic preparation variables introduced in block 2 were not significant in predicting third-year enrollment in all cohorts, with the exception of the effect of HSGPA in 2007.


Overall, the logistic regression models with all independent variables studied were retained as a final for both outcome variables (second- and third-year enrollment). Although for some cohorts block 3 was not found to be a significant model, the inclusion of academic variables improved the model in all periods studied, as shown by the Nagelkerker $R^2$. Also it was shown that the independent variables were much more influential, predicting students’ retention in the first-year models rather than in the second-year models. In descendent order of number of appearances, first-year GPA (4 times), age (3), entry exam (2), high school GPA (1) and gender (1) were found to be significant in the first-year models. On the other hand, the influence of independent variables dropped considerably in the second year since there were fewer periods in which independent variables influenced retention. The variables found to be significant in the second-year models were second-year GPA (4 times), high school GPA (1) and
gender (1). Results also indicated that gender and college GPA were the only variables repeated as significant variables in the same cohort year for both first and second year. College GPA repeated its significance in 2010, 2011, and 2012, while gender did it only in 2012.

**Conclusions of the Current Study**

Six relevant conclusions can be drawn from the study findings. First, the effects of student characteristics included in the study were found to be stronger in their impacts on second-year enrollment than on third-year enrollment. Independent variables seem to lose predictive power when they predict third-year enrollment. Overall, they were found to be significant predictors ten times in the first-year models, but only six times in the second-year models.

Second, even though variables did not consistently show a significant relationship with outcome variable across all cohorts, each one of them did show similar directions when found to be significant. Age and college GPA were the most powerful in predicting second-year enrollment, while college GPA was the strongest in the third-year enrollment model.

Third, the current study suggests that, when the age variable was found to be significant, older students were at considerably higher risk of not reaching the second year in college than younger students (risk increased between 20 and 30% with each additional age unit), which is consistent with existing literature that implied a relationship between age and attrition (Peltier et al., 1999; Braxton et al., 2004). These authors suggested that succeeding in college is much more difficult for older students because of their out-of-college responsibilities. The study confirmed the influence of college grades
on retention in half of the models (4 in the second-year enrollment model, and 3 in the third-year enrollment model). As noted earlier, past research also highlights the existence of a positive relationship between college GPA and retention: the higher the grades, the greater the probability to persist in the first two years of college (Murtaugh et al., 1999). Tinto, Astin, and Braxton’s theories also stressed the importance of academic involvement for the success college students. Tinto (2012) specifically touched on the positive effect earning credits have on students in the first year of college. Individuals feel they are advancing in their college careers, which add to their motivation and initial commitment to the goal of graduation.

Fourth, even though HSGPA and entry score were not found to be influential factors for retention in the majority of models, these variables should also be considered because, when found significant, their predictive effect was large, especially in the case of HSGPA (59% and 65% for each incremental unit in the two cohorts where it was found as influential, one in each year). Also, there is supporting evidence in the existing literature (Astin, 1975; Astin, Green, & Korn, 1987; Tross, Harper, Osher, & Kneidinger, 2000; Tinto, 1975; Wohlgemuth et al., 2006) that recognizes pre-college academic records as strong predictors of retention. Entry exam showed predictive power twice only in the first year, suggesting it loses influence on retention beyond the first year. The results of the current study contradict existing research that suggests both HSGPA and entry scores as consistently being predictors of retention. Not only the influence of HSGPA and entry score exam on retention was low, the study did not showed much difference between both variables regarding their predictive power on retention. This is consistent with the mixed results of existing literature discussed on chapter 1.
Lastly, the current study indicated a better first-year retention rate (79%) than the 69.8% (ACT, 2014) for US undergraduate private institutions. Even though these figures are not comparable since the former reflects retention at just one Ecuadorian private institution while the latter gives an average of private universities in the United States, they should drive the interest of researchers for reaching comparable numbers. However, the differences in terms of student diversity, institutional structure, and culture could validly explain better retention rates in Ecuador, in the case further research confirms findings for the whole higher education sector.

**Implications**

The relationship among students’ individual traits and retention was confirmed in the current study, especially for first-year retention. The implications of these results for students, faculty, administrators, and the subject institution are important. The importance of student persistence in college until graduation is reflected in the overall well-being of individuals (Pascarella & Terenzini, 2005), their families, universities and states. Hence college student retention should also be of great interest to policy makers at both the local and national levels. Authorities may promote research by requiring colleges and universities to collect and share information with academic and research communities. Regulation agencies should promote a debate about the need for a different system, which would challenge the current one and move away from past practices toward a new academic culture of research and motivated practice. Universities must use the experience already available in the literature as the insight to constructing a research base particular to Ecuador’s context and circumstances. Thus, any improvement in retention rates in Ecuador would be very helpful for all stakeholders. More students would graduate and
enjoy a better quality of life; universities would increase enrollment and income, which would help institutions cover current investment needs; faculty and administrators would benefit from improved job conditions; and the government would receive an economic boost from the active participation of more professionals.

If, in fact, the student diversity of American colleges and universities has been one of the principal causes for the stagnation of retention rates in the United States, a more homogeneous group of students, such as in Ecuador, might improve the efficacy of any intervention Ecuadorian institutions might conduct. The key, of course, will be research and practice. However, since there are important differences between both systems, more research is required to examine the applicability of the current retention knowledge base in Ecuador’s higher education system. The knowledge generated should then be applied through interventions where and when they are needed. Depending on whether current knowledge is applicable to Ecuador, existing theories may need to be adapted to fit Ecuadorian students. In the meantime, however, universities in Ecuador should try to develop some actions with the help of the existing literature, following Tinto’s (2012) suggestion: “The institution must begin by focusing on its own behavior and establishing conditions within its walls that promote retention” (Pos 209).

Current retention knowledge converges on four conditions that promote retention: expectations, support, assessment and feedback, and involvement (Tinto, 2012). The first one is partially related to students’ expectations, about college, which are further shaped by institutional action. Faculty and institutions also establish their expectations about students, especially regarding in-class activities: “High expectations are a condition for student success, low expectations a harbinger of failure. Simply put, no one rises to low
expectations” (Tinto, 2012, p. 7). The second condition, support, is particularly important in achieving students, faculty, and institutions’ expectations. Throughout their college careers, many students need financial, social, and academic support, especially during the first year of university. A sustainable and systematic plan that would support and enhance students, faculty, and institutions’ expectations should be designed and further implemented.

The third condition requires the institution to assess the actions taken and produce feedback for students, faculty, and staff. For example, in class group work may be put in place to help students to engage in academic activities or to help them socialize with peers; or the institution can install new technology in class to help professors and student academic interaction.

Stakeholders should adjust their plans or practices in response to the feedback. Again, this is especially true in first-year classrooms, where students are being exposed to a new environment and have to adjust accordingly (Tinto, 2012). Finally, as pointed out by Tinto (2012), the last condition, involvement, is probably the most important for student success. Students who engage in more interactions with peers, faculty, and staff members are more likely to persist through to graduation. However, Tinto (2012) also advised that all four conditions are necessary and when all of them are in place, students are most likely to remain in college. These conditions should be used as the operational objectives to reach the ultimate goal of increasing the institution’s retention rates, with a special focus on the first year of college.

Although it is very important at this juncture to recognize the structural differences between Ecuador and the United States, the institution can promote many
activities to enhance retention using the existing knowledge, even though some of this knowledge may not necessarily apply to Ecuador. The fact that most Ecuadorian universities lack a well-structured retention department and still experience retention rates similar to the United States suggest that research and well-informed practice could improve rates.

The current study should assist faculty and administrators in developing an intervention plan to help students persist and improve retention rates. Beside some pre-college characteristics identified as predictors, results of the current study suggest that academic performance in college is the most important factor for student retention in the first two years. In order to create the conditions proposed by Tinto that would enhance students’ retention, the starting point would be encouraging faculty and administrators to develop a plan to promote and help students engage in academic activities during the first year, which is the period when most students leave. The importance of the first-year experience for freshmen students and the influence of some pre- and in-college factors should be used to find the students to whom interventions must be directed. Even though the existing knowledge on retention was mainly acquired in the United States, this study confirmed some of these findings, which should provide a framework for short-term action plans until more research is done in Ecuador.

Two general recommendations can be drawn from the current study findings and existing empirical knowledge. First, the institution should create a department that handles students’ retention. For the retention department to operate effectively, the institution needs to appoint a director with outstanding leadership skills, because such an enterprise will require the active participation of faculty, staff, and authorities. The
director of the retention office would need to put together a team that can further influence the institution as a whole. Since many faculty members in Ecuador are part-time professors, universities need to find a way to provide them with an enhanced sense of affiliation to the institution. Thus, anyone within the institution would be committed to the ultimate goal of retention. Faculty and administrators should be aware of the problem and also be convinced about the institution’s need for their active participation in the retention process, especially regarding in-class academic activities (Tinto, 2012). As Braxton et al. (2004) point out in the discussion of student departure in commuter colleges, this final consideration is particularly important for institutions of a commuter nature; as opposed to a residential setting which also offers students informal on-campus activities beside the formality of classes, commuter students are tied to off-campus obligations that restrict their opportunities to engage in other university activities. Hence, these universities have limited opportunity to influence students outside the classroom.

Then, as identified in the study, college GPA and age should be considered the important factors for designing interventions, especially for students in both the first and second year of college. As Tinto (2012) stated, “In no place is support more needed than in the classroom where success is constructed one course at a time” (p. 7). Therefore, students should be given all the in-class support they can get from teachers, peers, and the institution itself so that they feel they are progressing (earning credits) during the first year in college. If students earn credits successfully at the beginning of their college careers their commitment to the goal of graduation will be strengthened (Tinto, 2012). Therefore, student-faculty interaction, in and out of class, is important to help students engage in positive academic activities that could result in better grades and positive
feelings about their college careers. The retention department will need to develop
strategies to detect early signs of academic failure. For example, early testing might help
identify at-risk students and provide closer attention and support to enhance their chances
of academic success. In addition, students could be provided free tutorial sessions and
mentoring programs, which might be more effective with support from faculty members.

Furthermore, peer mentoring could be implemented so that freshmen who miss
their high school friends or are overwhelmed by the new environment receive advice
from senior students. Senior students could help freshmen overcome difficulties by
offering support, sharing their experiences and the way they overcame the difficulties
most freshmen encounter at the beginning of college.

The second recommendation that can be drawn from this study addresses the need
for change in the institutional culture toward research. Such efforts should be expanded to
include other universities, as well as local and national governments, in order to produce
a broader impact. This would be accomplished when other Ecuadorian universities
acknowledge the importance of these activities for the future of higher education and
open the discussion about retention and good practice in Ecuador. As a starting point, it is
imperative to gather and analyze students’ pre- and in-college information to produce
research findings that can be generalized to a broader population in Ecuador. Replicating
the current study in different institutions could be the first step in generating this much-
needed debate.

In order to achieve the aforementioned goal, two steps should be advanced: the
first is basic, but by no means easy. Institutions should create research programs aimed to
train faculty on research methods, while offering incentives to professors and
administrators who engage in helping students succeed, through research and interventions. The second step will require even more effort. Universities need to be convinced about the importance of collecting more information from students and institutions, and then sharing this data with the higher education community. To accomplish this task, universities in Ecuador should be exposed to the benefits that research could offer to institutions and their students. In fact, the institution will need to lead by example sharing the results of and the benefits obtained from its studies. In particular, from the political and economic perspective of higher education institutions, private universities should view retention as an opportunity to increase the income needed to comply with the requirements of regulating agencies. An effective way to reach out to other universities would be to organize seminars with renowned speakers and invite key university accreditation agency and government’s higher education authorities. The main objectives of these events would be to inform all stakeholders of the multiple benefits of increasing retention rates, as well as the development of how-to strategies, by transmitting the research and practice experience of other countries where empirical knowledge on retention has already evolved. For example, exposing the idea that retaining is less costly than recruiting new students may be a powerful weapon in convincing university leaders to embark on the retention enterprise.

Along with inspiring universities’ leaders these seminars must motivate accreditation and government decision makers to help. Since higher education law gives the power to accreditation and higher education officials to control the system, they could require universities to gather relevant retention information about students and the
Institutions themselves and then share it with the whole system in a way confidentiality is granted.

In summary, the study provided some interesting results. It confirmed some of the retention current knowledge. It showed the relationship between college students’ pre-college traits / college GPA and retention in the beginning of college. Student left college at a higher rate in the first year, while the influence of the independent variables was also larger, both compared to the second year. The influence of age found on the first-year is consistent with existing theory (e.g., Astin’s, Tinto’s, Braxton’s theory) and research. Another consistency with existing knowledge was the significance found on academic variables, especially in the case of college GPA that was influential in four of the seven cohorts in both first and second years. The study also suggested better retention rate in Ecuador than the United States. A hypothesis of less student diversity in Ecuador positively influencing retention rates was raised.

Two recommendations were given: the creation of a new department to handle all retention related activities within the institution and the promotion of a nationwide debate on retention with the participation of all stakeholders. Since the importance of retention is reflected in the well-being of students, universities and states, stakeholders such as universities, regulation agencies, and government decision makers should be interested in promoting retention research and practice.

In summary, the study suggests that higher education in Ecuador lacks a culture of systematic retention research and practice, a deficiency reflected throughout Latin America. This gap, however, can also be viewed as an opportunity for the institution and its researchers, faculty and administrators to become leaders in the field, and promote a
vision applicable to the entire region. Reaching this goal begins with trained and qualified professionals dedicated to improving student success. Though the study validated the importance of certain pre-college traits and college GPA for first- and second-year retention, the institution would benefit from amplifying its knowledge base and gathering as much information as possible from students (pre- and in-college) and from campus activities, particularly the interactions taking place in the classroom setting. Qualitative research needs to work together with quantitative results to provide deeper understandings and clearer pictures. Leading by example, the institution should share its new research culture with other universities and government authorities, thereby encouraging a long-term and concerted plan that can only be of service to the country and Latin America.

**Limitations**

Based on the evaluation of pre-entry personal characteristics and in-college characteristics, this study was expected to depict a specific profile of students who decide to leave college early, in order to help them persist to graduation and also to help universities economically endure difficult times by increasing students’ retention. However, it should be noted that probably the other important objective of this work is to promote the retention debate within the Ecuadorian higher education system. This affirmation is based on the lack of important information, not only pre-entry data but also information regarding the academic and social interchanges or experiences among students, faculty and administrative staff during the whole journey to graduation, which exists about colleges and universities in Ecuador. The absence of relevant data imposes an important limitation upon understanding retention in more detail.
Furthermore, the practical implication of findings from this work might be limited to the target institution where the study participants were analyzed. It is important to mention that the original idea was to conduct a multi-institutional study; unfortunately, the unwillingness of other institutions to share information made it impossible to generalize the results of the study. Thus this work might be limited in drawing broader conclusions that can be applied to other private Ecuadorian universities.

The limitations described above, including the lack of useful retention information and the sense of mistrust among Ecuadorian higher education institutions, reaffirmed the need for awareness in exploring the retention problem based on larger populations, to help students, the academic community, and the country.

**Future Research**

The limitations, as outlined above, imply that there is plenty of need and room for future research on retention in Ecuador. This is positive news because research will provide administrators valuable information they need to establish priorities and target the issue of student retention. Retention research and informed interventions may constitute an efficient weapon in combatting attrition, especially in settings of more homogenous student bodies in terms of SES and ethnicity. Certainly, increasing retention rates requires a change of culture toward research, as well as the commitment of many stakeholders: faculty, researchers, administrators, university authorities, and local and national governments.

In the meantime, even though the data available at higher education institutions in Ecuador is limited, replicating this study with multiple institutions may be a good starting point. This effort could continue with a focus on qualitative research to explore the
reasons why students leave or stay. There are many interactions within college life that
affect an individual’s state of mind and the eventual decision to leave (Astin, 1975, 1999:

Even though there is plenty of literature about retention in other regions,
especially the United States, this empirical knowledge cannot be generalized to every
region in the world. Research would determine if the differences between both systems
influence outcomes or if U.S. empirical findings stand in Ecuador as well. Are the
retention rates shown in Ecuadorian studies similar to those found in the United States? If
so, why? The only way to answer these questions would be to replicate these studies in
Ecuador.

There are many key questions that remain unanswered in Ecuador. As an initial
step, it is necessary to track students’ progress and find out, on average, how long it takes
an undergraduate student to graduate. If large percentages of students are delaying
graduation, the institution needs to identify the reasons preventing them from fulfilling
degree requirements within established timelines. In Ecuador, the elevated number of
credits necessary to graduate and the thesis requirement may be affecting graduation rates
by delaying degree completion. If true, empirical research would provide the necessary
data to effect change at a government level. In this sense, conducting research to compare
retention and attrition figures across the public and private sectors might also provide a
clearer picture of higher education in Ecuador.

Another important consideration is the segment of students who leave during the
beginning of college, and the valuable data associated with understanding if and why they
return or do not return to complete their university degrees. Furthermore, research could
also incorporate comparative analyses of retention rates across programs to see if red flags appear that link high attrition rates to particular courses of study, and thereby communicate the need to university stakeholders to undertake a plan of action. It is our belief that only research can provide these questions and answers and a path toward sustained evaluation and improvement. These are just a few of the interesting issues that will hopefully receive the attention of scholars, researchers, administrators, and government authorities.
References


APPENDIX A:

Propositions to test Tinto’s Theory

1. Student entry characteristics affect the level of initial commitment to the institution.

2. Student entry characteristics affect the level of initial commitment to the goal of graduation from college.

3. Student entry characteristics directly affect the student likelihood of persistence in college.

4. Initial commitment to the goal of graduation from college affects the level of academic integration.

5. Initial commitment to the goal of graduation from college affects the level of social integration.

6. Initial commitment to the institution affects the level of social integration.

7. Initial commitment to the institution affects the level of social integration.

8. The greater the degree of academic integration, the greater the level of subsequent commitment to the goal of graduation from college.

9. The greater the degree of social integration, the greater the level of subsequent commitment to the institution.

10. The initial level of institutional commitment affects the subsequent level of institutional commitment.

11. The initial level of commitment to the goal of graduation from college affects the subsequent level of commitment to the goal of college graduation.
12. The greater the level of subsequent level of commitment to the goal of graduation from college, the greater the likelihood of student persistence in college.

13. The greater the level of subsequent level of commitment to the institution, the greater the likelihood of student persistence in college.

Note. Source: Braxton et al., 2014, p. 76
APPENDIX B:

Sequential Regression Models on the Retention

Note. GPA: Grade Point Average; Retention: First- to Second-year retention or Second- to Third-year retention

Figure B1.

Sequential Logistic Regression Model
APPENDIX C:

Descriptive Statistics of Variables for Students Attended from 2006 - 2012

Table C1

Descriptive Statistics of Variables for Each Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Students n (%)</th>
<th>Type HS n (%)</th>
<th>Gender n (%)</th>
<th>Age M (SD)</th>
<th>HSGPA M (SD)</th>
<th>Entry Exam M (SD)</th>
<th>1st Yr GPA M (SD)</th>
<th>2nd Yr GPA M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>149 (10.1)</td>
<td>8 (5.4)</td>
<td>141 (94.6)</td>
<td>77 (51.7)</td>
<td>72 (48.3)</td>
<td>18.68 (2.68)</td>
<td>17.32 (112)</td>
<td>78.11 (5.68)</td>
</tr>
<tr>
<td>2007</td>
<td>202 (13.6)</td>
<td>10 (5.0)</td>
<td>192 (95.0)</td>
<td>109 (54.0)</td>
<td>93 (46.0)</td>
<td>18.63 (2.30)</td>
<td>17.20 (112)</td>
<td>78.25 (5.60)</td>
</tr>
<tr>
<td>2008</td>
<td>210 (14.2)</td>
<td>15 (7.1)</td>
<td>195 (92.9)</td>
<td>104 (49.5)</td>
<td>106 (50.5)</td>
<td>18.30 (1.21)</td>
<td>17.39 (1.30)</td>
<td>77.83 (5.90)</td>
</tr>
<tr>
<td>2009</td>
<td>218 (14.7)</td>
<td>21 (9.6)</td>
<td>197 (90.4)</td>
<td>146 (67.0)</td>
<td>72 (33.0)</td>
<td>18.34 (1.42)</td>
<td>17.18 (1.25)</td>
<td>78.81 (6.05)</td>
</tr>
<tr>
<td>2010</td>
<td>201 (13.6)</td>
<td>19 (9.5)</td>
<td>182 (90.5)</td>
<td>137 (68.2)</td>
<td>64 (31.8)</td>
<td>18.29 (1.56)</td>
<td>17.25 (1.19)</td>
<td>79.22 (6.34)</td>
</tr>
<tr>
<td>2011</td>
<td>270 (18.2)</td>
<td>37 (13.7)</td>
<td>233 (86.3)</td>
<td>185 (68.5)</td>
<td>85 (31.5)</td>
<td>18.65 (2.15)</td>
<td>17.10 (1.16)</td>
<td>81.12 (6.33)</td>
</tr>
<tr>
<td>2012</td>
<td>230 (15.5)</td>
<td>39 (17.0)</td>
<td>191 (83.0)</td>
<td>163 (70.9)</td>
<td>67 (29.1)</td>
<td>18.65 (2.02)</td>
<td>16.82 (1.15)</td>
<td>80.99 (6.30)</td>
</tr>
<tr>
<td>Total</td>
<td>1480</td>
<td>149 (10.1)</td>
<td>1331 (89.9)</td>
<td>923 (62.4)</td>
<td>557 (37.6)</td>
<td>18.51 (1.94)</td>
<td>17.16 (1.20)</td>
<td>79.34 (6.19)</td>
</tr>
</tbody>
</table>

Note. HS: high school; HSGPA: High School Grade Point Average; GPA: Grade Point Average; Yr: year
Table C2

*Numbers and Percentages of Total Retained Students for Each Cohort*

<table>
<thead>
<tr>
<th>Cohort</th>
<th>( n ) (%) of Students</th>
<th>( n ) (%) of Students after 1st Yr</th>
<th>( n ) (%) of Students after 2nd Yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>149 (10.1%)</td>
<td>113 (75.8%)</td>
<td>90 (79.6%)</td>
</tr>
<tr>
<td>2007</td>
<td>202 (13.6%)</td>
<td>168 (83.2%)</td>
<td>146 (86.9%)</td>
</tr>
<tr>
<td>2008</td>
<td>210 (14.2%)</td>
<td>151 (71.9%)</td>
<td>130 (86.1%)</td>
</tr>
<tr>
<td>2009</td>
<td>218 (14.7%)</td>
<td>177 (81.2%)</td>
<td>170 (96.0%)</td>
</tr>
<tr>
<td>2010</td>
<td>201 (13.6%)</td>
<td>168 (83.6%)</td>
<td>159 (94.6%)</td>
</tr>
<tr>
<td>2011</td>
<td>270 (18.2%)</td>
<td>211 (78.1%)</td>
<td>186 (88.2%)</td>
</tr>
<tr>
<td>2012</td>
<td>230 (15.5%)</td>
<td>185 (80.4%)</td>
<td>162 (87.6%)</td>
</tr>
<tr>
<td>Total</td>
<td>1480 (100%)</td>
<td>1173 (79.3%)</td>
<td>1043 (88.9%)</td>
</tr>
</tbody>
</table>

*Note.* Yr: Year
**APPENDIX D:**

**Descriptive Statistics and Regression Models on the First- to Second-Year Retention**

Table D1

*Descriptive Statistics of Variables included in the Logistic Regression Model predicting the First- to Second-Year Retention*

<table>
<thead>
<tr>
<th>Cohort</th>
<th>n of students</th>
<th>Type HS</th>
<th>Gender</th>
<th>Age</th>
<th>HS GPA</th>
<th>Entry Exam</th>
<th>1st Yr GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Public n (%)</td>
<td>Private n (%)</td>
<td>Male n (%)</td>
<td>Female n (%)</td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>2006</td>
<td>113</td>
<td>7 (6.2)</td>
<td>106 (93.8)</td>
<td>60 (53.1)</td>
<td>53 (46.9)</td>
<td>18.72 (3.02)</td>
<td>17.35 (1.19)</td>
</tr>
<tr>
<td>2007</td>
<td>168</td>
<td>9 (5.4)</td>
<td>159 (94.6)</td>
<td>88 (52.4)</td>
<td>80 (47.6)</td>
<td>18.63 (2.26)</td>
<td>17.23 (1.16)</td>
</tr>
<tr>
<td>2008</td>
<td>151</td>
<td>13 (8.6)</td>
<td>138 (91.4)</td>
<td>74 (49.0)</td>
<td>77 (51.0)</td>
<td>18.16 (1.13)</td>
<td>17.55 (1.23)</td>
</tr>
<tr>
<td>2009</td>
<td>177</td>
<td>19 (10.7)</td>
<td>158 (89.3)</td>
<td>120 (67.8)</td>
<td>57 (32.2)</td>
<td>18.23 (1.21)</td>
<td>17.21 (1.27)</td>
</tr>
<tr>
<td>2010</td>
<td>168</td>
<td>16 (9.5)</td>
<td>152 (90.5)</td>
<td>115 (68.5)</td>
<td>53 (31.5)</td>
<td>18.24 (1.36)</td>
<td>17.28 (1.16)</td>
</tr>
<tr>
<td>2011</td>
<td>211</td>
<td>30 (14.2)</td>
<td>181 (85.8)</td>
<td>145 (68.7)</td>
<td>66 (31.3)</td>
<td>18.55 (1.85)</td>
<td>17.13 (1.17)</td>
</tr>
<tr>
<td>2012</td>
<td>185</td>
<td>30 (16.2)</td>
<td>155 (83.8)</td>
<td>138 (74.6)</td>
<td>47 (25.4)</td>
<td>18.31 (1.74)</td>
<td>16.88 (1.16)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1173</strong></td>
<td><strong>124 (10.6)</strong></td>
<td><strong>1049 (89.4)</strong></td>
<td><strong>740 (63.1)</strong></td>
<td><strong>433 (36.9)</strong></td>
<td><strong>18.40 (1.83)</strong></td>
<td><strong>17.21 (1.20)</strong></td>
</tr>
</tbody>
</table>

*Note.* HS: High school; GPA: Grade Point Average
Table D2

Results from Logistic Regression Model on the First- to Second-year Retention for 2006 Cohort

<table>
<thead>
<tr>
<th>Block</th>
<th>Block1</th>
<th>Block2</th>
<th>Block3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intercept</td>
<td>Type of high school</td>
<td>Gender</td>
</tr>
<tr>
<td>b</td>
<td>SE(b)</td>
<td>OR</td>
<td>b</td>
</tr>
<tr>
<td>1.93</td>
<td>2.04</td>
<td>6.87</td>
<td>1.79</td>
</tr>
<tr>
<td>-0.89</td>
<td>1.11</td>
<td>0.41</td>
<td>-0.76</td>
</tr>
<tr>
<td>-0.27</td>
<td>0.39</td>
<td>0.76</td>
<td>-0.45</td>
</tr>
<tr>
<td>0.01</td>
<td>0.08</td>
<td>1.01</td>
<td>0.02</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Block</th>
<th>Block2</th>
<th>Block3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HSGPA</td>
<td>Entry exam</td>
</tr>
<tr>
<td>b</td>
<td>SE(b)</td>
<td>OR</td>
</tr>
<tr>
<td>0.35</td>
<td>0.22</td>
<td>1.42</td>
</tr>
<tr>
<td>-0.08*</td>
<td>0.04</td>
<td>0.93</td>
</tr>
</tbody>
</table>

\( \Delta \chi^2 \) 5.28 16.51**  
\( \Delta df \) 2 1  
\( -2LL \) 163.52 158.24 141.73  
\( \chi^2 \) 1.26 6.54 23.05**  
\( df \) 3 5 6  
Nagelkerke \( R^2 \) 0.01 0.06 0.21

Note. HSGPA: High School Grade Point Average; First GPA: First year Grade Point Average; * \( p < .05 \); ** \( p < .01 \)
Table D3

Results from Logistic Regression Model on the First- to Second-year Retention in 2007

<table>
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<tr>
<th>Block1</th>
<th></th>
<th></th>
<th></th>
<th>Block2</th>
<th></th>
<th></th>
<th></th>
<th>Block3</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>b</td>
<td>SE(b)</td>
<td>OR</td>
<td>b</td>
<td>SE(b)</td>
<td>OR</td>
<td>b</td>
<td>SE(b)</td>
<td>OR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Intercept</td>
<td>2.30</td>
<td>1.82</td>
<td>9.99</td>
<td>-3.08</td>
<td>4.58</td>
<td>0.05</td>
<td>-5.87</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Type of high school</td>
<td>-0.65</td>
<td>1.07</td>
<td>0.52</td>
<td>-0.94</td>
<td>1.10</td>
<td>0.39</td>
<td>-1.06</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gender</td>
<td>0.40</td>
<td>0.39</td>
<td>1.49</td>
<td>0.53</td>
<td>0.42</td>
<td>1.70</td>
<td>0.52</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Age</td>
<td>-0.02</td>
<td>0.08</td>
<td>0.98</td>
<td>0.01</td>
<td>0.09</td>
<td>1.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Block2</td>
<td></td>
<td></td>
<td></td>
<td>HSGPA</td>
<td>-0.03</td>
<td>0.20</td>
<td>0.97</td>
<td>-0.02</td>
<td>0.21</td>
<td>0.98</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Entry exam</td>
<td>0.07</td>
<td>0.04</td>
<td>1.08</td>
<td>0.10*</td>
<td>0.04</td>
<td>1.10</td>
<td></td>
</tr>
<tr>
<td>Block3</td>
<td></td>
<td></td>
<td></td>
<td>First GPA</td>
<td></td>
<td></td>
<td></td>
<td>0.02</td>
<td>0.01</td>
<td>1.02</td>
<td></td>
</tr>
</tbody>
</table>

Δ χ² | 3.69 | 1.99 |
Δ df | 2 | 1 |
-2LL | 181.62 | 177.93 | 175.95 |
χ² | 1.47 | 5.16 | 7.15 |
df | 3 | 5 | 6 |
Nagelkerke R² | 0.01 | 0.04 | 0.06 |

*Note.* HSGPA: High School Grade Point Average; First GPA: First year Grade Point Average; *p < .05; **p < .01
Table D4

Results from Logistic Regression Model on the First- to Second-year Retention in 2008

<table>
<thead>
<tr>
<th>Block1</th>
<th>b</th>
<th>SE(b)</th>
<th>OR</th>
<th>b</th>
<th>SE(b)</th>
<th>OR</th>
<th>b</th>
<th>SE(b)</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>9.41**</td>
<td>2.88</td>
<td>1221</td>
<td>1.28</td>
<td>3.90</td>
<td>145.53</td>
<td>2.90</td>
<td>4.07</td>
<td>18.17</td>
</tr>
<tr>
<td>Type of high school</td>
<td>-1.58</td>
<td>0.85</td>
<td>0.21</td>
<td>-1.71</td>
<td>0.86</td>
<td>0.18</td>
<td>-1.61</td>
<td>0.85</td>
<td>0.20</td>
</tr>
<tr>
<td>Gender</td>
<td>0.24</td>
<td>0.32</td>
<td>1.27</td>
<td>-0.15</td>
<td>0.35</td>
<td>0.86</td>
<td>-0.39</td>
<td>0.38</td>
<td>0.68</td>
</tr>
<tr>
<td>Age</td>
<td>-0.39**</td>
<td>0.14</td>
<td>0.68</td>
<td>-0.37**</td>
<td>0.14</td>
<td>0.69</td>
<td>-0.35*</td>
<td>0.14</td>
<td>0.70</td>
</tr>
<tr>
<td>Block2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSGPA</td>
<td></td>
<td></td>
<td></td>
<td>0.44**</td>
<td>0.15</td>
<td>1.56</td>
<td>0.46**</td>
<td>0.15</td>
<td>1.59</td>
</tr>
<tr>
<td>Entry exam</td>
<td></td>
<td></td>
<td></td>
<td>-0.04</td>
<td>0.03</td>
<td>0.96</td>
<td>-0.04</td>
<td>0.03</td>
<td>0.96</td>
</tr>
<tr>
<td>Block3</td>
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<td>First GPA</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.02</td>
<td>0.01</td>
</tr>
</tbody>
</table>

\[ \Delta \chi^2 \]
|       | 9.87**|       | 3.32 |
| \[ \Delta df \] | 2     |       | 1    |
| -2LL  | 237.86| 227.99| 224.67|
| \[ \chi^2 \]  | 11.56 | 21.43**| 24.75**|
| \[ df \]   | 3     | 5     | 6    |
| Nagelkerke $R^2$ | 0.08  | 0.14  | 0.16 |

Note. HSGPA: High School Grade Point Average; First GPA: First year Grade Point Average; * $p < .05$; ** $p < .01$
Table D5

Results from Logistic Regression Model on the First- to Second-year Retention in 2009

<table>
<thead>
<tr>
<th></th>
<th>Block1</th>
<th>Block2</th>
<th>Block3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$B$</td>
<td>$SE(b)$</td>
<td>OR</td>
</tr>
<tr>
<td>Intercept</td>
<td>$6.89^{**}$</td>
<td>2.15</td>
<td>984.23</td>
</tr>
<tr>
<td>Type of high school</td>
<td>-0.83</td>
<td>0.77</td>
<td>0.44</td>
</tr>
<tr>
<td>Gender</td>
<td>-0.21</td>
<td>0.37</td>
<td>0.81</td>
</tr>
<tr>
<td>Age</td>
<td>-0.25*</td>
<td>0.11</td>
<td>0.78</td>
</tr>
<tr>
<td>HSGPA</td>
<td>0.22</td>
<td>0.17</td>
<td>1.24</td>
</tr>
<tr>
<td>Entry exam</td>
<td>-0.08*</td>
<td>0.03</td>
<td>0.93</td>
</tr>
<tr>
<td>First GPA</td>
<td>0.01</td>
<td>0.01</td>
<td>1.01</td>
</tr>
<tr>
<td>$\Delta \chi^2$</td>
<td>6.34*</td>
<td></td>
<td>2.46</td>
</tr>
<tr>
<td>$\Delta df$</td>
<td>2</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>$-2LL$</td>
<td>203.83</td>
<td>197.49</td>
<td>195.03</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>6.94</td>
<td>13.28*</td>
<td>15.74*</td>
</tr>
<tr>
<td>$df$</td>
<td>3</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Nagelkerke $R^2$</td>
<td>0.05</td>
<td>0.10</td>
<td>0.11</td>
</tr>
</tbody>
</table>

Note. HSGPA: High School Grade Point Average; First GPA: First year Grade Point Average; * $p < .05$; ** $p < .01$
Table D6

Results from Logistic Regression Model on the First- to Second-year Retention in 2010

<table>
<thead>
<tr>
<th>Block</th>
<th>Variable</th>
<th>$b$</th>
<th>$SE(b)$</th>
<th>OR</th>
<th>$b$</th>
<th>$SE(b)$</th>
<th>OR</th>
<th>$b$</th>
<th>$SE(b)$</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block1</td>
<td>Intercept</td>
<td>3.61</td>
<td>2.02</td>
<td>36.80</td>
<td>-0.69</td>
<td>4.26</td>
<td>0.50</td>
<td>-9.17</td>
<td>4.99</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Type of high school</td>
<td>-0.00</td>
<td>0.67</td>
<td>1.00</td>
<td>-0.11</td>
<td>0.68</td>
<td>0.88</td>
<td>-0.11</td>
<td>0.70</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td>Gender</td>
<td>-0.11</td>
<td>0.41</td>
<td>0.90</td>
<td>-0.19</td>
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</table>

$\Delta \chi^2$  1.41
$\Delta df$      2
$-2LL$            178.53
$\chi^2$         0.98
$df$             3
Nagelkerke $R^2$ 0.01

Note. HSGPA: High School Grade Point Average; First GPA: First year Grade Point Average; * $p < .05$; ** $p < .01$
Table D7

Results from Logistic Regression Model on the First- to Second-year Retention in 2011

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<th>SE(b)</th>
<th>OR</th>
<th>b</th>
<th>SE(b)</th>
<th>OR</th>
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<td>27.99</td>
<td>-0.73</td>
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<td>0.06</td>
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<td>0.08</td>
<td>0.92</td>
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<td>1.04</td>
<td>0.06*</td>
<td>0.03</td>
<td>1.06</td>
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</tr>
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<tr>
<td>First GPA</td>
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<td></td>
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<td></td>
<td>0.04**</td>
<td>0.01</td>
<td>1.04</td>
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</tr>
</tbody>
</table>

| Δχ²         | 2.92  |       | 33.89**|
| Δdf         | 2     |       | 1     |
| -2LL        | 280.95| 278.03| 244.14|
| χ²          | 2.56  | 5.48  | 39.37**|
| df          | 3     | 5     | 6     |
| Nagelkerke R²| 0.02  | 0.03  | 0.21  |

Note. HSGPA: High School Grade Point Average; First GPA: First year Grade Point Average; * p < .05; ** p < .01
Table D8

Results from Logistic Regression Model on the First- to Second-year Retention in 2012

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<th>OR</th>
<th>$b$</th>
<th>$SE(b)$</th>
<th>OR</th>
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<td>1.71</td>
<td>0.42</td>
<td>0.48</td>
<td>1.53</td>
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<td>-1.35**</td>
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<td>0.26</td>
<td>-1.34**</td>
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<td>0.64</td>
<td>-0.41**</td>
<td>0.09</td>
<td>0.66</td>
<td>-0.34**</td>
<td>0.09</td>
<td>0.71</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>HSGPA</td>
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<td>0.17</td>
<td>1.20</td>
<td>0.24</td>
<td>0.18</td>
<td>1.27</td>
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<td>1.05</td>
<td>0.06</td>
<td>0.03</td>
<td>1.06</td>
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<td>Block 3</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.03**</td>
<td>0.01</td>
</tr>
</tbody>
</table>

$\Delta \chi^2$ | 4.15 | 10.30** |
$\Delta df$ | 2 | 1 |
$-2LL$ | 192.50 | 188.36 | 178.06 |
$\chi^2$ | 34.89** | 39.03** | 49.33 |
$df$ | 3 | 5 | 6 |
Nagelkerke $R^2$ | 0.22 | 0.25 | 0.31 |

*Note. HSGPA: High School Grade Point Average; First GPA: First year Grade Point Average; * $p < .05$; ** $p < .01$
Figure D9.

Gender on the First- to Second-year Retention Across the Cohorts
Figure D10.

Age on the First- to Second-year Retention Across the Cohorts
Figure D11.

Type High School on the First- to Second-year Retention Across the Cohorts
Figure D12.

High School GPA on the First- to Second-year Retention Across the Cohorts
Figure D13.

Entry Score on the First- to Second-year Retention Across the Cohorts
**Figure D14.**

*First Year GPA on the First- to Second-year Retention Across the Cohorts*
APPENDIX E:

Descriptive Statistics and Regression Models on the Second- to Third-Year Retention

Table E1

Descriptive Statistics of Variables included in the Logistic Regression Model predicting the Second- to Third-Year Retention

<table>
<thead>
<tr>
<th>Cohort</th>
<th>n of students</th>
<th>Type HS</th>
<th>Gender</th>
<th>Age</th>
<th>HSGPA</th>
<th>Entry Exam</th>
<th>2nd Yr GPA</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Public n (%)</td>
<td>Private n (%)</td>
<td>Male n (%)</td>
<td>Female n (%)</td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>2006</td>
<td>90</td>
<td>6 (6.7)</td>
<td>84 (93.3)</td>
<td>47 (52.2)</td>
<td>43 (47.8)</td>
<td>18.70 (2.39)</td>
<td>17.43 (1.18)</td>
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<tr>
<td>2007</td>
<td>146</td>
<td>8 (5.5)</td>
<td>138 (94.5)</td>
<td>68 (46.6)</td>
<td>78 (53.4)</td>
<td>18.62 (2.39)</td>
<td>17.31 (1.18)</td>
</tr>
<tr>
<td>2008</td>
<td>130</td>
<td>11 (8.5)</td>
<td>119 (91.5)</td>
<td>64 (49.2)</td>
<td>66 (50.8)</td>
<td>18.17 (1.77)</td>
<td>17.56 (1.23)</td>
</tr>
<tr>
<td>2009</td>
<td>170</td>
<td>19 (11.2)</td>
<td>151 (88.8)</td>
<td>113 (66.5)</td>
<td>57 (33.5)</td>
<td>18.22 (1.20)</td>
<td>17.21 (1.24)</td>
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<tr>
<td>2010</td>
<td>159</td>
<td>15 (9.4)</td>
<td>144 (90.6)</td>
<td>110 (69.2)</td>
<td>49 (30.8)</td>
<td>18.21 (1.38)</td>
<td>17.30 (1.16)</td>
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<tr>
<td>2011</td>
<td>186</td>
<td>25 (13.4)</td>
<td>161 (86.6)</td>
<td>125 (67.2)</td>
<td>61 (32.8)</td>
<td>18.46 (1.79)</td>
<td>17.18 (1.19)</td>
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<tr>
<td>2012</td>
<td>162</td>
<td>24 (14.8)</td>
<td>138 (85.2)</td>
<td>129 (79.6)</td>
<td>33 (20.4)</td>
<td>18.25 (1.63)</td>
<td>16.92 (1.13)</td>
</tr>
<tr>
<td>Total</td>
<td>1043</td>
<td>108 (10.4)</td>
<td>935 (89.6)</td>
<td>666 (63.9)</td>
<td>377 (36.1)</td>
<td>18.36 (1.79)</td>
<td>17.25 (1.20)</td>
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Note. HS: High School; HSGPA: High School Grade Point Average; GPA: Grade Point Average
Table E2

Results from Logistic Regression Model on the Second- to Third-year Retention in 2006

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<td>0.09</td>
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<td>0.01</td>
<td>0.09</td>
<td>1.01</td>
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<td>1.02</td>
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<td>Block3</td>
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<td>0.01</td>
<td>0.01</td>
<td>1.02</td>
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</table>

\[ \Delta \chi^2 = 2.12 \]
\[ \Delta df = 2 \]
\[ -2LL = 121.32 \]  \[ 119.20 \]  \[ 115.32 \]
\[ \chi^2 = 0.576 \]  \[ 2.70 \]  \[ 6.58 \]
\[ df = 3 \]  \[ 5 \]  \[ 6 \]
\[ Nagelkerke R^2 = 0.01 \]  \[ 0.04 \]  \[ 0.09 \]

Note. HSGPA: High School Grade Point Average; Second GPA: Second year Grade Point Average; * p < .05; ** p < .01
Table E3

Results from Logistic Regression Model on the Second- to Third-year Retention in 2007

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<th>Gender</th>
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<th>HSGPA</th>
<th>Entry exam</th>
<th>Second GPA</th>
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<td>SE($b$)</td>
<td>OR</td>
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<td>0.66</td>
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</table>

$\Delta \chi^2$ | 5.97 | 0.83 |
$\Delta df$ | 2 | 1 |
$-2LL$ | 133.88 | 127.92 | 127.09 |
$\chi^2$ | 0.28 | 6.25 | 7.08 |
$df$ | 3 | 5 | 6 |
Nagelkerke $R^2$ | 0.00 | 0.07 | 0.08 |

Note. HSGPA: High School Grade Point Average; Second GPA: Second year Grade Point Average; * $p < .05$; ** $p < .01$
Table E4

Results from Logistic Regression Model on the Second- to Third-year Retention in 2008

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<td>0.86</td>
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<td>Gender</td>
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<td>-0.17</td>
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<td>0.08</td>
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<td>1.01</td>
<td>0.02</td>
<td>0.04</td>
<td>1.02</td>
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</tr>
</tbody>
</table>

Δχ^2  0.17  2.33
Δdf    2  1
-2LL  125.25  125.08  122.75
χ^2   0.13  0.30  2.64
df    3  5  6
Nagelkerke R^2  0.00  0.00  0.03

Note. HSGPA: High School Grade Point Average; Second GPA: Second year Grade Point Average; *p < .05; **p < .01
Table E5

Results from Logistic Regression Model on the Second- to Third-year Retention in 2009

<table>
<thead>
<tr>
<th>Block1</th>
<th>b</th>
<th>SE(b)</th>
<th>OR</th>
<th>b</th>
<th>SE(b)</th>
<th>OR</th>
<th>b</th>
<th>SE(b)</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>22.57</td>
<td>9159.07</td>
<td>6346068671.14</td>
<td>21.71</td>
<td>9123.29</td>
<td>2671458791.77</td>
<td>13.68</td>
<td>8875.60</td>
<td>868604.06</td>
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<tr>
<td>Type of high school</td>
<td>-18.70</td>
<td>9159.07</td>
<td>0.00</td>
<td>-18.77</td>
<td>9123.28</td>
<td>0.00</td>
<td>-18.42</td>
<td>8875.60</td>
<td>0.00</td>
</tr>
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<td>Gender</td>
<td>0.86</td>
<td>0.80</td>
<td>2.36</td>
<td>0.97</td>
<td>0.88</td>
<td>2.63</td>
<td>0.82</td>
<td>0.89</td>
<td>2.28</td>
</tr>
<tr>
<td>Age</td>
<td>-0.82</td>
<td>0.24</td>
<td>0.92</td>
<td>-0.08</td>
<td>0.25</td>
<td>0.93</td>
<td>-0.07</td>
<td>0.26</td>
<td>0.93</td>
</tr>
</tbody>
</table>

Block2

| HSGPA                   | -0.11  | 0.31       | 0.90    | -0.05  | 0.32       | 0.96    |
| Entry exam              | 0.03   | 0.06       | 1.04    | 0.08   | 0.06       | 1.09    |

Block3

| Second GPA              | 0.05*  | 0.02       | 1.05    |

\[\Delta \chi^2 = 9.34^{**}\]

<table>
<thead>
<tr>
<th>\Delta df</th>
<th>\chi^2</th>
<th>df</th>
<th>Nagelkerke R^2</th>
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<tbody>
<tr>
<td>2</td>
<td>78.35</td>
<td>77.94</td>
<td>68.60</td>
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<tr>
<td>5</td>
<td>4.08</td>
<td>4.48</td>
<td>13.83</td>
</tr>
<tr>
<td>6</td>
<td>0.06</td>
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*Note. HSGPA: High School Grade Point Average; Second GPA: Second year Grade Point Average; *p < .05; **p < .01*
Table E6

Results from Logistic Regression Model on the Second- to Third-year Retention in 2010

<table>
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<th></th>
<th>Block3</th>
<th></th>
</tr>
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<tr>
<td>b</td>
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<td>3.21</td>
<td>1113.74</td>
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<td>7.12</td>
<td>25.18</td>
<td>-9.20</td>
<td>8.75</td>
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<td>0.04</td>
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<td>OR</td>
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<td>0.04</td>
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<td>Gender</td>
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<td>0.16</td>
<td>0.79</td>
<td>-0.20</td>
<td>0.17</td>
<td>0.82</td>
<td>-0.22</td>
<td>0.21</td>
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<tr>
<td>HSGPA</td>
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<td>0.32</td>
<td>1.12</td>
<td>0.09</td>
<td>0.39</td>
<td>1.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entry exam</td>
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<td>0.06</td>
<td>1.02</td>
<td>0.14</td>
<td>0.08</td>
<td>1.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second GPA</td>
<td>0.06*</td>
<td>0.02</td>
<td>1.07</td>
<td>0.06*</td>
<td>0.02</td>
<td>1.07</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Δχ²               | 0.35         |    |    | 19.25**      |    |    |

Note. HSGPA: High School Grade Point Average; Second GPA: Second year Grade Point Average; *p < .05; **p < .01
Table E7

Results from Logistic Regression Model on the Second- to Third-year Retention in 2011

<table>
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<tr>
<th>Block</th>
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<th>OR</th>
<th>b</th>
<th>SE(b)</th>
<th>OR</th>
<th>b</th>
<th>SE(b)</th>
<th>OR</th>
</tr>
</thead>
<tbody>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>3.65*</td>
<td>1.75</td>
<td>38.34</td>
<td>-4.34</td>
<td>4.27</td>
<td>0.13</td>
<td>-6.43</td>
<td>4.48</td>
<td>0.00</td>
</tr>
<tr>
<td>Type of high school</td>
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<td>0.42</td>
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<td>0.57</td>
<td>0.54</td>
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<td>Gender</td>
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<td>0.86</td>
<td>-0.37</td>
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<td>-0.39</td>
<td>0.47</td>
<td>0.68</td>
</tr>
<tr>
<td>Age</td>
<td>-0.12</td>
<td>0.09</td>
<td>0.89</td>
<td>-0.10</td>
<td>0.09</td>
<td>0.91</td>
<td>-0.12</td>
<td>0.10</td>
<td>0.89</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>HSGPA</td>
<td>0.25</td>
<td>0.19</td>
<td>1.28</td>
<td>0.29</td>
<td>0.20</td>
<td>1.34</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Entry exam</td>
<td>0.04</td>
<td>0.03</td>
<td>1.04</td>
<td>0.05</td>
<td>0.03</td>
<td>1.05</td>
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</tr>
<tr>
<td>Block3</td>
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</tr>
<tr>
<td>Second GPA</td>
<td>0.02</td>
<td>0.01</td>
<td>1.02</td>
<td></td>
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</tr>
</tbody>
</table>

\[ \Delta \chi^2 \]
\[ \Delta df \]
\[ -2LL \]
\[ \chi^2 \]
\[ df \]
\[ Nagelkerke R^2 \]

Note. HSGPA: High School Grade Point Average; Second GPA: Second year Grade Point Average; * p < .05; ** p < .01
Table E8

Results from Logistic Regression Model on the Second- to Third-year Retention in 2012

<table>
<thead>
<tr>
<th>Block1</th>
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<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>5.56*</td>
<td>2.06</td>
<td>259.78</td>
<td>-0.99</td>
<td>4.88</td>
<td>0.37</td>
<td>-7.13</td>
<td>5.48</td>
</tr>
<tr>
<td>Type of high school</td>
<td>0.82</td>
<td>0.56</td>
<td>2.26</td>
<td>0.86</td>
<td>0.56</td>
<td>2.37</td>
<td>0.90</td>
<td>0.58</td>
</tr>
<tr>
<td>Gender</td>
<td>-1.92**</td>
<td>0.46</td>
<td>0.15</td>
<td>-2.02**</td>
<td>0.49</td>
<td>0.13</td>
<td>-2.19**</td>
<td>0.52</td>
</tr>
<tr>
<td>Age</td>
<td>-0.21</td>
<td>0.11</td>
<td>0.82</td>
<td>-0.17</td>
<td>0.11</td>
<td>0.84</td>
<td>-0.18</td>
<td>0.12</td>
</tr>
</tbody>
</table>

| Block2                |       |       |   |       |   |       |   |       |
| HSGPA                 | 0.22 | 0.20 | 1.24 | 0.28 | 0.21 | 1.33 |
| Entry exam            | 0.03 | 0.04 | 1.03 | 0.06 | 0.04 | 1.06 |
| Block3                |       |       |   |       |   |       |   |       |
| Second GPA            | 0.04** | 0.01 | 1.04 |

| Δχ²  |       |       |   |       |   |       |   |       |
| Δdf  | 2     | 1     |   |       |   |       |   |       |
| -2LL | 137.03 | 134.84 | 123.66 |
| χ²   | 20.23** | 22.43** | 33.61** |
| df   | 3     | 5     | 6  |       |   |       |   |       |
| Nagelkerke R²        | 0.18 | 0.20 | 0.29 |

*Note. HSGPA: high school Grade Point Average; Second GPA: Second year Grade Point Average; * p < .05; ** p < .01*
Figure E9.

*Gender on the Second- to Third-year Retention Across the Cohorts*
Figure E10.

*Type High School on the Second- to Third-year Retention Across the Cohorts*
Figure E11.

Age on the Second- to Third-year Retention Across the Cohorts
**Figure E12.**

*High School GPA on the Second- to Third-year Retention Across the Cohorts*
Figure E13.

Entry Score on the Second- to Third-year Retention Across the Cohorts
Figure E14.

Second Year GPA on the Second- to Third-year Retention Across the Cohorts