Pre-college Characteristics Affecting Student’s College Graduation in Ecuador

Diego Perez
University of Miami, dperez@internacional.edu.ec

Follow this and additional works at: https://scholarlyrepository.miami.edu/oa_dissertations

Recommended Citation
https://scholarlyrepository.miami.edu/oa_dissertations/1485

This Open access is brought to you for free and open access by the Electronic Theses and Dissertations at Scholarly Repository. It has been accepted for inclusion in Open Access Dissertations by an authorized administrator of Scholarly Repository. For more information, please contact repository.library@miami.edu.
UNIVERSITY OF MIAMI

PRE-COLLEGE CHARACTERISTICS AFFECTING STUDENT’S COLLEGE GRADUATION IN ECUADOR

By

Diego Perez

A DISSERTATION

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

Coral Gables, Florida

August 2015
A dissertation submitted in partial fulfillment of
the requirements for the degree of
Doctor of Education

PRE-COLLEGE CHARACTERISTICS AFFECTING STUDENT’S COLLEGE
GRADUATION IN ECUADOR

Diego Perez

Approved:

Soyeon Ahn, Ph.D.
Associate Professor, Department of
Educational and Psychological Studies

Marie Guerda Nicolas, Ph.D.
Associate Professor, Department of
Educational and Psychological Studies

Scott Ingold, Ph.D.
Adjunct Faculty, Department of
Educational and Psychological Studies

Dean of the Graduate School

Tywan G. Martin, Ph.D.
Assistant Professor, Department
of Kinesiology and Sport Sciences
The topic of retention has been considered one of the most studied areas of research in higher education within and outside the United States. Similarly, higher education in Ecuador has recently put their efforts to optimize students’ retention and degree attainment in college. However, Ecuador is lacking in its research that guides researchers and administrators to design the most effective strategy for enhancing students’ retention in college. Therefore, the present study is especially important in that it would build a cornerstone in higher education research in a country where there is minimal work in the area of retention. With a hope to provide valuable insights to improve retention rates for the higher education institutions in Ecuador, the current study examined the role of the potential factors that were known to be related to students’ graduation. Secondary data consisting of student information enrolled at a small private university in Ecuador between 2006 and 2008 was analyzed using a sequential logistic regression model, where the influence of pre-college characteristics on whether a student graduated within six years or not was examined. Results from a sequential logistic regression model showed that high school GPA and admission test scores were positively related to whether a student graduated or not within six years. And, it was also found that the odds of student’s graduation varied by the areas of study, showing that students in the STEM area are less likely to graduate from college within six years when compared to students in
other fields of study. The current study suggested considering a number of important students’ characteristics in developing the strategies for enhancing students’ retention at the higher education institutions in Ecuador. In particular, this study supported the needs of early intervention prior to the recruitment of high school students that should be continued throughout college. Universities in collaboration with high schools recommend providing students with preparatory courses that build a solid academic foundation before college. In addition, university administrators need to focus on the development of the reliable and valid prediction model that help identify at-risk students who need the target intervention. Then, faculty and student affairs should be actively involved in guiding and tutoring students and providing professional counseling programs designed to closely supervise and support at-risk students. Future research on the topic of retention in Ecuador should involve the inclusion of other variables such as in-college characteristics including institutional experiences, integration, and goals and commitments in predicting the outcome of graduation in Ecuador.
DEDICATION

To my wife Veronica who patiently supported me during this long four years and had to overcome each trip dealing with her own struggles. Thanks for your patience and understanding of all the sacrifices we had to make to attain this objective. To my beloved sons Jose Maria and Juan Diego and my beautiful daughter Valentina, who had to understand daddy could not be all the time during events, presentations, tournaments, and others. You were always on my mind during those moments.
ACKNOWLEDGEMENTS

Thanks to all the professors of the Educational Leadership program and especially to Doctor Carol-Anne Phekoo whose patience throughout the program made possible for me to get to the finish line. To Doctor Soyeon Ahn whose intensity, tenacity and dedication forced me to fulfill the requirements to finish this study. Your parallel goals of having me finishing with the program and the setting of deadlines to accomplish intermediate objectives were crucial in the fulfillment of the final document. To Doctor Guerda Nicolas who through her guidance allowed me to initially focus on a set direction and organize the study on a way to attain the main objectives. To Doctor Scott Ingold and Doctor Ty Martin whose time and dedication allowed me to structure my work in a more professional manner and fulfill the committees’ requirements. To my “cohort” friends Xavier, Enrique, and Peter with whom the trips, long study journeys, discussions, pressure, and short coexistence made this expedition a lot more enjoyable to pursue. Thanks to Universidad Internacional del Ecuador for the support during these four years of constant travelling and dedication of time and resources to accomplish this goal. Finally, to my parents Eduardo and Maggie, whose example and values were the foundation for what I have been able to achieve during my whole life. You are an inspiration to all of us who somehow relate to you in life.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>LIST OF TABLES</th>
<th>vii</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIST OF FIGURES</td>
<td>viii</td>
</tr>
<tr>
<td>LIST OF APPENDIX</td>
<td>ix</td>
</tr>
</tbody>
</table>

Chapter One: Introduction ................................................................................. 1

Role of Higher Institution .................................................................................. 1
Student Retention in Higher Education .......................................................... 3
Higher Education in Latin America ................................................................. 5
Higher Education in Ecuador ........................................................................... 7
Theoretical Basis for the Study .......................................................................... 9
Significance of the Study .................................................................................. 12
Research Questions .......................................................................................... 14

Chapter Two: Review of the Literature .............................................................. 16

Brief History and Terminology ......................................................................... 16
Theoretical Framework ...................................................................................... 21
Pre-College Student Characteristics and Retention ......................................... 29
Rationale and Focus of the Current Study ....................................................... 35

Chapter Three: Methods .................................................................................. 38

Research Design ............................................................................................... 38
Study Setting ..................................................................................................... 39
Participants ....................................................................................................... 39
Data Source ........................................................................................................ 40
LIST OF TABLES

Table 1  Total Undergraduate Enrollment between 2006 - 2008................................. 74

Table 2  Relation of New Students vs. Total Undergraduate Enrollment between
2006-2008 .......................................................................................................................... 75

Table 3  List of Variables in the Model................................................................................ 76

Table 4  Descriptive Statistics for Pre-college Nominal Variables ...................................... 77

Table 5  Descriptive Statistics for Pre-college Academic Variables ................................. 78

Table 6  Frequency of Students by Gender and Whether or not One Graduates within
Six Years ............................................................................................................................. 79

Table 7  Frequency of Students by Area of Study, Gender and Whether or not One
Graduates within Six Years ............................................................................................... 80

Table 8  Frequency of Students by Type of High School and High School Location and
Whether or not One Graduates within Six Years .............................................................. 81

Table 9  Frequency of Students by Area of Study and Whether or not One Graduates
within Six Years .................................................................................................................. 82

Table 10 Results from an Independent Samples t-test comparing Graduation by Pre-
college Academic Variables ............................................................................................ 83

Table 11 Summary of Logistic Regression Model Predicting Odds of Graduation .... 84
LIST OF FIGURES

Figure 1 Tinto’s model of voluntary student departure........................................22

Figure 2 Astin’s I-E-O Model ........................................................................26

Figure 3 Terenzini and Reason’s Parsing the First Year of College Model........27

Figure 4 Structure of the sequential logistic regression model .......................48
LIST OF APPENDICES

Appendix A Undergraduate Students Registration Form at Universidad Internacional del Ecuador ................................................................. 85

Appendix B Request for Authorization Letter to the Superior Council of Universidad Internacional del Ecuador ............................................................................. 86
Chapter One: Introduction

Colleges and universities live from and for students. A significant amount of efforts have been placed on the recruitment processes that also require considerable amounts of money for higher education institutions in what has become a very competitive market. Marketing strategies to attract students have become more creative and commercialized over time (Hossler, Bean, & Associates, 1990). As marketing strategies become more successful in attracting students to higher education, attentions have been turned into an issue regarding how to retain students through college life and help them complete a college degree.

Given that the ultimate goal of higher education was, is, and will be to recruit, retain, and graduate as many students as possible in a timely manner, and thus optimize graduation rates at the higher education institution, understanding the factors that increase students’ retention in college is imperative for the success of most universities. This has been also a central focus of the higher institutions in many Latin American countries, including Ecuador. As such, the focus of the current study was to understand retention rates and the related factors enhancing student’s retention at the university in Ecuador, where quality education has been believed to be essential in empowering the nation as a whole.

Role of Higher Institution

The International Institute for Higher Education in Latin America and the Caribbean (IESALC) proposed three key roles of higher education institution at the Regional Conference for Higher Education in 2008. These include (a) higher education as a public and social good, as a human right, and a government responsibility, (b) the main
and inalienable value of higher education in the construction of prosperous, just, and
solidary societies as model of human and sustainable development, and (c) the formation
of integral individuals, citizens, and professionals capable of fronting multiple challenges
of our society with ethical responsibility and social compromise (Cadenas & Carvalho,
2010).

Likewise, one of the key roles of higher education is to assist students’ personal
fulfillment. Student completion of academic goals in higher education helps the
individual develop critical thinking skills, which are essential for the decision-making
required in one’s everyday life. It might be challenging for individuals without college
degrees to accumulate economic wealth or to adjust into this fast paced environment with
continuous changes (Seidman, 2012). Moreover, a negative college experience might
impact a person’s desire to pursue formal learning and prevent the individual from
accessing the resources for job advancement. Likewise, attending a higher education
institution but leaving early wastes precious opportunities that most of the time cannot be
replenished.

Another critical role of higher education is to educate citizens and empower the
nation. A nation that promotes the educational attainment of higher education is
concerned with its ability to develop the global economic condition (Marginson & Van
der Wende, 2009). Globalization along with the socioeconomic, demographic, and
technological changes influences higher education institutions as, “six out of ten jobs
today require some type of postsecondary education” (ACT, 2009). As Lotkowsky,
Robbins, and Richard (2009) stated, competitiveness in the global world requires the
optimization of the college-age population enrolling in the postsecondary education and completing a degree in a timely fashion.

Consequently, colleges and universities have multiple roles to their nation and their citizens as direct stakeholders. Provided that education is vital for the success of a nation, student access to higher education has been a major concern for the government, which results in its commitment to support students’ college completion. Therefore, colleges and universities have been predisposed to prepare students professionally in order for them to contribute to the economic development of their countries and its abilities to be competitive in a global world.

**Student Retention in Higher Education**

The process of matriculating students in a college or university is referred to as *retention* from the institution’s perspective, and *persistence* and *completion* from the student’s perspective (Reason, 2009; Tinto, 2012). It is also noted that attrition, desertion, dropout, and stopout are various other terms that have been interchangeably used in the literature with retention (Seidman, 2012; Tinto, 2012). Throughout this document, hereafter, both terms - *retention* from the institution’s perspective to refer to the process of maintaining students in higher education and *persistence* from the student’s perspective to refer to the process of student’s completing college degree – were used.

Many financial consequences of early departure from college exist both for the students and the institutions: Students could be left with loans and thus they are later unable to repay their debts; and institutions could have a substantial loss of revenue. According to Schuh and Gransemer-Topf (2005), three elements are associated with institutional costs affected by the lack of students’ persistence towards graduation: (a)
immediate direct institutional cost, (b) immediate indirect institutional costs, and (c) long-term institutional costs after students leave their institution. Among the immediate direct costs, the most significant ones are the cost of recruitment, the cost of investment from institutional financial aid, the cost of the lost tuition income, and finally other lost income such as housing, dining, bookstore purchases, entertainment, special services, and others.

From the marketing perspective, it might be reasonable to think that keeping a student enrolled is easier (or cheaper) than attracting a new one (Hossler et al., 1990). However, the ease to retain students might not be directly applicable to higher education, as evidenced by retention rates in the U.S. being steady over time at between 50 to 60 percent (National Center for Educational Statistics [NCES], 2011). Hossler et al. (1990) pointed out that in higher education recruitment is more efficient than retention because it is accountable to an identifiable group within the institution. On the other hand, retention is everyone’s business and thus involves several stakeholders represented by different departments and divisions within the educational organization. Moreover, Hossler et al. have argued that while the admission process can be organized, staffed, and funded by an admissions office, retention issues need to be handled throughout the institution.

Concerns regarding graduation rates have been ubiquitous around the world. The European system of higher education, for example, has relied on the objectives set at the Bologna declaration of 1999 to guide the future of its system. The Bologna process was an initiative to impulse the convergence of the European higher education system and enhances its competitiveness (Marginson & van der Wende, 2009). The number of signatory countries increased from 29 to 46 between 1999 and 2007. The nations’
signatories of the Bologna declaration initially focused on three major objectives: (a) to promote the European citizen’s mobility and employment, (b) to achieve greater comparability and compatibility of higher education systems, and (c) to increase international competitiveness of European higher education systems. It is through bi-annual meetings that European Higher Education system had sought out the internal consolidation of its “action lines” with true convergence both around shared goals as increased access and better graduation rates, as well as through true structural convergence improving the quality and compatibility of higher education (Witte, Huisman, & Purser, 2009). In Latin America, statements, agreements, and commitments along with the recent socialist governmental trends of many countries also set their goals of “higher education for all” (Vos & Ponce, 2004) as a very important long-term objective.

As maximizing education at the higher level becomes a priority in Latin America, retention of students towards graduation seems to be one of the most vital issues. This emphasizes that the empirical studies on student retention are necessary in Latin America and Ecuador for increasing more comprehensive understanding regarding how students can be integrated into the culture and academic life of an institution, from admission to graduation as the end outcome. Moreover, the knowledge gained from such empirical studies would assist administrators to design the appropriate strategies to minimize attrition and optimize persistence and graduation rates at the higher education.

**Higher Education in Latin America**

Higher Education in Latin America has been characterized by its complexity, in the past, the present, and for the future. Historical and emerging trends in higher
education are characterized by its heterogeneity, inequality, and the role of public universities. The common goal of higher education in this region has been set to construct a system to improve the living conditions of its population, and to provide the possibility of a greater well being. Rapid growth of higher education took place in the second half of the twentieth century, when the number of universities went from 75 in 1950 to more than 1,500 currently, and the number of students from 276,000 to nearly 12 million in the same period of time (Fernandez Lamarra, 2004).

To understand the context of higher education in this region, it is important to identify the preparation of students prior to enter into the higher education system, specifically at the primary education level. The gross schooling rate, which can be defined as the number of college students per 10,000 inhabitants, is 28.5% in Latin America and the Caribbean, while it has reached 57% in North America and Western Europe (Interuniversity Development Center [CINDA], 2007). This disparity was mostly the result of a long period of general academic contraction known as “the lost decades” of Latin America and the Caribbean. The average time spent in the school system by current juvenile cohorts tended to be insufficient. According to a report from the United Nations Educational, Scientific and Cultural Organization (UNESCO) in 2002, students spent on average less than nine years in the school system, which represented an increase of only three years over a twenty-year period. Considering that students entering higher education represented the quality of high school education, the UNESCO’s findings regarding student’s average time spent in the school system introduced an additional issue that would affect the quality of higher education in the Latin America region. Such lack of progress at the primary education level in Latin America was evidenced by the
Human Poverty Index figures, one of which was the change in the gross domestic product (GDP) over time, which had reached a consolidated rate at around 3% (United Nations, 2007).

In 1994, the Latin America region adopted a model of mass participation in higher education (Garcia Guadilla, 1997). As a result, the total enrollment in higher education grew to 14 million in 2003 from approximately 7.5 million students in 1994 (UNESCO, 2005). Currently, the main goal in this region is a prosperous development of higher education and thus the decrease of the economic gap compared to those members of the Organization for Economic Co-operation and Development (OECD). An example of this gap was the disparity identified through the comparison in the number of personal computers per one thousand inhabitants of 33 for this region versus 317 for countries in OECD (World Times Information Society Index, 2005). Countries in this region have realized that narrowing such gap can be reached by a better higher education reflected by higher rates of retention and persistence to graduation.

**Higher Education in Ecuador**

The Ecuadorian government has devoted itself to education more than any other public sector program (Vos & Ponce, 2004). Vos and Ponce stated that the coverage of primary education in Ecuador is good, but its quality is poor making the transition to further levels of education low and not improved during the recent years. This considerable inequality in access to education had been present and influenced by the residence location (urban vs. rural) and the socio-economic status (rich vs. poor). Currently, Ecuador seeks the second goal of the Millennium Development Goals of achieving universal primary education enrollment at 100% by 2015, targeting secondary
higher education to make a substantial impact on the average educational level of the work force (Vos & Ponce, 2004).

Higher education in Ecuador had experienced a sustained growth of 10% in its enrollment during the last fifteen years dating back to 1996 (Consejo Nacional de Educacion Superior [CONESUP], 2007). The higher education system in Ecuador consists of 71 higher education institutions with 33 private universities, 9 semi private universities receiving some funds from the federal government for their operation, and 29 public universities under total control by the government. There are a total of 2,242 different majors officially approved by the government entity regulating higher education under the control of the Ministry of Education. These universities offer associate degrees from 212 unique majors and the bachelor degrees from 2,030 majors.

According to a 2007 education census, Ecuador had more than 443,000 college students, from which approximately 425,000 were undergraduate students and the rest were graduate students (CONESUP, 2007). Most students were in administrative sciences, totaling approximately 150,000 students, followed by 75,000 in technological sciences and about 67,000 in social sciences (CONESUP, 2007). College students were 54.4% females, and their participation is 63.4% in the administrative sciences, 70.6% in education, 57.3% in social sciences, 65.8% in health sciences, and 23.9% in technological sciences.

Although the current net college enrollment in 2004 was only 12% in Ecuador (Vos & Ponce, 2004), the number of students enrolled in higher education institutions continues to grow. The immense concern in Ecuador lied on the financial costs due to students’ departure from college. As Hossler et al. (1990) pointed out, the alarm triggers
by the fact that the cost of student recruitment could be measured in thousand dollars per student, while the cost of student drop-out in ten thousands of dollars, causing higher education institutions to lose huge amounts of money. Therefore, retention becomes a vital issue as well for universities in Ecuador and should be handled effectively.

**Theoretical Basis for the Study**

Due to the lack of retention research in Ecuador, this study was framed based on research conducted in the U.S. Therefore, it should be noted that the theoretical basis described below might not be directly applicable in Ecuador.

The earliest studies on student retention began in the 1930’s, in which student retention was originally conceptualized as student mortality. It was not until the 1960’s when a more systematic approach started to emerge by Feldman and Newcomb in 1969, who pioneered a more methodological study built upon the work of Astin and Spady that later became one of the well-known retention research. One of the earliest works on retention was by Tinto (1975), who proposed the interactionalist model of student retention. Other influential theoretical models include Astin’s (1977, 1985) theory of involvement, the works of Kamens (1974) and Bean (1980, 1983), that with the contribution of Eaton (2000), resulted later in the psychological model of student departure (Renn & Reason, 2013). Of those theories, one of the most influential is Tinto’s theory of student retention. Tinto (1975) suggested that students arrive to college with certain expectations and aspirations that influence student’s decision to continue higher education. He stated that most institutions have not yet been able to translate what is known about student retention into activities that have led to substantial gains in student persistence and graduation.
According to Berger, Blanco Ramirez, and Lyons (2012), early in American history the demand for higher education and the interest in earning a degree were low such that retention was considered unimportant. Thus, retention was not studied in any meaningful way until the last few decades of the twentieth century when an increase in demand for higher education rose and student bodies became more diverse. Characteristics of typical college students have changed from a selective and homogeneous group to a diverse range of individuals. The levels of preparation, motivation, and other individual characteristics shape the reasons to attend college and directly impact the chances that students will be retained and ultimately persist to earn a college degree (Berger et al., 2012). Therefore, the focus of studies on retention has recently shifted to how students’ characteristics influence retention at the specific institutional settings.

As a response, institutions nowadays try to identify the specific characteristics of students that are related to students’ retention such as cultural capital, academic background, background characteristics, and expectations of college and use them to design their recruitment strategies to attract students who would presumably persist and be retained. As an example, Berger et al. (2012) suggested that more prestigious institutions have focused on recruiting students who are more likely to be retained mostly based upon their family backgrounds, levels of education preparation, and exposure to expectations of college, which are known as cultural capital.

Gonzalez-Fiegehen (2005) stated that attrition is related to a repetition of classes, and moreover, that there were very few students who graduated in the stipulated time of the established curriculum. Some of the main causes of attrition were grouped into the
following four categories: (a) external causes (socioeconomic status, place of residence, income, parental level of education, first generation students, need to work while in college), (b) institutional and internal causes (lack of financial aid, lack of guidance on career choice, no commitment to institution), (c) academic causes (academic background, excessive length of studies, quality of faculty, admission test scores), and (d) personal causes (household income, motivation, expectations, emotional estate, social capital, family environment).

Gonzalez-Fiegehen (2005) also identified three categories of subsequent implications of students’ retention: (a) social, (b) institutional, and (c) personal implications. First, social implications included the feedback of frustrated professionals to the cycle of poverty, possible reduction in the intellectual contribution to the community and increase in the level of unemployment, and increase in the cost of education to the institutions due to under-optimization of available resources due to attrition. Second, institutional implications included limitations to comply with the institutional mission, a reduction in the efficiency and quality indexes, the economic implications due to reduced income and additional costs, among others. Lastly, personal implications included the increase in admission that seldom places students of lower socio economic status at a disadvantage due to their deficient preparation, the scarce availability of financial aid, the lack of admission policies, lack of knowledge on career choice, the academic and institutional environment and lack of commitment with the institution, among others.
Significance of the Study

Colleges and universities put more emphasis on student retention rates now more than ever before and thus educational institutions put their efforts to discourage student departure and preserve their established student base. Economic pressures that bear heavily on academic administration make such efforts highly critical for institutional success. Research on retention is especially important due to the vigorous competition among colleges and universities to recruit students and maintain students’ enrollment levels. This pressure is heightened by the fact that it costs more to attract students than it does to retain them (Habley, Bloom, & Robbins, 2012; Webster & Showers, 2011).

Institutions of higher education live by and for students who seek to continue their education taking it to higher personal, professional, economic, and financial levels. Institutions seek to provide environment and resources that enable students to develop a new stage in the live of the human being, which probably is the most influential in the individual growth. With this in mind, retention of college students becomes one of the most important and challenging issues in higher education. As Renn and Reason (2013) state, “student retention arguably has been the primary goal for higher education institutions for several decades and the focus of much research effort among higher education scholars” (p. 173). It is certain that governments target higher education worldwide as a main objective for its populations and an aggressive goal for increasing the percentages of citizens to education preparation. This made the President of the U.S. to set a goal of leading the world with the highest proportion of its population with a college degree (Pike, Hansen, & Childress, 2014; Renn & Reason, 2013), and so do
governments in other regions that make specific commitments to improve higher education.

However, unfortunately, not many empirical studies have been conducted to understand retention in Latin America’s higher education institutions. Among the few available, the International Seminar organized by the Centro Inter-Universitario de Desarrollo (CINDA) and the International Institute for Higher Education in Latin America and the Caribbean (IESALC) (2005) provided statistics from several countries that gave some idea on graduation rates under various scenarios. Between 2000 and 2005, the average graduation rate for the region was 43.2% (IESALC, 2005). The further analysis showed a gender difference in graduation rates, suggesting that on average females were more likely to graduate from college. It was also found that graduation rates varied by major, showing that medicine and related majors had the highest graduation rates while Civil Engineering showed the lowest and Law at an intermediate rate.

One goal of this study was to increase the interest of universities and related government entities regulating education on the issue of retention in Ecuador and to provide an awareness of the importance of this issue, not only at an institutional level of financial survival but on the responsibility as educators to support students during their college life and take them to the completion of higher education degrees. Thus it is expected to increase awareness for the higher education community to promote research within their institutions on retention and contribute to more detailed and broad information that will enable them to understand the issues involved in college student retention in Ecuador. The potential implication of this study for practice is to strengthen the knowledge of the student affairs department at the universities in Ecuador to optimize
the students’ retention and graduation outcome. Designing the university that makes students feel safe and nurtured would enhance the expectations concerning environmental experiences that are related to persistence towards graduation.

The second objective was to provide information for the institution to design and implement the most effective co-curricular activities that would meet student expectations regarding non-academic activities that might enhance students’ retention. Finally, to prepare the field of academia in Ecuador for future research and possibly replicate this study in other institutions of higher education to compile information on retention of college students.

**Research Questions**

Three main research questions of this study were:

1. Research Question #1: Are student characteristics such as gender, type of high school institution, and location of high school institution (in-state versus out-of-state) related to college graduation?

2. Research Question #2: Are high school GPA and admission test scores related to college graduation?

3. Research Question #3: Does college graduation differ by the area of study?

In summary, the dependent variable was college graduation defined as the students who completed degrees within six years. Degree completion and curriculum design in Ecuador considers a five-year time frame for a full time student. The study considered an additional one-year increase to allow a time gap for students who might not be able to dedicate to a full time status due to the need to work to pay for their studies, which is not an unusual practice. The independent variables were student background
variables (gender, type of high school, location of high school), pre-academic characteristics (admission tests and high school GPA), and area of study.
Chapter Two: Review of the Literature

As mentioned earlier, due to the lack of retention research in Ecuador, the discussion below focused on what has been known in the United States.

Brief History and Terminology

Retention of students at colleges and universities has long been a concern for educators (Murtaugh, 1999). Retention is one of the most widely studied in higher education (Tinto, 2006-2007), with literature expanding for more than four decades through books, journals, edited volumes, and a variety of conferences dedicated solely to this very important field. Renn and Reason (2013) described student retention as “arguably” the primary goal for higher education and the “focus of much research” among higher education scholars. According to Tinto (2006), the view of retention has changed since the 1970’s from the individual student’s point of view - not staying due to lack of individual attributes, skills, and motivation - to the role of the environment, “in particular the institution”.

Tinto (2013) argued that the increase in students’ access into higher education was not directly related to the increase in the attainment of college degrees. While access into higher education in the U.S. between 1990 and 2009 increased by 44% (Tinto, 2013), the proportion of high-school students entering college immediately after graduation grew from 49% in 1980 to 68% in 2008, which was an increase of 39%. Success in college measured by graduation varied by the type of institutions, for example on those where no residential services are provided, and where large number of students
commute, work, or attend part-time (Tinto, 2013). The intention of students toward attaining a college degree was also related to retention. Many students entered college with the firm intention not to attain a degree or to transfer to another institution (Seidman, 2012) and thus it influenced the institution’s capacity to increase student retention. However, the students’ intention was seldom identifiable prior to enrollment.

Brief history. Retention in the United States was not a concern until the beginning of the twentieth century (Habley, Bloom, & Robbins, 2012). It was during the last thirty years when retention became a universal concern across higher education and when the practical, theoretical, and knowledge bases of retention became fully developed. In the early 1900’s, the United States became industrialized, which contributed to “the increased need for college education” (Seidman, 2012) as a way to produce professionals prepared to run complex organizations. An increase in demand for higher education allowed institutions to become more selective in their admission process. The growth in student’s desire to attend college along with the selectiveness of admission processes resulted in building more colleges and universities that led to the emergence of the concept of retention in higher education. As a result, the completion of college education and the attainment of a college degree became more important, and the awareness of attrition rates led to the first focus of what later came to be called retention.

Morrison and Silverman (2012) stated that there were many theories, models, and concepts on college student retention. The first studies of retention were credited to McNeely in 1937. McNeely was basically interested in various factors that influenced students’ behavior to withdraw from college. McNeely used the term student mortality and defined it as “failure to remain in college until graduation (Morrison & Silverman,
The most significant findings of the studies were that men were more likely to drop out from higher education than women, and that students from private institutions were more likely to obtain a degree than those from public institutions (Seidman, 2012). Age was also found to be a predictive factor, as younger students tended to drop out less from college in comparison to mature students.

Summerskill conducted research on the topic of student attrition in 1962. His work focused more on the institutional factors that contributed to attrition that was grounded on psychological and sociological concepts. His work was valuable especially in that different frameworks including psychological and sociological theories were considered in the retention research (Seidman, 2012). In 1970, Spady developed a sociological model posited on the suicide theory of Durkheim (Seidman, 2012). His model claimed that social conditions influenced student’s decision to be dropped out from the university similarly, but not as dramatic as in suicide. In the same year, Meyer argued that socialization played a definite role in the retention of students in college and influenced his analysis for subsequent retention theories. Kamen in 1971 extended Meyer’s research by including the influence of institutional structures and their effects on students (Seidman, 2012). His research supported that colleges provided social status to students and that had an impact on student retention. According to Morrison and Silverman (2012), Kamen’s research focused on the importance of the external factors in student retention (Seidman, 2012).

Astin (1975) recognized two predictive factors of student retention in college: personal and environmental. Personal factors included academic background, family background, educational aspirations, and age, among others as mentioned by Morrison.
and Silverman (2012), while the environmental factors included residence, employment, academic environment, and institutional characteristics.

In 1985, Bean and Metzner concentrated their studies on nontraditional students and argued that previous retention theories relied too much on social variables as major influences of student retention (Seidman, 2012). Their studies showed that environmental factors were more influential on retention for nontraditional students, and that academic variables such as academic advising, absenteeism, major certainty, and course availability positively influenced the decision to persist in college (Seidman, 2012).

In 1987, Tinto introduced his theory of individual departure. Tinto posited that the most important factor influencing retention was the student’s ability to integrate into the college environment. Tinto’s theory was developed based on the works of Van Gennep and Durkheim, an anthropologist and sociologist, respectively (Seidman, 2012). Bean (1987) argued that there was not enough evidence to support Tinto’s theory through an analogy of Durkheim’s theory of suicide. On the contrary, Bean related the causes of student attrition similarly to those of an employee leaving his work in organizations. Bean stressed the environmental factors as a major influence of student retention (Seidman, 2012). Finally, in 1987 Seidman suggested that retention could be enhanced with an “early, intensive, and continuous intervention” (Seidman, 2012, loc. 1323). This intensive intervention was referred to as a process that permanently changes the student’s personal and academic behavior. It is, however, Tinto’s model of academic and social integration that was considered the foundation of retention of college students.

**Terminology.** To conceptualize retention, a number of terms used in the literature should be first defined. These terms include descriptors such as student mortality
(Gekowski & Scwatz, 1961; McNeely, 1937), college dropouts (Spady, 1971; Summerskill, 1962; Tinto, 1975), student attrition (Panos & Astin, 1967; Pantages & Creedon, 1978; Sexton, 1965; Tinto, 1993), college retention (Berger, 2002; Braxton & Mundy, 2002; Iffort, 1957; Tinto, 1990), and student persistence (Berger & Milem, 1999; Berger, 2002). Berger, Blanco Ramirez, and Lyons (2012) mentioned that even though these terms could be related, they are not similar and define them individually, and provided the following overview of each of these areas:

- **Attrition** refers to a student who fails to reenroll at an institution in consecutive semesters. **Dismissal** refers to a student who is not permitted by the institution to continue enrollment. **Dropout** refers to a student whose initial education goal was to complete at least a bachelor’s degree, but did not. **Mortality** refers to the failure of the student to remain in college until graduation. **Persistence** refers to the desire and action of a student to stay within the system of higher education from beginning year through degree completion. **Retention** refers to the ability of an institution to retain a student from admission through graduation. **Stopout** refers to a student who temporarily withdraws from an institution or system. **Withdrawals** refer to the departure of student from college or university campus. (p. 12)

The present study focused on both **retention** and **persistence**, which related the process of transition from admission to matriculation and continued through graduation or degree completion. Tinto (2012) distinguished two related terms, student retention and student persistence, according to the point of view from which the student progress is viewed. From the student’s perspective, the terms persistence and completion were used to measure the progress toward the students who completed the degree. From the institution’s point of view, retention and graduation were associated terms that were applied to students who entered the institution as freshman with the goal of graduating. When a student for any reason discontinued his attendance, the term Tinto (2012) used was stop-out, and in the same way the term student attrition described “the rate at which students terminate college without completing a degree” (Tinto, 2012). The study of
retention and persistence became complex when the initial intent of entering students was not the completion of a degree (Tinto, 2012).

**Theoretical Framework**

Several models and theories were used to explain student persistence in higher education. Of them, Tinto’s theory of student departure (1993) constituted the most paradigmatic model (Renn & Reason, 2013). Tinto’s model (1993) introduced the concepts of social and academic integration and most models of retention made reference to Tinto’s ideas. Other researchers perceived student persistence through different lenses. Bean and Eaton placed a psychological lens into its analysis, and college impact models (Astin’s I-E-O, Weidman’s Undergraduate Socialization Model, Terenzini and Reason’s Parsing Model) were primarily used to study persistence as an outcome of college (Renn & Reason, 2013).

**Tinto’s theory of student departure.** Tinto (1975, 1987, 1993) presented a model focusing on the college student withdrawal process (Pascarella & Terenzini, 2005). According to Seidman (2012), Tinto’s theory is one of the most often cited theories concerning student retention. Tinto’s Theory of Student Departure is based on the work of Durkheim (theory of suicide) and Gennep (rites of passage theory) as well as Spady’s work (1970), which emphasized the interaction between individual students characteristics and features of the campus environment (Metz, 2004; Seidman, 2012;). Figure 1 denotes the basic concepts of Tinto’s theory in a graphical way.
The origin of Tinto’s theoretical model of persistence traced to the collaboration with Cullen in 1973 and included the following six components: (a) pre-entry attributes as prior schooling and family background; (b) student aspirational and institutional goals and commitments; (c) institutional experiences; (d) integration; (e) intentions and external goals and commitments; and (f) outcomes (Metz, 2004). Tinto described his model as “an interactive model of student retention” (1993, p. 112) and included elements of both the psychological and organizational theoretical models (Seidman, 2012). It basically stated that students arrive to college with some “entry characteristics” (Seidman, 2012) and with an initial commitment towards the institution and graduation that influenced the decision to persist or depart.

**Figure 1** Tinto’s model of voluntary student departure

<table>
<thead>
<tr>
<th>Attribution pre-Entry</th>
<th>Academic Experiences</th>
<th>Personal/Normative</th>
<th>Commitment and Goals</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior schooling and family background</td>
<td>Pre-entry attributes</td>
<td>Pre-entry attributes</td>
<td>Pre-entry attributes</td>
<td>Pre-entry attributes</td>
</tr>
<tr>
<td>Student aspirational and institutional goals and commitments</td>
<td>Student aspirational and institutional goals and commitments</td>
<td>Student aspirational and institutional goals and commitments</td>
<td>Student aspirational and institutional goals and commitments</td>
<td>Student aspirational and institutional goals and commitments</td>
</tr>
<tr>
<td>Institutional experiences</td>
<td>Institutional experiences</td>
<td>Institutional experiences</td>
<td>Institutional experiences</td>
<td>Institutional experiences</td>
</tr>
<tr>
<td>Integration</td>
<td>Integration</td>
<td>Integration</td>
<td>Integration</td>
<td>Integration</td>
</tr>
<tr>
<td>Intentions and external goals and commitments</td>
<td>Intentions and external goals and commitments</td>
<td>Intentions and external goals and commitments</td>
<td>Intentions and external goals and commitments</td>
<td>Intentions and external goals and commitments</td>
</tr>
<tr>
<td>Outcomes</td>
<td>Outcomes</td>
<td>Outcomes</td>
<td>Outcomes</td>
<td>Outcomes</td>
</tr>
</tbody>
</table>

Tinto’s model related students to a “formal and informal academic and social system” (Pascarella & Terenzini, 2005). This relation resulted in a form of integration that led to success through retention and eventually graduation. Pascarella and Terenzini stated that integration “is the extent to which the individual shares the normative attitudes and values of peers and faculty in the institution…” (2005, p. 54), while Tinto referred to it as “…the degree to which a person integrates the values and norms of a community into his or her own value system (2012, Notes Chapter 5, para. 1). According to this theory, positive integration enhances the students commitment to the institution and thus increases the probabilities of students’ persistence, while negative experiences diminish integration of the student reducing academic and social commitment that will ultimately influence the desire to withdrawal. Pascarella and Terenzini (2005) related the concept of “integration” in Tinto’s theory to Astin’s (1985) “involvement” and Pace’s (1988) “quality of effort.”

Tinto (2012) explained that, other things being equal, a higher degree of student integration into the social and academic environments contributed to a greater degree of institutional and goal commitment and therefore to a lower dropout and higher completion rates. Persistence is a function of the fit between student’s motivation and academic ability and the institution’s academic and social characteristics. Tinto distinguished two types of “fit” that an individual can have with an institution: academic integration and social integration. Academic integration is the level to which a student believes he or she is meeting the explicit academic standards of the college or university (Tinto, 1975). Social integration pertains to the level of congruency between a student and the social system of a college or university (Tinto, 1995). Tinto suggested that
academic and social integration each had a positive impact on a student’s commitment to the institution and to the goal of college graduation. In other words, the higher the level of academic and social integration, the greater the student’s level of post-enrollment commitment to his/her institution and the higher that student’s desire to graduate (Tinto, 1975).

Tinto’s student integration model has served as the foundation for other theoretical models developed by several researchers. Cabrera, Nora, and Castaneda (1993) for example, mentioned “Tinto’s theory attributes attrition to the lack of congruency between students and institutions” (1993, p. 124). They asserted from research that this model suggested by Tinto validated the significance of pre-college characteristics as predictors of retention that was aligned with the objective of the current study.

**Alexander Astin’s I-E-O model and theory of involvement.** Astin (1977, 1991, 1993) provided two very influential models of student retention. The first one is Astin’s theory of involvement (1984) that explained the effect of the dynamics of the student within the college environment to explain the change in development and influence in the outcomes. According to Astin (1985), “his theory can be simply stated as that students learn by becoming involved” (Pascarella & Terenzini, 2005, p. 53). Astin introduced the term of involvement, which is defined as the amount of physical and psychological energy that the student devotes to the academic experience (Astin, 1999). Astin (1985) suggested five basic postulates around his theory: (a) involvement requires the investment of psychological and physical energy on activities; (b) involvement is a continuous concept; (c) involvement has both quantitative and qualitative features; (d) the
outcomes measured through learning and development is directly proportional to the quality and quantity of involvement; and (e) educational outcomes are related to the capacity to produce involvement (Astin, 1999; Pascarella & Terenzini, 2013).

One of the reasons that Astin developed his student involvement theory model was the propensity that he found in many scholars to treat students as a “black box” (Astin, 1999), in which inputs, as university policies and programs, resulted in outputs measured by student achievements such as GPA or scores in standardized tests. Astin (1984) thought of a “missing mediating mechanism” that linked these programs and policies with student achievement and development.

Thus, Astin developed the second model called Input-Environment-Outcome (I-E-O) Model (Pascarella & Terenzini, 2005), which is depicted in Figure 2. The I-E-O model was very effective and descriptive in that it demonstrated how various factors influenced students’ outcome in college by using the following three sets of elements: (a) Inputs defined as demographic characteristics (race, sex), family backgrounds (capital culture), and academic and social experiences (academic preparation, entrance test scores); (b) Environment, including the people, programs, policies, cultures, and experiences encountered in college; and (c) Outcomes comprising the characteristics, knowledge, skills, attitudes, values, beliefs, and behaviors as the student leaves college (Pascarella & Terenzini, 2005; Reason, 2013).

Simply stated, Astin suggested that the “baggage” a student brings to college constitutes the inputs that predict the end outcomes influenced by the environment in which they interact while in college. According to Renn and Reason (2013), the I-E-O model required measuring student inputs such as demographic characteristics, precollege
academic preparation, and other factors that may be important to seek for students’ outcomes.

Figure 2  Astin’s I-E-O Model

Terenzini and Reason’s integrated model. Terenzini and Reason’s model (2005, 2010) is one of the most recent additions to the study of college impact models and student’s persistence (Renn & Reason, 2013). It is a model that, as its name suggest, integrates the concepts of various models and theories and adds the complexity of the effects of organizations and student climates to student outcomes (Renn & Reason, 2013). As Reason (2009) stated,

To answer the call for a more comprehensive and integrated model for studying student outcomes, Terenzini and Reason (2005) offered a conceptual framework that extended and synthesized models by Astin (1985, 1993), Tinto (1975, 1993), and Pascarella (1985) and drew on the model for studying organizational effects on student outcomes proposed by Berger and Milem (2000)(p. 661).

Similar to other models, Terenzini and Reason mentioned that students are coming to college with the existing characteristics and experiences known as inputs that must be considered to understand how college experience affects student’s persistence. As shown in Figure 3, the model depicts three stages in the college experience: (a) student pre-college characteristics and experiences; (b) the college experience; and (c)
outcomes. Student pre-college characteristics and experiences depict variables including socio-demographic traits, academic preparation and performance, and student dispositions. The college experience of the model consists of three areas that affect student outcomes: the organizational context, the peer environment, and individual student experiences, which include classroom experiences, curricular experiences, and out-of-class-experiences. The interaction among the variety of individual characteristics and experiences shape the student’s subsequent college experiences with the institutional and peer environment as well as other major socialization agents to produce positive or negative outcomes that influence persistence and further degree attainment objectives (Reason, 2009).

Figure 3 Terenzini and Reason’s Parsing the First Year of College Model

Terenzini and Reason’s model is also known as the Parsing the first Year of College model (Renn & Reason, 2013) as it was developed to study specific effects that influenced the first-year students outcomes. However, Terenzini and Reason suggested
this model could serve as well to study outcomes for any group of students and at
different stages of the college life (Renn & Reason, 2013).

**Weidman’s model of undergraduate socialization.** One of the theoretical
models used to define student persistence through the understanding of the influence of
non-college effects of campus environments is Weidman’s (1989) model of
undergraduate socialization. Weidman (as cited in Renn & Reason, 2013) defined
socialization “as the process by which undergraduate students acquire knowledge,
attitudes, and skills necessary to succeed in college” (p. 64). This concept of socialization
influenced various theories of student change and development including Weidman
(1989) and Tinto (1987, 1993) and theories that are part of this group involving the
concept of socialization.

Weidman’s model hypothesized that students bring their background
characteristics to college, similar to Tinto and Pascarella (Pascarella & Terenzini, 2005).
Their background characteristics included socioeconomic status, aptitudes, career
preferences, aspirations, and values, as well as normative pressures from parents and
other external influences like from peers, employers, and the community (Pascarella &
Terenzini, 2005). The model was considered to be an important reference to the influence
of non-college characteristics on students and how this affected the socialization
outcomes. The socialization process as presented by Weidman (1989), assumed that
greater socialization into the college environment led to more positive outcomes
including persistence (Renn & Reason, 2013). The model, according to Renn and Reason
(2013) placed more focus on college contexts and the resultant of the pressure of non-
college environment that affected students’ persistence decisions.
Pre-College Student Characteristics and Retention

There has been considerable theoretical work and substantial amount of debate as to explain the factors affecting student retention (Tinto, 2006). Several edited volumes and numerous articles have discussed the merits of various theoretical models, each of which posited a more accurate depiction of the process of student retention. The result was a more sophisticated understanding of the complex network of events that shaped student leaving and persistence.

According to the body of work in the retention research, pre-college characteristics were considered to be useful predictors of student retention, and the results of these studies had direct implications on students’ recruitment. However, pre-college characteristics have not solely explained all of the variation in attrition rates of students. Students are more likely to stay in school when they are actively involved in campus activities and feel a sense of community in the institution (Astin, 1993; Naretto, 1995; Tinto, 1993). Astin (1997) referred to a group of pre-college characteristics as the entering freshmen characteristics. Four variables (high school grades, admission test scores, sex, and race) were considered to add significantly to the prediction of retention (Astin, 1993). These input variables allowed Astin (1997) to predict an expected retention rate through a series of multiple regression analysis since it was likely for most institutions to have information about these variables. Tinto (1993) affirmed in his model of student departure that three exogenous constructs (family background, individual attributes, and precollege characteristics) interacted and directly influenced the student’s initial commitment to the institution and to the academic goals.
In a study by Kuh, Cruce, Shoup, Kinzie, and Gonyea (2008), they mentioned that most models relating aspects of success in the process of student persistence examined 5 different sets of variables with the first one being student characteristics that included demographics, pre-college academics, and experiences. In Terenzini and Reason’s (1995) conceptual framework, it is hypothesized that students come to college with certain specific characteristics that prepare them to engage in the formal and informal learning opportunities that shape subsequent college interactions that influence college student outcome (Terenzini & Reason, 2005). Peltier, Laden, and Matranga (1999) posited that in some cases certain personal characteristics can be an advantage for persistence and can increase the probability of degree attainment. It has been shown in several studies that ethnicity, age, and gender are related to success in college (Peltier et al., 1999).

Pascarella and Terenzini (1978) stated that Tinto’s model considers attrition as a timely process involving several types of interactions between the student and the environment of the institution. The student brings pre-matriculation characteristics to college (Reason, 2009). Such characteristics include family background, personal attributes, and experiences and presumes to influence college performance, goal commitments, and institutional commitments. The effect of these characteristics on student’s experience is moderated by the environment of the institution, leading into positive or negative integration into the academic and social systems of the college and university.

In summary, many scholars emphasized the pre-college factors that students bring to college and their influence on students’ retention, which are categorized into the following two characteristics: Demographic variables, and Academic variables. Below,
results from the empirical studies examining the relations of the demographic variables and academic variables to retention are summarized.

**Demographic variables and retention.** Most recent studies in undergraduate higher education have pointed out the increasing diversity of students attending colleges and universities in the United States (Reason, 2003). Most notable changes in students’ characteristics included racial and ethnic identities, gender, age, and socioeconomic status (Reason, 2003).

First, the number of women attending higher education institutions became one of the most important demographic variables, with the most prominent increase occurring during the last two decades (Reason, 2003; Woodward, Love, & Komives, 2000). The turning point was in 1979, when women as a percentage of college students reached that of men (Woodward et al., 2000). In 2000, women surpassed 55 percent of the student population and reached higher graduation rates than men (Woodward et al., 2000), increasing from 50% in 1980 up to 55% in 1999 to approximately 58% in 2011 (Reason, 2003). The National Center for Education Statistics (2011-12) estimated the enrollment for undergraduate students in the U.S. by gender at all institutions of higher education in 2012 to be 43% for males and 57% for females. Similarly, the participation of females in the Ecuadorian system of higher education in 2007 was approximately 55%, while that of men 45% (CONESUP, 2008).

Studies brought mixed conclusions regarding women’s persistence in college. Walton (1992) and Moore and Klas (1989) found that gender was not significantly related to a student’s decision to drop out or persist. However, other studies have reported higher completion rates for women in comparison to men, which consistently showed
that women are more likely than men to attain the bachelor’s degree regardless of the “time spent in college” (Astin, 1993). Tinto (1993) noted that in relation to success women tended to leave college more than men because of social forces rather than academic reasons and did it more voluntarily, while men were more likely to remain until dismissed due to poor academic performance.

Second, the most recent change is that the typical age of students had risen over the past two decades. The average student age rose each decade and by 1999 in the United States the older students (age 25 and older) made up approximately 40% of the total college student population (Peltier et al., 1999). In Ecuador, the situation was not that different in that the average age of the student population was 25.57 by 2007 (CONESUP, 2008). According to Peltier et al., there was not much research linking age to persistence. Leppel (2002) mentioned that as enrollment of traditional students declined, many colleges and universities strategically encouraged older nontraditional students to return to school as they had a typically higher persistence rate than younger students.

Third, students’ socioeconomic status (SES) was found to be an important characteristic to predict one’s retention. Specifically, researchers emphasized that the link between academic preparation and SES was strongly related to the eventual attainment of degree completion (Adelman, 2006; Cabrera, Burkum, & LaNasa, 2003; Pascarella & Terenzini, 2005; Reason, 2009). In general, students from low SES background, lower quality academic preparation, and minimal academic resources in high school found more difficulties in persisting to degree attainment “leading these authors to conclude that a
high-quality academic preparation in high school can overcome the delirious effects of a low SES background” (Reason, 2009, p. 665).

Finally, according to Rendon, Jalomo, and Nora (2000), the initial research on retention focused on predominantly white students, which made research on minority students relatively young (Braxton, 2002). Racial and ethnic identities were not considered until the early 1990’s, but certainly they have had a differential effect on retention mostly for the minority groups. Other scholars supported the fact that, even though the number of college degrees granted to minorities had increased, there still was an important difference with predominant white students (Chen & DesJardins, 2010). This issue was raised by scholars such as Braxton (2011) to criticize Tinto’s highly acclaimed model of student departure and suggested that more work be done to expose racial, ethnic, and other characteristics in the impact of retention.

**Academic variables and retention.** In Reason’s (2009) study, it was asserted that academic preparation and performance of college preparatory coursework in high school are one of significant predictors of college persistence and degree attainment and that both personal and institutional resources shaped that student’s high school preparation and coursework. Kuh pointed out that two of the best predictors of whether a student will graduate or not were academic preparation and motivation. Kuh’s (2001) reasoning was that the best strategy would be to admit students with a superb high school preparation who are academically talented.

Another characteristic with which students arrive at college of most relevance in recent studies within academic background is the admission test score. Precollege academic achievement represented by ACT or SAT scores was an important predictor of
success in first-year grades and persistence (Kuh et al., 2008). However, Kuh et al. (2008) acknowledged that once college experiences are considered, factors as living on campus, enrollment status, working off campus, and others diminished considerably the effects of pre-college characteristics and experiences in persistence. Research conducted by the ACT (2009) showed that academic factors have had a positive relationship with college retention. Findings indicated that high school GPA, socioeconomic status (SES), and assessment test scores all have had a positive influence, but this significance was enhanced when combined with non-academic factors as institutional commitment, academic goals, social involvement, social support, and academic self-confidence (Lotkowski et al., 2009; Webster & Showers, 2011).

Tinto (2013) asserted that academic skills as a precollege characteristic had a very important role in the persistence of students towards a degree. Astin (1997) indicated that four variables were critical for the analysis of retention within contemporary students: high school grades, admission test scores, race, and gender composition. Within these, high school grades and admission test scores were significantly and strongly related although according to Peltier et al. (1999) the findings were mixed. One technique used to evaluate the significance of admission tests in the retention process is the use of a merit-index criterion (Reason, 2003). The merit-index is the quantification of the relationship between the admission exam of an individual student and the average of the same admission test of “college-bound students, within the same school during the same test administration period” (Reason, 2003, p. 185).

**Area of study and retention.** Research on retention (Astin, 1997) suggested that there were a number of environmental factors known to influence retention rates, over
and above the influence of student input characteristics (Astin, 1993). One such factor was the student's “major field” of specialization. Institutions in the U.S., where many students major in social sciences fields such as sociology, psychology, or others would be expected to have higher-than-expected retention rates, whereas those enrolling large numbers of students in majors such as engineering and other hard sciences would be expected to have lower-than-expected rates (Astin, 1997).

Rationale and Focus of the Current Study

Colleges and universities have placed more emphasis on student retention rates than ever before (Webster & Showers, 2011) and have tried to put efforts to prevent student departure. Financial pressures have influenced heavily on academic administration and have made such efforts critical for institutional success and future existence. Therefore, research on this issue is very important “due to the vigorous competition among colleges and universities to recruit students and maintain enrollment levels” (Webster & Showers, 2011, p. 301).

One of the predominant theoretical frameworks used to study retention is Tinto’s (1975, 1993) interactionalist theory of student retention. However, through the years, new perspectives have been proposed on the basis of Tinto’s theory by adding constructs to improve the power of the model providing additional sources of social and academic integration for undergraduate students (Berger & Milem, 1999). A comprehensive study on retention should include a thorough analysis of several patterns including behavioral involvement and perceptual integration in college persistence process. Even though this process of college persistence is integrative of many variables, precollege characteristics
play an important role by themselves in influencing students’ involvement and integration.

As referred by Tinto (1993), persistence involved the process of integration of the student to the social and academic communities of the college. Tinto (1993) referred to integration as the association and membership of the individuals to the communities present in college life. Several characteristics influenced this integration directly or indirectly and student’s precollege characteristics, which were the ones that the individual carried into college life, and importantly, impacted the sense of integration required to persist and eventually attain a college degree, as is the focus of the present study.

The context of the study, where there was neither information nor additional reports on the issue of retention in Ecuador, allowed the flexibility on the application of the theoretical framework on the findings and objectives. Within the theories previously presented (Astin, 1987, 1991, 1993; Terenzini & Reason, 2005, 2010; Tinto, 1975, 1987, 1983), all considered the fact that background characteristics influenced college student retention. Eventually each contemplated the importance of additional factors that influenced retention, which was logical. Therefore, the current study considered Tinto’s Theory of Student Departure as defined by the longitudinal model of institutional departure, as the guidance to analyze the effect of precollege demographic (family background) and academic characteristics (prior schooling) that have been empirically studied on persistence towards the attainment of a degree at a local small private university in Ecuador.

As discussed earlier, the theoretical models that were developed in the U.S. might not be completely applicable to understand retention in Ecuador. Some variables that
were considered within the retention models developed in the U.S. might not be totally applicable for the Ecuadorian context. Race and ethnicity, for example, are not yet a major issue, whereas socioeconomic status is. Most institutions of higher education could be compared to commuter colleges and universities in the U.S. as residential campuses are not yet as important. The same situation goes for student athletics and Greek life. For this reason, social involvement in such context is not yet a major challenge for Ecuadorian universities. With these in mind, however, it is our hope that the current study would provide the basis of building the retention model that works for Ecuadorian universities.
Chapter Three: Methods

Research Design

The current study was correlational in nature in that it examined the degree to which two or more variables were associated (Creswell, 2005) using a predetermined or intact group (Cook & Cook, 2008). Correlational research as stated by Cook and Cook (2008) sought to establish if the relationships existed among variables and described their direction and strength “without the introduction of an intervention to change an outcome variable” (p. 101). The use of a non-experimental correlational research allowed the researcher to design further interventions through information that was found to show the significant relationship among variables, guiding to future experimental studies, and identifying the potential causal relationships that may have existed but cannot be inferred from correlational research.

In this study, a quantitative analysis of the secondary data was used to examine the significance of the relationship between each of the independent variables that included demographic, academic, and institutional variables and the dependent variable, graduation. The advantages of the use of the secondary data included: it saved time on the collection of the information; the data was available and therefore had ease of access; and was efficient in the handling of informed consent from the participants. The secondary data used in this study was based on self-reported information of the incoming first year students at the time of completing their admission process collected by an institution in Ecuador.
Study Setting

The current study was based on students enrolled as freshmen between 2006 and 2008 into one of the oldest private higher education institutions in Ecuador. For many decades public institutions dominated higher education in Ecuador. In the late 1980s, the government decided to deregulate the higher education system in Ecuador and approved private institutions in order to meet an increased demand for education that was in short supply and characterized by poor quality. Since then, many private universities have emerged in Ecuador.

Both graduate and undergraduate programs are part of the academic curriculum of the institution, from which student samples were drawn. For the purpose of this study, students enrolled in only undergraduate programs were included in the analyses. The undergraduate student population in this university is approximately 5,000 students enrolled in both on-site and on-line programs in an approximate 1 to 1 ratio. The university currently employs 100 full-time professors and approximately 500 part-time professors across 8 undergraduate programs. There are eleven schools and/or colleges responsible for the coordination and supervision of twenty-two majors such as Business Administration, Architecture, International Business, International Relations, Law, Tourism, Hotel Management, Gastronomy, Medicine, Odontology, Psychiatry, Computer Science, Information Technology, Robotics, and Automotive Engineering.

Participants

A total undergraduate enrollment in this institution between 2006 and 2008 is shown in Table 1. Students who entered the university during both spring and fall semesters of 2006, 2007, and 2008 were considered as the sample included in the current
study. The total numbers of new students (freshman) enrolled were 252 in 2006, 244 in 2007, and 286 in 2008. Table 2 shows the relation of new students (freshman) to the total enrollment for each semester. Across all three years, the total number of individuals for the study was 782, 52% of which were male students ($n = 408$). In addition, 134 students attended public high schools and the participants from STEM fields of study were 291, comprising the health sciences 165, and 330 from professional and vocational areas. Additionally, 605 of the participants resided in-state (from the city of Quito) and 181 were out-of-state (from out-of-Quito) students. After a thorough review of the information, a total of 39-registered student whose information was incomplete were eliminated, leading to a total final sample of 743 students.

**Data Source**

University gathered data from students during the admission process. Students completed the admissions application shown in Appendix A. The application was submitted to the Admissions Department where the data were entered into the integrated academic system and became part of the data warehouse. The integrated academic system’s structure was comprised of a series of databases one of which included students records from the time of first admission to the eventual time of graduation. Each record was composed of a series of fields with data ranging from personal information, demographics, and information on academic records. The admissions department ensured that the input of the student’s information into the database was accurate. The person responsible for this job had an assigned password that allowed for the input and handling of the information to remain in a rather secure manner.
The curriculum at this small private non-profit university was designed to be complete in a 5-year term. After finishing the required course work, the student was required to complete a thesis project related to his/her major of study within an additional twelve-month period. The thesis was presented to an assigned committee and a successful defense granted the student his/her degree. The academic year is divided into two semesters starting in the months of September or October for the regular admission period and February or March for a second term of admissions. The semester starting in September or October is the one that enrolls the highest number of high school graduates as the dates coincide with the ending of the high school academic year programmed in July of each year. Ecuador does not follow a four-season calendar due to its geographical location, but for the purpose of the study the semester starting during the month of September is considered the fall semester, and that one starting during the months of February or March as the spring semester. Therefore, the study analyzed the data, which considered a 6-year allowance for graduation or degree attainment.

Data Collection

Upon approval of the study from the University Institutional Review Board (IRB), the de-identified data were obtained from the Registrar’s office and the IT department at the university. In particular, permission for the official use of the university’s data was first requested from the Superior Council of the institution through a formal petition letter as shown in Appendix B. The authorization from this executive body was utilized in the various departments when requesting data. Any request for information was made via email. Once the data were received, they were compiled in an Excel file and the quality of the data was evaluated. If any missing data were found, decisions on the elimination of
participants’ records or the use of any procedure to fill the data with a strong criteria support were performed. Then, the data were imported to SPSS (IBM Corp., 2013) for data analysis.

**Variables**

The dependent variable of interest was whether one graduated from college within a period of at least six years after enrollment. The outcome variable was coded as being one if the student graduated within the six years or zero if the student did not graduate. In the current study, no distinction was made depending on whether a student graduated in five or six years. And, three sets of independent variables were used to predict a binary outcome variable, whether one graduated or not within six years. The three sets of independent variables included demographics, pre-college characteristics, and institution-related variables.

**Independent variables.** The independent variables for this study were: demographics including gender, type of high school (public or private), location of high school (in-Quito or other), pre-college characteristics including high school GPA and admission test scores, and an institutional-related variable, the chosen area of study.

Astin (1997) commented that the kind of students that enrolled in an institution of higher education, including the precollege characteristics they bring, influenced in more than half of the variance in institutional retention rates. This effect, he asserted was greater than the influence of any institutional effect. The independent variables of this study differentiated pre-college characteristics between demographic and academic factors that were expected to affect one’s graduation. For a list of variables and its specific individual characteristics as pertaining to the study refer to Table 3.
First, three students’ demographic variables used in this study were gender, type of high school, and location of high school. The present study hypothesized that the higher rate of female participation in higher education is related to a higher rate of graduation (Astin, 1975; Peltier et. al, 1999; Reason, 2003; Tinto, 1975). Therefore, coding males as 1 and females as 0 created a dummy variable representing “male”. The other two independent variables relating to pre-college characteristics were type of high school and geographical location. The type of high school referred to the nature of proprietorship with regard to private or public governance. Type of high school was dummy-coded with private being 1 and public being 0.

The last pre-college characteristic to be analyzed was the geographical location of the high school, coded with in-state (in-Quito) being 1 and out-of state (out-of-Quito) being 0. Ecuador’s geo-political structure is distributed into provinces. There are twenty-two provinces divided in four regions: coastal, highlands, amazon and insular or the Galapagos islands. Higher education institutions are mainly concentrated on the major cities of the country, and especially in three: Quito, Guayaquil, and Cuenca. It was therefore an important factor to identify the students who migrated from the country into the metropolitan areas. The geographic origin of a high school may have influenced retention rates due to the differences in the characteristics of the students (Murtaugh, Burns, & Schuster, 1999). For the purpose of this study and the analysis of the variable high school location, students from the metropolitan district were considered as from Quito (in-state), while those from out of the district were considered as out-of-Quito (out-of-state) to relate to American college and university terminology.
Second, two pre-college characteristics used in this study were high school grade-point average (high school GPA) and admission test score. High school GPA has long been considered a strong pre-college predictor of retention (ACT, 2007). It was therefore controlled for in an attempt to isolate the unique contribution of student ratings to variations in student persistence. High school GPA is a numerical continuous variable whose values were measured in a scale between 0 and 10, and generally reported in two decimal places. The minimum requirement for graduation was an average GPA of 7.00 out of 10.00. In addition, admission test scores have been considered a significant predictor of retention (Astin, Korn, & Green, 1987; Tross Harper, Osher, & Kneidinger, 2000), so this variable was used in an attempt to explain variations in student graduation rates. The admission test score is a numerical continuous variable ranging from 0 to 100, which was supplied by the Centre of Evaluation for Higher Education (CENEVAL) in Mexico. According to the test development agency, the main purpose of the admission test was to assess students’ abilities and competencies that were required to complete college study.

Finally, one institution-related variable, the area of study, was used in the analysis. The University has 9 schools and colleges within its programs and majors of study (Administrative Sciences, Architecture, Health Sciences, Social Sciences, Law, Automotive Engineering, Gastronomy, Tourism and Hotel Management, and Applied Sciences). For the purpose of this study, majors were subcategorized into three areas of study: Science, Technology, Engineering, and Math Fields (STEM), Health Sciences fields, and Vocational and Professional fields. As Pascarella and Terenzini (2005)
suggested students majoring in STEM fields have higher completion rates, as well as those majoring in health sciences majors such as Medicine.

These subcategories representing the area of study were created based on the following criteria: first, the number of students registered for majors of each of the areas divided the total number of enrollees in approximately equal portions of the total enrollment number; second, the areas of study and specialization for the majors on each area theoretically demanded similar dedication of time, resources, and especially educational interests; finally, the pre-academic requirements and high school preparation required for specialized majors as medicine and STEM fields demanded that special courses be taken during the last three years of college, which differentiated these students from other vocational and professional majors. In summary, two dummy variables representing STEM area (1 = STEM vs. 0 = Vocational/professional fields) and Health science area (1 = Health science vs. 0 = Vocational/professional fields) were created with vocational/professional fields being a reference group.

**Research Hypotheses**

Using the aforementioned variables, three research questions were examined to test the stated hypotheses:

*Research Question #1:* Are student characteristics such as gender, type of high school institution, and location of high school institution (in-state versus out-of-state) related to college graduation?

**Hypothesis 1.1:** Females are more likely to graduate from college than males.

**Hypothesis 1.2:** Students from private high school institutions are more likely to graduate from college than students from public high schools.
Hypothesis 1.3: Students from in-state high schools are more likely to graduate than students from out-of-state high schools.

Research Question #2: Are high school GPA and admission test scores related to college graduation?

Hypothesis 2.1: Incoming students with higher high school GPA are more likely to graduate than students with lower high school GPA.

Hypothesis 2.2: Incoming students with higher admission test scores are more likely to graduate than students with lower admission test scores.

Research Question #3: Do college graduation rates differ by the area of study?

Hypothesis 3.1: Students who major in STEM and Health Sciences are more likely to graduate than those who do not major in these fields.

Data Analysis

The Statistical Package for the Social Sciences (SPSS, IBM Corp., 2013) was used to perform data analysis of the current study. First, descriptive statistics were obtained to describe the distribution of each of the variables involved in the study. Five categorical variables (gender, type of high school, location of high school, area of study, and a binary variable representing whether a student graduated within 6 years or not) were examined using the frequency table. A cross-tabulation table was created to check the distribution of each of the independent variables on the dependent variable. For two continuous variables (high school GPA and admission test scores), measures of central tendency (mean, minimum, and maximum) as well as measures of variability (standard deviation) were examined.
Next, a preliminary analysis was performed to identify the univariate relationship between each of the independent variables and the outcome using either a chi-square test or an independent samples t-test. In particular, a chi-square test was used to examine the relationship between a categorical independent variable and outcome. In addition, an independent samples t-test was used to analyze whether means on the continuous variables (HSGPA and admission test score) differ by graduation status.

Lastly, a sequential logistic regression model was run to examine whether a student graduation within 6 years or not depended on independent variables as predictors with three blocks: (a) Model 1 predicting whether a student graduates or not using pre-college demographic variables as gender, type of high school (public or private), and high school location (in-Quito vs. out-of-Quito); (b) Model 2 predicting whether a student graduates or not using the pre-college academic variables as high school GPA (HSGPA) and admission test score, in addition to the independent variables in Model 1; and (c) Model 3 predicting whether a student graduates or not using the independent variable of area of study (STEM fields, health science fields, and vocational/professional fields) plus the independent variables included in Model 2. Figure 4 describes the framework of the sequential logistic regression model, demonstrating the composition of each block and its inclusion on the next subsequent block.
In the sequential logistic regression model, a model comparison was first performed to choose the best model by testing the significance of the difference in the chi-square value between models and comparing Nagelkerke $R^2$. Individual predictors were then tested for its significance using the Wald’s statistics, followed by the discussion on the magnitude of effect based on Odds ratio (OR), which indicated the increase in the odds of one’s graduation for an additional unit increase in the independent variable, controlling for all other variables in the model. OR was used to express the magnitude of effects 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.

*Note:* GPA: Grade Point Average; STEM: Science Technology Engineering and Math

*Figure 4 Structure of the sequential logistic regression model*
Power Analysis

An a priori power analysis test was performed to estimate the minimum sample size to find a statistically significant result given power, alpha (\(\alpha\)), and effect size (ES) using the statistical software Gpower 3.1.5 (Faul, Erdfelder, Buchner, & Lang, 2009). The a priori power analysis showed that to reach a statistical power of .80 (Cohen, 1992, 2013), assuming a small effect size ES (OR = 1.5) and a type I error (\(\alpha\)) set at .05, the required minimum sample size was 277.
Chapter Four: Results

The first step for data analysis was to perform a preliminary analysis to ensure that the data was appropriate to answer research questions using statistical analysis. These included (a) checking the distribution of each variable based on the descriptive statistics of variable, (b) examining whether each of the independent variables is related to the dependent variable, and (c) ensuring the underlying assumptions of the statistical analysis to answer the previously stated research questions. Because the current study was based on the secondary data obtained from the university, in which no item-level data were available, the psychometric properties of two continuous measures (i.e., high school GPA and college entrance exams) were not tested as a preliminary analysis.

Descriptive Statistics

A total of 743 students who entered the university as freshmen between 2006 and 2008 were used. In the current study, two types of the data were used in the analysis: One was a categorical variable, and the other was a continuous variable. The frequency table was examined for the categorical variables, while the distribution of continuous variable was examined based on the measures of central tendency and variability.

Table 4 summarizes the number (and percentage) of students selected by gender, type of high school, location of high school, and area of study. First, more than half of students were male ($n = 445, 59.9\%$). Second, the majority of students ($n = 689, 92.7\%$) came from public high schools, mostly from ones located in the city of Quito ($n = 655, 88.2\%$). Third, students’ areas of study were grouped into the following three subcategories: Science, Technology, Engineering, and Mathematics (STEM), Health Sciences, and Professional/Vocational. 42.6% of students ($n = 242$) were in STEM
majors, which included Automotive Engineering ($n = 164$), Computer Science ($n = 9$), Robotics ($n = 59$), and Information Systems ($n = 10$). 111 students (14.9%) were in Health Sciences included the majors of Medicine ($n = 83$), Odontology ($n = 17$), Nutrition Science ($n = 6$), and Psychology ($n = 5$). And, the rest of students ($n = 390$, 52.5%) majored in the Vocational and Professional fields of study including Law ($n = 27$), Journalism ($n = 30$), Communication ($n = 28$), International Relations ($n = 49$), Business Administration ($n = 30$), Marketing ($n = 13$), International Business ($n = 86$), Gastronomy ($n = 29$), Hotel Management ($n = 21$), Biology ($n = 16$), Architecture and Interior Design ($n = 25$), Public Relations ($n = 12$), Political Science ($n = 2$), and Tourism ($n = 22$).

As shown in Table 5, students’ high school GPA ranged between 14.00 and 20.00, with a mean value of 17.24 and a standard deviation ($SD$) of 1.20. Admission test score had a mean of 76.78 and a $SD$ of 6.73, with a minimum value of 52.80 and a maximum value of 97.1. Table 6 - Table 8 summarizes the frequency distribution of students by the categorical variables and whether they graduated or not within six years. Of 246 (33.1%) out of 743 who graduated in a six-year term, 48.4% ($n = 119$) were males; 95.1% ($n = 234$) of the students from a private high school graduated; 90.2% ($n = 222$) of the students from high schools located in Quito graduated; 17.9 % ($n = 44$) of the students were from STEM fields of studies; 23.2 % ($n = 57$) of students were from Health Science majors; and 58.9 % ($n = 145$) of the students in other Vocational and Professional majors graduated. Of 44 students who graduated from STEM fields of studies, 4 out of 17 (23.5%) were females, while 40 out of 185 were males; of 57 students who graduated from Health Science majors, 32 out of 60 (53.3%) were females, while 25 out of 51
(49.0%) were males; of 145 students out of 390 who graduated from Vocational and Professional majors, 91 out of 221 (41.2%) were females while 54 out of 169 (31.9%) were males. Of 497 out of 743 who did not graduate in six year terms, 65.6 % (n = 326) were males; 34.0 % (n = 234) of the students from a private high school graduated; 33.9 % (n = 222) of the students from high schools located in Quito graduated; 18.2 % (n = 44) of the students from STEM fields of studies graduated; 51.4 % (n = 57) of students in Health Science majors graduated; and 37.2 % (n = 145) of the students in other Vocational and Professional majors graduated.

**Relationship between Independent and Dependent Variables**

The relationship between each of the independent variables and the outcome was examined using either a chi-square analysis or an independent samples t-test. A chi-square analysis was used to test the relationship between each of the categorical independent variables (i.e., gender, type of high school, high school location, and area of study) and whether one graduated or not. An independent samples t-test was performed to examine means on the independent continuous variable (high school GPA and admission test score) differed depending on one’s graduation status.

Result from a chi-square analysis indicated that there was a significant but small relationship between gender and whether one graduated or not ($\chi^2(1) = 20.31, p < .01, \phi = .17$). As shown in the frequency table (Table 6), more males (65.6%) did not graduate within six years when compared to females (34.4%). Second, a chi-square analysis showed that there was a significant and small relationship between the area of study (STEM, Health Science, and Vocational) and whether one graduated or not ($\chi^2(2) = 43.94, p < .01, \phi = .24$). However, no significant relation to the graduation
status was found by the type of high school ($\chi^2(1) = 3.17, p = .08, \phi = -.07$) or high school location ($\chi^2(1) = 1.54, p = .22, \phi = .05$).

As shown in Table 9, results from an independent samples $t$-test showed that HSGPA was significantly different between students who graduated and students who did not graduate ($t(741) = -6.03, p < .01$). HSGPA was higher for students who graduated ($M = 17.61, SD = 1.21, n = 246$) when compared to students who did not graduate ($M = 17.06, SD = 1.16, n = 497$), $M_{diff} = -0.55$, SE($M_{diff}$) = 0.09, 95% CI: -0.73, -0.37. In addition, admission test scores were significantly different between students who graduated and students who did not ($t(741) = -4.40, p < .01$). Admission test score was higher for students who graduated ($M = 78.30, SD = 6.41, n = 246$) when compared to those who did not graduate ($M = 76.02, SD = 6.75, n = 497$), $M_{diff} = -2.28$, SE($M_{diff}$) = 0.52, 95% CI: -3.30, -1.26. For both independent $t$-tests, the assumption for the equal variances was ($F = 3.14, p = .08$) for HSGPA and ($F = 0.51, p = .48$) for admission test score.

**Assumption Checking for Logistic Regression Model**

The following three assumptions for the logistic regression were first evaluated and found to be met: 1) whether the dependent variable is coded to be binary (i.e., graduate vs. not graduate); 2) whether the dependent variable is coded correctly (1 = graduate vs. 0 = not graduate); 3) whether the errors are assumed to be independent; and 4) whether there is sufficient sample size.

**Results from Logistic Regression Model**

Three research questions for the current study were answered by performing a sequential logistic regression model predicting the odds of one’s graduation within 6
years by including independent variables into three distinct blocks. In block 1, three demographic variables (gender, type of high-school, and location of high-school) were included. In block 2, high-school GPA and admission test score were added and thus the additional effect of pre-college characteristics was tested after controlling for the demographic variables included in block 1. And, in block 3, two dummy variables representing STEM and Health Science were included to examine the incremental effects of academic and institutional variables after controlling for the demographic variables and pre-college characteristics in block 2.

Based upon the model comparisons between models ($\chi^2(2) = 34.30, p < .001$ for Model 1 vs. Model 2, and $\chi^2(2) = 19.58, p < .001$ for Model 2 vs. Model 3), Model 3 was retained as the final model, which was also supported by a Nagelkerke $R^2$ of .14, which depicted an improvement over those for Model 1 (Nagelkerke $R^2 = .04$) and for Model 2 (Nagelkerke $R^2 = .10$). Therefore, results from Model 3 as a final model were discussed below. Overall, results showed that at least one of the slopes in Model 3 explained a significant amount of variance in the odds of students’ graduating ($\chi^2(7) = 76.80, p < .001$), which indicated that the final model was found to be significant.

In Model 3, three predictors were found to be statistically significant in predicting the odds of one’s graduation within six years after controlling for all other variables. These included high school GPA, admission test score, and dummy variable representing STEM fields. First, for a one-unit increase in high school GPA, the odds of one’s graduation within six-years is expected to be increased by 37% on average ($OR = 1.37, b = 0.29, SE = 0.08, \chi^2(1) = 13.97, p < .001$) after controlling for other variables in Model 3. Second, for a one-unit increase in the admission test score, the odds of one’s
graduation within six-years is expected to be increased by 4% on average (OR = 1.04, b = 0.03, SE = 0.01, \(\chi^2(1) = 5.41, p < .05\)) after controlling for other variables in Model 3. Lastly, the odds of one’s graduation within six years were 57% times lower for students in STEM areas when compared to students in professional/vocational areas (OR = 0.43, b = 0.84, SE = 0.22, \(\chi^2(1) = 14.06, p < .001\)) after controlling for other variables in Model 3. Based on Rosenthal’s criteria (Rosenthal, 1996), these effects were all considered to be small in its magnitude.

All other predictors (i.e., gender (OR = 0.77, b = -0.18, SE = 1.53, \(\chi^2(1) = 20.31, p < .001\)), type of high school (OR = 0.88, b = -0.03, SE = 0.36, \(\chi^2(1) = 3.12, p = .08\)), location of high school (OR = 0.70, b = -0.35, SE = 0.27, \(\chi^2(1) = 1.54, p = .22\)), and dummy variable representing health science (OR = 0.76, b = -0.27, SE = 0.23, \(\chi^2(2) = 43.94, p < .001\)) were not found to be significant as shown in Table 10. These indicated that the odds of one’s graduation within six years were not different by gender, type of high school, and location of high school after controlling for other variables in the Model 3. In addition, the odds of one’s graduation within six years were not significantly different between students in Health Science and those in professional/vocational areas when other variables were held constant.
Chapter Five: Discussion

The topic of retention has been considered one of the most important areas of research in higher education within and outside of the United States. The present study was especially important because it set a cornerstone in research in higher education in a country where there is minimal work in the area. Ecuador has recently experienced a rapid increase in students’ access to higher education and more attention has been concentrated to optimize students’ retention and degree attainment in college. The current study examined the potential factors related to students’ graduation using data obtained from a small private university, with a hope to provide a valuable insight to improve retention objectives for universities in Ecuador.

The Current Study

In this study, three research questions were examined. First, the current study examined whether student’s demographics including gender, type of high school institution, and location of high school institution (in-state versus out-of-state) were related to the odds of students’ graduation within 6 years. Second, the current study examined whether high school GPA and admission test scores were related to the odds of students’ graduation within 6 years. Third, the current study examined whether the odds of students’ graduation within 6 years differed by the area of study.

For the first research question, three research hypotheses were posited: (a) females are more likely to graduate from college than males; (b) students from private high school institutions are more likely to graduate from college than students from public high schools; and (c) students from high schools in Quito (in-state) are more likely to graduate than students from out-of-Quito (out-of-state) high schools. For the second
research question, two research hypotheses were postulated: (a) students with higher high school GPA are more likely to graduate than students with lower high school GPA; and (b) students with higher admission test scores are more likely to graduate than students with lower admission test scores. For the third research question, one research hypothesis was posited as students who major in STEM and Health Sciences are more likely to graduate than those who do not major in these fields.

Research questions and the associated research hypotheses were examined using a total of 743 freshmen admitted to a small private university in Ecuador in 2006, 2007, and 2008. First, a preliminary analysis of the individual independent variables was performed to identify its univariate relation to whether a student graduated within six years or not. In particular, a chi-square analysis was performed to examine the relationship between each of the categorical variables (gender, type of high school, high school location, and area of study) and whether a student graduated within six years or not. For the continuous variables (HSGPA and admission test score), a series of independent samples t-test was used to find the independent relationship with the graduation outcome.

Then, a sequential logistic regression with three distinct blocks was performed to predict the odds of one’s graduation status: Model 1 with students’ demographic variables (gender, type of high school, and high school location); Model 2 with the precollege academic variables (HSGPA and admission test score) after controlling for students’ demographic variables included in Model 1; Model 3 with the area of study variables (STEM, health science, and vocational fields) after controlling for students’ demographic and their pre-college academic variables.
Summary of Study Findings

The logistic regression model 1 examined whether student demographic characteristics (gender, type of high school, and high school location) were related to whether one graduated within six years or not. Results of this analysis showed that of the student background variables, only gender was found to show a statistically significant difference in the odds of students’ graduation. This was also found in the univariate chi-square analysis, which showed that female students were more likely to graduate within the six years compared to male students.

The logistic regression Model 2 examined the effect of pre-college academic characteristics on the odds of students’ graduation within six years after controlling for student demographic variables. Results showed that both high school GPA and admission test score were found to be significant in predicting the likelihood of one’s graduation, suggesting that students with higher GPA and admission test score were more likely to graduate within six years. Such inferences were also drawn based on the results of the independent samples t-test analysis comparing high school GPA and admission test scores between students who graduated and those that did not graduate. In addition, in Model 2, gender, which was found to be significant in Model 1, still remained significant.

The logistic regression Model 3, which was retained as the final model, examined the difference in the odds of graduation depending on the area of study after controlling for student demographics and academic background. Students in the STEM majors showed significantly lower odds of graduation when compared to those in vocational majors. However, no significant difference in the odds of graduation between students in health science and those in vocational majors was found. A small but significant
relationship between graduation status and area of study was also found in the chi-square analysis. In Model 3, both high school GPA and admission test scores were found to be significant, while gender was no longer found to be significant. The result from Model 3, which was retained as the final model, suggested that high school GPA, admission test scores, and area of study were significant predictors of one’s graduation status, while all other variables were held constant.

**Inferences of the Study Findings**

Regarding research question 1, the posited three research hypotheses were partially confirmed. In particular, the research hypothesis related to gender was supported, while no significant differences in the odds of graduation existed depending on high school type and high school location. Specifically, females had higher odds of graduation than males, in the logistic regression Model 1 and Model 2. In Model 1 with other student demographic characteristics being controlled, the odds of females’ graduating within six years was 50% more than those of males. In Model 2, where both student demographic characteristics and academic performance variables were controlled, the odds of females’ graduating within six years were 41% more than for those of males. However, gender effect was no longer significant in Model 3 when adding the area of study. Such gender difference was found in many studies (Astin & Oseguera, 2005; Cabrera, Burkum, & La Nasa, 2005; DesJardines, et al., 2006; Diaz Peralta, 2008; Pike, Hansen, & Childress, 2014).

Regarding research question 2, findings supported the two hypotheses related to the pre-college academic variables. Incoming students with higher high school GPAs had higher odds of graduation than those with lower GPAs. In Model 2, with student
background and pre-college academic characteristics being controlled, for one additional unit increase in high school GPA the odds of graduating within six years is expected to increase by 35% on average. Similarly, students with higher admission test scores are 4% more likely to graduate than students with lower admission test scores when controlling for only student demographic variables, and 3% more likely when controlling for the area of study. These finding were supported and concordant with results found in many studies (ACT, 2009; Astin, 1997; Kuh, 2001; Kuh et al., 2008; Lotkowski et al., 2009; Peltier, 1999; Tinto, 2013; Webster & Showers, 2001), where pre-college academic preparation, achievements, skills, talent, resources, presented among other forms by standardized admission tests performance and high school grades, were found to be critical in the persistence of students to degree attainment. Moreover, studies in Latin America that are similar to the specific context of this study showed the importance of high school grades and admission tests in predicting student success related to retention (Cortes & Palomar, 2008; Donoso & Scheifelbein, 2007).

Regarding research question 3, findings supported that students majoring in STEM areas are less likely to graduate within six years than those in vocational areas. It was found that students in STEM majors were 57% less likely to graduate within six years when compared to those in vocational majors. However, no significant differences in the odds of graduation were found between students in health science and those in vocational majors. This relationship between the area of study and graduation status was supported by several predominant scholars’ studies (Braxton, Sullivan, & Johnson, 1997; Braxton et al. 2014; Tinto, 1975, 1993). In addition, several empirical studies in the
region of Latin America supported the fact that students in STEM majors were less likely to graduate from the college (Giraldo et al., 2007; Trevizan, Beltran, & Consolito, 2010).

**Implications of the Current Study**

A number of implications can be drawn from this study. First, students need to be informed of the importance of high school academic preparation for a successful higher education experience. High school students seldom concentrate on their academic preparation with a view to prepare for higher education studies. Most students often aim to finish high school not focusing on the influence that the academic preparation would exert in college success. Given that college preparation was found to be significant in this study, it is recommended that higher education institutions design programs in collaboration with high schools to better prepare students for the transition to college, particularly during the final years of high school.

Second, a special attention to students’ preparation for admission tests is required. Students’ poor or under-performance on admission tests influences the admission to the college or university of choice. An adequate preparation would allow prospective students to aim for the best college or university and to prepare students for higher education. In particular, the basic skills required to succeed in college should be stressed and thus students are encouraged to take a number of preparation courses for the specific majors to perform better and complete a college degree. College academic units should work jointly with high schools to design programs to prepare high school students for standardized tests.

Third, an institutional support can be provided by first identifying at-risk students and further implementing collaborative learning programs that should be given to the
identified at-risk students as early in the process as possible. The current study suggested that at-risk students are those with lower high school GPA, lower admission test scores, and from, but not restricted, STEM areas of study. The student affairs office should be responsible for this task in conjunction with academic departments. These programs could include tutoring, academic advising, and academic leveling courses strategies.

Fourth, institutions should be actively communicating with parents regarding students’ progress toward college performance and graduation. Parents’ information sessions should be implemented and are particularly important in yielding more active parental involvement in their children’s education.

Furthermore, faculty involvement would be also critical in the process of supporting at-risk students for their success in college. Faculty members should implement a “not-out-of-radar” policy for at-risk students and provide the required interventions and special attention to these students. Special training on education pedagogy would enable faculty to be up to date in new concepts and techniques that will allow them to professionally support the special needs of at-risk students. Tutoring sessions can be planned and implemented on a regular basis. During the recruitment process, admissions officers should provide career counseling procedures with two objectives: (a) to provide guidance in determining major or area of study; and (b) to provide confidence and a professional image in the process of career choice to both high school institutions and prospective students. This strategy would become a strategic advantage within the competitive college education market.

Finally, an institution should develop several strategies for helping students graduate during college. As a first step, the admission office should develop a prediction
model that accurately identifies potential at-risk students for a close follow-up. Several offices including student affairs and career counseling programs in the university should design and implement intervention to handle at-risk students. Career choice counseling should be available to provide guidance to those who do not have a clear path defined. Information meetings can be planned during the orientation week, in which available resources to support student success during college is communicated. Lastly, surveys and other tools can be implemented to identify struggling students, the issues for the struggle, and difficulties that students might be experiencing. Tabulation of these results will allow administrators to identify improvement opportunities and design strategies to handle these groups of at-risk students.

In summary, gender, high school GPA, admission test scores, and area of study were found to be significant in predicting the odds of graduation. Such findings were supported by many of the retention theories such as Tinto’s Theory of Student Departure and Model of Interaction (1975; 1987; 1989; 1993), Astin’s I-E-O Model and Theory of Involvement (1997; 1991; 1993), and Terenzini and Reason’s Integrated Model (2005; 2010). All these theories claim that student pre-college characteristics and experiences influence the end results student success, which can be measured by degree attainment or graduation.

However, it should be noted that a number of confounding factors might explain low graduation rates found in the sample. The first factor would be a relatively short time lag between the required degree period of 5 years and the period when the data was gathered. The second factor would be due to the fact that universities in Ecuador require students to complete a thesis for graduation, which require more time for students’
graduation and thus lead to low rate of graduation. Finally, the number of female students enrolled in STEM majors was considerably low, which would have influenced the low graduation rates in STEM, given that the odds of females’ graduation have found to be considerably higher to that of males.

**Limitations**

As most studies on degree completion, the present study was based on a degree completion as a proxy of college student success and explores its relation to pre-college characteristics and degree completion (Cabrera, Burkum, & La Nasa, 2005). Of four types of factors affecting college completion proposed by Pike et al. (2014), this study was limited to one type of factor, which consequently limits the scope of the findings to a part of what a student brings to college. Students’ pre-college characteristics are important variables that an incoming student brings to college, and could give a preliminary idea of the success a student could have toward the attainment of a college degree. However, the effect of pre-college characteristics would be better understood when other factors are held constant in the model. Given that the diversity of students has increased in Latin American universities, further analysis should include factors that pertain to students’ diversity as well.

Results of the study provided a snapshot for future research on the topic of retention through college degree attainment. Students’ records on the data set were limited to cohorts during the three years (2006-2008), which was mainly due to the availability of data. A longitudinal analysis of students’ retention would be required to better understand retention issues in Ecuador. Also, the institution under the study was of specific characteristics, which might not fully represent those of higher education.
institutions in Ecuador. Even though private universities are the largest in number, most students go to public universities, whose student quality is not the same as private universities. Such variation in the study limits the applicability only to private institutions.

**Future Research**

To our knowledge, studies on retention and college degree completion are lacking in Ecuador. This study is therefore an important benchmark to stimulate the replication of future research, with the objective of synthesizing results across different universities and providing recommendations to university administrators and government officials in designing better educational policies. However, other variables not considered in this study should be considered in future research. Several pre-college characteristics such as socioeconomic status (SES), parental level of education, and ethnicity should be included.

In addition, the focus for future research should be developed by combining both organizational and interactive models that integrate the factors included in Tinto’s (1975) Model of Student Departure and additional academic, psychosocial, environmental, and social variables suggested by Bean’s (1980) theoretical model (Diaz Peralta, 2008). Gathering information about more characteristics at the university level is required to broaden the scope of influences a student might experience in college and the decision to persist or leave. Examples are academic performance measured through college GPA, academic integration, medium and long-term goals and objectives, institutional commitment, peer and faculty interaction, financial aid, social interaction, and others.

Finally, future studies should focus on the reasons why students in the STEM
fields are more likely to struggle in reaching graduation. In particular, focus groups and interviews can be designed to understand students’ experiences in the STEM fields and their needs for college completion so that more targeted interventions for students in related majors can be developed.

**Conclusions**

Higher education institutions across different countries have long tried to develop the most effective strategies to help retain students. It was not until recently that higher education administrators and policy-makers in Ecuador became interested in identifying the factors affecting students’ retention and further developing strategies that enhance retention rates in college. The current study was important in that findings from empirical data would shed light on an effective method to deal with the issue of retention in universities in Ecuador as well as in Latin America. Furthermore, this study would motivate more research on this topic so that a more cohesive picture can be drawn on college retention in Ecuador and Latin America.
References


Astin, A. W. (1996). *Degree Attainment Rates at American Colleges and Universities: Effects of Race, Gender, and Institutional Type.* Higher Education Research Institute, Graduate School of Education & Information Studies, 3005 Moore Hall/Mailbox 951521, University of California, Los Angeles, CA 90095-1521; 310-825-1925.


Witte, J., Huisman, J., & Purser, L. (2009). European higher education reforms in the context of the Bologna Process: How did we get here, where are we and where are we going?. *Higher Education to 2030, 205*.
# Tables

## Table 1

*Total Undergraduate Enrollment between 2006 - 2008*

<table>
<thead>
<tr>
<th>Year</th>
<th>Semester</th>
<th>Total Enrollment</th>
<th>Total 1st Semester Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>2006</td>
<td>Spring</td>
<td>337</td>
<td>799</td>
</tr>
<tr>
<td></td>
<td>Fall</td>
<td>503</td>
<td>1063</td>
</tr>
<tr>
<td>2007</td>
<td>Spring</td>
<td>379</td>
<td>1129</td>
</tr>
<tr>
<td></td>
<td>Fall</td>
<td>565</td>
<td>1198</td>
</tr>
<tr>
<td>2008</td>
<td>Spring</td>
<td>418</td>
<td>1088</td>
</tr>
<tr>
<td></td>
<td>Fall</td>
<td>648</td>
<td>1234</td>
</tr>
</tbody>
</table>
Table 2

*Relation of New Students vs. Total Undergraduate Enrollment between 2006-2008*

<table>
<thead>
<tr>
<th>Year</th>
<th>Semester</th>
<th>Total Enrollment</th>
<th>Total 1st Semester Enrollment</th>
<th>% New / Total Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>Spring</td>
<td>1136</td>
<td>65</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>Fall</td>
<td>1566</td>
<td>295</td>
<td>19%</td>
</tr>
<tr>
<td>2007</td>
<td>Spring</td>
<td>1508</td>
<td>108</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>Fall</td>
<td>1763</td>
<td>318</td>
<td>18%</td>
</tr>
<tr>
<td>2008</td>
<td>Spring</td>
<td>1506</td>
<td>116</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>Fall</td>
<td>1882</td>
<td>333</td>
<td>18%</td>
</tr>
</tbody>
</table>
Table 3

List of Variables in the Model

<table>
<thead>
<tr>
<th>Name</th>
<th>Role Taken</th>
<th>Level of Measurement</th>
<th>Variable Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduation Status</td>
<td>Dependent</td>
<td>Categorical</td>
<td>Binary</td>
</tr>
<tr>
<td>Gender</td>
<td>Independent</td>
<td>Categorical</td>
<td>Binary</td>
</tr>
<tr>
<td>Type of High School</td>
<td>Independent</td>
<td>Categorical</td>
<td>Binary</td>
</tr>
<tr>
<td>Location of High School</td>
<td>Independent</td>
<td>Categorical</td>
<td>Binary</td>
</tr>
<tr>
<td>High School GPA</td>
<td>Independent</td>
<td>Numerical</td>
<td>Continuous</td>
</tr>
<tr>
<td>Admission Test Score</td>
<td>Independent</td>
<td>Numerical</td>
<td>Continuous</td>
</tr>
<tr>
<td>Area of Study</td>
<td>Independent</td>
<td>Categorical</td>
<td>Binary</td>
</tr>
</tbody>
</table>
Table 4

Descriptive Statistics for Pre-college Nominal Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>298</td>
<td>40.1%</td>
</tr>
<tr>
<td>Male</td>
<td>445</td>
<td>59.9%</td>
</tr>
<tr>
<td>Total</td>
<td>743</td>
<td></td>
</tr>
<tr>
<td>Type of High School</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>689</td>
<td>92.7%</td>
</tr>
<tr>
<td>Public</td>
<td>54</td>
<td>7.3%</td>
</tr>
<tr>
<td>Total</td>
<td>743</td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quito D.M.</td>
<td>655</td>
<td>88.2%</td>
</tr>
<tr>
<td>Province</td>
<td>88</td>
<td>11.8%</td>
</tr>
<tr>
<td>Total</td>
<td>743</td>
<td></td>
</tr>
<tr>
<td>Area of Study</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STEM</td>
<td>242</td>
<td>32.6%</td>
</tr>
<tr>
<td>Health Sciences</td>
<td>111</td>
<td>14.9%</td>
</tr>
<tr>
<td>Vocational / Professional</td>
<td>390</td>
<td>52.5%</td>
</tr>
<tr>
<td>Total</td>
<td>743</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* D.M. = Metropolitan District; STEM = Science, Technology, Engineering, and Math
Table 5

*Descriptive Statistics for Pre-college Academic Variables*

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Min</th>
<th>Max</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School GPA</td>
<td>743</td>
<td>14.00</td>
<td>20.00</td>
<td>17.24</td>
<td>1.20</td>
</tr>
<tr>
<td>Admission Test Score</td>
<td>743</td>
<td>52.80</td>
<td>97.17</td>
<td>76.78</td>
<td>6.73</td>
</tr>
</tbody>
</table>

*Note.* GPA = Grade Point Average
Table 6

*Frequency of Students by Gender and Whether or not One Graduates within Six Years*

<table>
<thead>
<tr>
<th></th>
<th>Gender</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Male</td>
<td>Female</td>
<td></td>
</tr>
<tr>
<td>Graduate</td>
<td>246</td>
<td>119</td>
<td>127</td>
<td>42.6%</td>
</tr>
<tr>
<td></td>
<td>(33.1%)</td>
<td>(48.4%)</td>
<td>(51.6%)</td>
<td></td>
</tr>
<tr>
<td>Did not graduate</td>
<td>497</td>
<td>326</td>
<td>171</td>
<td>57.4%</td>
</tr>
<tr>
<td></td>
<td>(66.9%)</td>
<td>(73.3%)</td>
<td>(34.4%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>743</td>
<td>445</td>
<td>298</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Numbers in parenthesis represent percentages across columns.
Table 7

*Frequency of Students by Area of Study, Gender and Whether or not One Graduates within Six Years*

<table>
<thead>
<tr>
<th>Area of study</th>
<th>Gender</th>
<th>College Graduation</th>
<th></th>
<th>Graduated</th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Count</td>
<td>%</td>
<td>Count</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td><strong>STEM</strong></td>
<td>Female</td>
<td>13</td>
<td>76,47%</td>
<td>4</td>
<td>23,53%</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>185</td>
<td>82,22%</td>
<td>40</td>
<td>17,78%</td>
<td>225</td>
</tr>
<tr>
<td><strong>Health Science</strong></td>
<td>Female</td>
<td>28</td>
<td>46,67%</td>
<td>32</td>
<td>53,33%</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>26</td>
<td>50,98%</td>
<td>25</td>
<td>49,02%</td>
<td>51</td>
</tr>
<tr>
<td><strong>Vocational / Professional</strong></td>
<td>Female</td>
<td>130</td>
<td>58,82%</td>
<td>91</td>
<td>41,18%</td>
<td>221</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>115</td>
<td>68,05%</td>
<td>54</td>
<td>31,95%</td>
<td>169</td>
</tr>
</tbody>
</table>

*Note.* Numbers in parenthesis represent percentages across rows.
Table 8

*Frequency of Students by Type of High School and High School Location and Whether or not One Graduates within Six Years*

<table>
<thead>
<tr>
<th></th>
<th>Type of High School</th>
<th>High School Location</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Private</td>
<td>Public</td>
</tr>
<tr>
<td>Graduate</td>
<td>246</td>
<td>33.1%</td>
<td>234</td>
</tr>
<tr>
<td>Did not graduate</td>
<td>497</td>
<td>66.9%</td>
<td>455</td>
</tr>
<tr>
<td>Total</td>
<td>743</td>
<td>689</td>
<td>54</td>
</tr>
</tbody>
</table>

*Note.* Numbers in parenthesis represent percentages across columns.
Table 9

*Frequency of Students by Area of Study and Whether or not One Graduates within Six Years*

<table>
<thead>
<tr>
<th>Area of Study</th>
<th>Total</th>
<th>STEM</th>
<th>Graduate</th>
<th>Did not graduate</th>
<th>Total</th>
<th>Did not graduate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Sciences</td>
<td>57</td>
<td>17.9%</td>
<td>51.4%</td>
<td>48.6%</td>
<td>54</td>
<td>10.9%</td>
<td>48.1%</td>
</tr>
<tr>
<td>Vocational</td>
<td>145</td>
<td>58.9%</td>
<td>37.2%</td>
<td>62.8%</td>
<td>245</td>
<td>49.3%</td>
<td>50.5%</td>
</tr>
<tr>
<td>STEM</td>
<td>246</td>
<td>33.1%</td>
<td>66.9%</td>
<td>33.1%</td>
<td>497</td>
<td>66.9%</td>
<td>33.1%</td>
</tr>
<tr>
<td>Graduate</td>
<td>44</td>
<td>18.2%</td>
<td>81.8%</td>
<td>18.2%</td>
<td>198</td>
<td>81.8%</td>
<td>18.2%</td>
</tr>
<tr>
<td>Did not graduate</td>
<td>57</td>
<td>17.9%</td>
<td>81.8%</td>
<td>17.9%</td>
<td>54</td>
<td>10.9%</td>
<td>89.1%</td>
</tr>
</tbody>
</table>

Note. STEM = Science, Technology, Engineering, and Math; Numbers in parenthesis represent percentages across columns.
Table 10

*Results from an Independent Samples t-test comparing Graduation by Pre-college Academic Variables*

<table>
<thead>
<tr>
<th></th>
<th>Test of Homogeneity of Errors</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>F</em></td>
<td><em>p</em></td>
<td><em>t</em></td>
<td><em>df</em></td>
<td><em>p</em></td>
<td><em>Mdiff</em></td>
<td><em>SE(Mdiff)</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSGPA</td>
<td>3.14</td>
<td>0.08</td>
<td>-6.03</td>
<td>741</td>
<td>&lt; .01</td>
<td>-0.55</td>
<td>0.09</td>
<td></td>
<td></td>
<td>-0.73</td>
<td>-0.37</td>
<td></td>
</tr>
<tr>
<td>Admission Test Score</td>
<td>0.51</td>
<td>0.48</td>
<td>-4.40</td>
<td>741</td>
<td>&lt; .01</td>
<td>-2.28</td>
<td>0.52</td>
<td></td>
<td></td>
<td>-3.30</td>
<td>-1.26</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* HSGPA = High School Grade Point Average
Table 11

Summary of Logistic Regression Model Predicting Odds of Graduation

<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>-0.25*</td>
<td>0.12</td>
<td>-0.40***</td>
<td>1.45</td>
<td>-8.35***</td>
<td>1.56</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>-0.69***</td>
<td>0.16</td>
<td>0.50</td>
<td>-0.53**</td>
<td>0.17</td>
<td>0.59</td>
<td>-0.18</td>
<td>0.19</td>
<td>0.83</td>
</tr>
<tr>
<td>Type of High School</td>
<td>-0.42</td>
<td>0.35</td>
<td>0.66</td>
<td>-0.26</td>
<td>0.35</td>
<td>0.77</td>
<td>-0.03</td>
<td>0.36</td>
<td>0.97</td>
</tr>
<tr>
<td>HS Location</td>
<td>-0.24</td>
<td>0.26</td>
<td>0.79</td>
<td>-0.34</td>
<td>0.27</td>
<td>0.71</td>
<td>-0.35</td>
<td>0.27</td>
<td>0.71</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Block2</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HSGPA</td>
<td>0.30*</td>
<td>0.08</td>
<td>1.35</td>
<td>0.29***</td>
<td>0.08</td>
<td>1.34</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Admission Test Score</td>
<td>0.04**</td>
<td>0.01</td>
<td>1.04</td>
<td>0.03*</td>
<td>0.01</td>
<td>1.03</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Block3</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>STEM fields</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Science fields</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( \Delta \chi^2 \) 34.30*** 19.58***
\( \Delta df \) 2 2
\( -2LL \) 920.62 886.32 866.74
\( \chi^2 \) 22.92*** 57.22*** 76.80***
\( df \) 3 5 7
Nagelkerke \( R^2 \) .04 .10 .14

Note. HS = High School; HSGPA = High School Grade Point Average; STEM = Science, Technology, Engineering, and Math; n = 743. * \( p < .05 \); ** \( p < .01 \); *** \( p < .001 \)
Appendices

Appendix A

Undergraduate Students Registration Form at Universidad Internacional del Ecuador

<table>
<thead>
<tr>
<th>FECHA DE INSCRIPCIÓN</th>
<th>PERIODO ACADÉMICO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| CARRERA:               |                   |
|                       |                   |

| HORARIO:              | NOCTURNO:         |
|                       | SEMIPRESENCIAL:   |
|                       |                   |

### DATOS PERSONALES

Favor llenar con letra imprenta:

<table>
<thead>
<tr>
<th>Apellidos:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nombres:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lugar y Fecha de Nacimiento:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sexo: Masculino: Femenino: Estado Civil:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dirección Domiciliaria:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E-MAIL:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teléfono:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>teléfono celular:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Movistar: Porta: Alegro:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Código de Ciudadanía/ Pasaporte:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Empresa donde trabaja: Cargo:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dirección Oficina: Desde cuándo:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fax: Teléfono:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

### DATOS ACADÉMICOS

<table>
<thead>
<tr>
<th>Institución del Bachillerato (Lugar y nombre):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Especialización: Fecha de Grado: Calificación:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Universidad en que estudió: Carrera que estudió: Desde: Hasta:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Licenciado: Título profesional o grado académico que obtuvo: Fecha:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

### DOCUMENTOS ENTREGADOS

<table>
<thead>
<tr>
<th>Cédula de Ciudadanía/ Pasaporte (original y 2 copias):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Papeleta de votación (original y 1 copia): 2 Fotografías tamaño carnet:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Certificado Médico (original y 1 copia): Recibo de caja de tesorería por inscripción:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

| Título (original y 1 copia) de: Acta de Grado: Certificado Estudios: |
|--------------------------|------------------------|
|                          |                        |

| Programa de materias (No.): Certificado de Conducta: |
|--------------------------------|-----------------|
|                                 |                 |

<table>
<thead>
<tr>
<th>Certificado 3era Matrícula:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

Atendido por: Firma del Estudiante:

FECHA:........................................

* REQUISITOS PARA ALUMNOS PROVENIENTES DE OTRAS INSTITUCIONES DE EDUCACIÓN SUPERIOR

Eduación de calidad para una vida exitosa

85
Appendix B

Request for Authorization Letter to the Superior Council of Universidad Internacional del Ecuador
Quito, Marzo 30 de 2014

Señores
CONSEJO SUPERIOR
Universidad Internacional del Ecuador
Quito.-

De mi consideración,

A través de la presente, yo Diego Gustavo Perez Darquea, funcionario de esta universidad y en mi calidad de estudiante de doctorado en Liderazgo en Educación Superior en la Universidad de Miami, solicito autorización de uso de la información existente en la base de datos de la institución además de otra adicional que pueda requerir para la investigación a realizar como parte de la disertación doctoral requerida en el proceso de obtención del título de Doctor en Liderazgo de la Educación.

El trabajo de investigación involucra analizar las variables pre-universitarias con las que los estudiantes inician su vida universitaria en la UIDE y la relación que estas pudieren tener con el objetivo final de obtener un título universitario de tercer nivel. El título del trabajo de investigación es:

**Student Retention in Higher Education in Ecuador: An Analysis of a Private University**

La información recibida para este ejercicio se mantendrá en total confidencialidad y su uso será exclusivo para los objetivos de la institución. El nombre de los participantes no será de ninguna manera reportado ni identificado.

Por la atención a la presente agradezco por anticipado y estoy seguro el trabajo de mi investigación será en provecho de los intereses de la institución con el fin de optimizar la retención de sus alumnos hasta la obtención de sus títulos universitarios.

Atentamente,

Diego Perez Darquea