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Towards the Education Nation: Revisiting the Impact of Financial Aid, College  
Experience, and Institutional Context on Baccalaureate Degree Attainment  
Using a Propensity Score Matching, Multilevel Modeling Approach

A dissertation submitted in partial satisfaction of the  
requirements for the degree Doctor of Philosophy  
in Education

by

Ray Franke

2012

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## ABSTRACT OF THE DISSERTATION

Towards the Education Nation: Revisiting the Impact of Financial Aid, College Experience,  
and Institutional Context on Baccalaureate Degree Attainment

Using a Propensity Score Matching, Multilevel Modeling Approach

by

Ray Franke

Doctor of Philosophy in Education

University of California, Los Angeles, 2012

Assistant Professor José L. Santos, Committee (Co-)Chair

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To compete in the global marketplace, the U.S. economy heavily relies on higher education institutions to educate the college graduates and knowledge workers needed to create the innovative products and services of tomorrow. And yet, where once America led the world in educational attainment, recent data from the Organization for Economic Cooperation and Development indicates that the U.S. now ranks only 15<sup>th</sup> among major industrialized nations in college completion rates. As a result, increasing degree attainment and reclaiming America's spot at the top have become major policy objectives. Despite the heightened interest and a remarkable investment of \$235 billion in total financial aid in 2010-11, however, research

specifically directed at the intersection of degree attainment and financial assistance is surprisingly slim in quantity and challenged methodologically.

This quantitative study sought to address limitations in the literature and examined the effects of financial aid in conjunction with students' college experiences and the institutional context on six-year degree attainment. Particularly, I studied the effects of various forms of financial aid, such as need-based and merit grants, subsidized and unsubsidized loans, and federal work-study, and how these differentially impact students from various income backgrounds. I also examined factors and experiences during students' pre-college, transition, and college attendance phases that affect degree completion at the individual level and how institutional structural-demographic characteristics, institutional and peer climate, and organizational behavior impact student success.

In support of recent calls for more interdisciplinary perspectives in the study of persistence and degree attainment, I used a multitheoretical conceptual framework. To minimize endogeneity bias in the estimation of financial aid effects, I applied a propensity score matching technique in combination with a multilevel (HGLM) modeling approach. Data for this study was drawn from the Beginning Postsecondary Students survey (BPS:04/09), the Integrated Postsecondary Education Data System, and the Delta Cost Project. The final sample in this study encompassed N=6,561 students attending n=651 4-year colleges and universities in the U.S.

Results in this study revealed that financial aid influences six-year degree attainment for all but high income students. Particularly for low income students, need-based grants from all sources (federal, state, and institutional) are found to significantly increase their chances to graduate, whereas unsubsidized loans severely lower their likelihood to obtain a baccalaureate degree. For middle income students, institutional need-based and merit grants are found to exert

a positive influence on student degree completion. Results further confirmed a persistent attainment gap: despite all financial aid and controlling for students' academic performance, pre-college and college experiences, and institutional factors, low income students are found significantly less likely to obtain a baccalaureate degree.

At the student level, this study also confirmed strong positive effects of academic performance in college and high school, living on campus, and being socially integrated into the campus environment. Factors found detrimental on student degree attainment are, for instance, initial transfer inclination, distance from home, and working more than 20 hours a week. In regard to contextual influences, attending a low selectivity institution is found to lower chances of degree attainment, as is attending colleges and universities with a high representation of part-time students and high share of individuals receiving federal grant aid. In contrast, institutional structural diversity, measured through the share of minority students on campus, is found to increase a student's likelihood of degree completion within six years.

The dissertation of Ray Franke is approved.

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Für meine Eltern & Familie – ihr habt mich zu dem gemacht was ich bin. Nur mit Eurer  
immerwährenden, fürsorglichen und liebevollen Unterstützung habt Ihr es mir ermöglicht,  
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## CHAPTER 1: INTRODUCTION

To compete in the global marketplace, the U.S. economy heavily relies on higher education institutions to educate the college graduates and knowledge workers needed to create the innovative products and services of tomorrow. And yet, where once America led the world in educational attainment, recent data from the Organization for Economic Cooperation and Development (OECD) indicates that the U.S. now ranks only 15<sup>th</sup> among major industrialized nations in college completion rates (OECD, 2011). As a result, increasing degree attainment and reclaiming America's spot at the top have become major policy objectives, as evidenced recently by the launch of the *American Graduation Initiative* (The White House, 2009).

Increasing college graduation rates is not an easy venture. To do this, we must not only build a K-12 system that ensures sufficient academic preparation and a successful transition into higher education, we also have to utilize the full potential of American society and increase the number of students of color, first-generation and low income students. Research shows there are vast human resources largely untapped in the U.S. Focusing only on low- and moderate income students, the Advisory Committee on Student Financial Assistance (ACSFA) estimates that 1.4 to 2.4 million more bachelor's degree could have been earned in the first decade of the millennium, if financial barriers were reduced (ACSFA, 2006). Thus, increasing access to and success in higher education for low income students alone, could make a sizeable contribution towards the stated goal of adding five million college graduates to the American workforce by 2020 (The White House, 2009). To contribute to our understanding of influential factors on degree attainment, not only for low income students, this study examines the impact of financial aid, student characteristics and experiences, and institutional context on six-year degree completion.



U.S. higher education has a long history of providing educational opportunity and financial aid to students who are “needy and deserving” (McPherson & Schapiro, 1998). However, it was not until the 1960s that the federal government became extensively involved in student financial aid, aiming to offer equal educational opportunities to students regardless of their economic status. Today, the U.S. spends \$235 billion in financial aid of all forms and from all sources. To put this into perspective, this is approximately the entire GDP of Finland, currently the 35<sup>th</sup> largest economy in the world (The World Bank, 2010). The federal government alone spent \$169 billion in 2010-11, which represents an increase of 164% over the past decade (College Board, 2011b).

Despite this remarkable investment in higher education, research specifically directed at the intersection between degree completion, financial aid, and student income is surprisingly slim in quantity and challenged methodologically (Alon, 2005; Cellini, 2008; Chen, 2008; Dowd, 2008; Goldrick-Rab, Harris, & Trostel, 2009; Hossler, Ziskin, Gross, Kim, & Cekic, 2009; St. John, 2000). This is particularly puzzling, given the persistent and even widening gaps in degree completion between economically disadvantaged students and their wealthier peers (Astin & Oseguera, 2004; Kane, 2004; Walpole, 2003, 2007). As the ACSFA estimates, among 8<sup>th</sup> graders in 2000 only 20% of low income students were likely to obtain a bachelor’s degree by 2012. This compares to 68% for their high income peers (ACSFA, 2006).

Most recent data from the National Center of Education Statistics (NCES) also reveals a negative trend for economically disadvantaged students. Data shows that six-year bachelor’s degree attainment for first-time, full-time students (overall) at 4-year public institutions increased from 65.0% to 70.3% between 2001 and 2009. However, for low income students degree completion rates decreased from 57.4% to 54.8% over the same period, thus evidence a

widening of the attainment gap at America's colleges and universities (National Center for Education Statistics, 2011b). Studying factors that impact degree completion for economically disadvantaged students, therefore, is not only essential for educational policy and the U.S. economy; it is of vital importance to individuals that seek personal advancement through higher education.

### Significance and Problem Statement

Over the past decades, student success<sup>1</sup> in postsecondary education, particularly persistence and degree completion, has been of interest to scholars from various disciplines and multidisciplinary fields. To study these outcomes, higher education researchers have often resorted to interactionist theory and Tinto's (1975, 1993) model of student departure. However, other conceptual frameworks and theoretical models have been applied successfully to explain persistence decisions that can lead to degree attainment, for instance the student attrition model (Bean, 1980, 1982, 1990), the student adjustment model (Nora & Cabrera, 1996), and the student/institution engagement model (Nora, 2004).

Drawing mostly on human capital theory (Becker, 1962, 1980) and price response theory (Heller, 1997; Leslie & Brinkman, 1987), economists have focused on financial aspects in student college-going behavior. However, scholarly attention has centered mostly on aspects of student access to postsecondary education and institutional choice, less on persistence and degree completion (Chen, 2008; St. John, Cabrera, Nora, & Asker, 2000). To study the impact of finance and financial barriers, scholars have examined the effects of price (tuition and fees),

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<sup>1</sup> *Success* is broadly defined as student persistence *or* degree completion. Given the intricate nature of both of these measures, and due to the fact that scholarly attention has focused primarily on persistence, the literature review will encompass both aspects (see subsection *Scope*). However, the focus of this study is degree completion.

grants, loans, and work-study (Alon, 2007; Bettinger, 2004; Cabrera, Nora, & Castañeda, 1992; Cuccaro-Alamin & Choy, 1998; DesJardins & McCall, 2010; Dowd & Coury, 2006; Dynarski, 1999; Herzog, 2008; Hu & St. John, 2001; Perna, 1998; Scott-Clayton, 2011; Singell Jr, 2004; St. John, 1998; St. John, Andrieu, Oescher, & Starkey, 1994). Historically, most studies found that student aid was positively associated with persistence and degree completion. However, since the 1990s a growing number of scholars have reported negative or not significant results (Herzog, 2008; St. John, 1998, 2000; St. John, Paulsen, & Carter, 2005; Stinebrickner & Stinebrickner, 2004), leading to a discussion about the adequacy of financial aid to promote these outcomes.

Sociologist and organizational theorists have also studied student persistence and college departure. Most recently, Bourdieu's (1977, 1986) social reproduction theory gained attention and has been applied to study social stratification processes and unequal educational outcomes by focusing on a broader definition of capital that incorporates social and cultural aspects. Organizational theorists are mostly concerned with the impact of the college environment on student behavior (Berger & Milem, 2000). To examine potentially influential factors, scholars have focused on aspects of institutional and organizational behavior (Berger & Milem, 2000; Bolman & Deal, 2008), student/peer climate (Astin, 1984, 1993; Hurtado & Carter, 1997; Oseguera & Rhee, 2009; Rhee, 2008; Weidman, 1989), and, most recently, resource-dependency of institutions (J. Pfeffer & Salancik, 1978, 2003; Titus, 2006b).

Despite these various approaches and the advancement in our understanding of the factors that influence student success in higher education, there is much we still need to comprehend. As Chen (2008) and St. John et al. (2000) note, the bulk of research has focused on individual persistence decisions and student departure. The specific factors and processes that

can impact *degree completion*, however, have received considerable less attention. Even fewer scholars examine the crucial intersection of degree completion and financial aid, and how specific aid components can impact students differently across various income and socioeconomic groups (Chen, 2008; Goldrick-Rab et al., 2009; Hossler et al., 2009; St. John et al., 2000). Furthermore, researchers frequently use aggregated variables of financial aid, thus neglect possible differential effects by aid subtypes, such as subsidized and unsubsidized loans, merit and need-based grants, and federal work-study (Chen, 2008; Goldrick-Rab et al., 2009; Hossler et al., 2009; St. John et al., 2000). Thus, our understanding of the effects of various financial aid tools that might close – or at the minimum narrow – the attainment gap is still limited.

Researchers have also experienced methodological difficulties in identifying causal effects of financial aid on persistence and degree completion – a requirement for testing any theory intended to inform policy or practice. While there are several challenges, recent discourse appears to focus on limitations resulting from selection bias or endogeneity, omitted variable bias, and the disregard of the longitudinal nature of the effects of financial aid (Alon, 2005; Cellini, 2008; Dowd, 2008; Goldrick-Rab et al., 2009; Hossler et al., 2009). Particularly endogeneity has been identified as a key problem in this line of research. The challenge results from the fact that aid eligibility is influenced or even determined by factors such as students' race/ethnicity, income/SES, cultural values, and educational aspiration, which can also affect student outcomes on persistence and degree attainment (Hossler et al., 2009). Thus, the same factors making a student eligible for financial aid can also impact the likelihood to obtain a degree and possibly induce bias into estimation results.

Just as much as the various theoretical, often discipline-based, frameworks have advanced our knowledge, they may have contributed also to a compartmentalized, thus incomplete, view of a complex phenomenon—the various factors, decisions, and processes that ultimately prompt an individual to stay in college and graduate, or withdraw. For instance, as St. John et al. (2000) note, higher education scholars that base their investigative efforts on the interactionist framework, focus primarily on academic and social experiences in college. However, they largely ignore economic aspects and financial aid elements. In contrast, scholars using an economic perspective specifically seek to examine the effects of financial need, adequacy of aid, and the various forms of aid. Studies utilizing such a framework often minimize or even omit college experience measures, thus underestimate or neglect the impact college itself can have on student outcomes (Chen, 2008; Hossler et al., 2009; St. John et al., 2000). Sociologists, psychologists, and organizational theorists too have made invaluable contributions to the understanding of persistence and degree completion, yet also often lack an integrated conceptual framework. Therefore, most recently scholars have called for a new interdisciplinary perspective that would allow a more comprehensive, integrated view on these crucial college outcomes (Goldrick-Rab et al., 2009).

The scarcity of information at the intersection of degree completion, financial aid, and income in combination with conceptual and methodological shortcomings in current research limits our understanding and our capacity to make informed policy decisions. Thus, I seek to contribute to the knowledge base by examining the effects of financial aid in conjunction with students' college experiences and organizational/institutional context on six-year degree completion at 4-year colleges and universities. In particular, I examine the specific effects of various forms of financial aid, such as subsidized and unsubsidized loans, grants, and federal

work-study, and how these differentially impact students from various income groups for their potential to narrow existing attainment gaps. For this, I use a multitheoretical conceptual framework that seeks to account for student-level and institutional-level influences. To minimize the impact of endogeneity in the estimation of financial aid effects, I apply a quasi-experimental technique (propensity score matching) in combination with a multilevel modeling approach (hierarchical generalized linear modeling). The data is drawn from the latest version of the Beginning Postsecondary Students survey (BPS:04/09), a longitudinal database sponsored by the National Center of Education Statistics (NCES), and merged with institutional data from the Integrated Postsecondary Education Data System (IPEDS) and the Delta Cost Project.

### Relevance

A college degree appears now to be a prerequisite for economic and social success in American life. Fourteen percent of students from low income families may reach the top 40% of income distribution without earning a college degree. However, holding a bachelor's degree practically triples their chance, raising the percentage that may earn such an income to 41% (Haskins, 2008). Economists have a long history of estimating the work-related benefits of education and find that, among other things, higher education levels decrease an individual's likelihood of unemployment and significantly increase earnings (H. R. Bowen, 1996; Ehrenberg & Smith, 2006; Leslie & Brinkman, 1993). As recent estimates show (Julian & Kominski, 2011), the median income for bachelor's degree holders in 2008 was almost twice (\$42,783) the amount that students with only a high school diploma (\$21,569) earned. When estimating work-life earnings<sup>2</sup>, the differences become even more evident. While high school graduates are projected

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<sup>2</sup> Estimates are projected median, synthetic work-life earnings for white (non Hispanic), male workers.

to earn \$1.5 million over the course of a 40-year work period, the projected income for bachelor's degree holders is estimated to be \$2.6 million, about 73% higher, or even twice the amount (\$3.0 million) for individuals that earned a master's degree.

Given these benefits, it is not surprising that enrollment in higher education constantly increased over time. While in 1980, 12.1 million students enrolled in degree-granting institutions in the U.S., this number increased to 15.3 million in 2000, and 21.0 million in 2010 (National Center for Education Statistics, 2012). However, prices to attend college have also increased remarkably and generally outpaced inflation. Between 1981-82 and 2011-12, inflation adjusted tuition at public 4-year institutions increased sharply by 268%. Just over the past decade alone, published in-state tuition and fees at 4-year public colleges and universities increased at an average rate of 5.6% per year *beyond* the rate of general inflation. California, once a pioneer in the provision of accessible public higher education, in 2011-12 alone increased prices to attend its public 4-year colleges by 21% and 37% at public 2-year institutions, due to a dire economic and fiscal situation (College Board, 2011a; Gardner & Blumenstyk, 2012).

With college enrollment constantly increasing, despite a sharp rise in the cost of attendance, one would assume that family income also increased over time. Quite the contrary is the case, however, particularly for low income families. Over the entire income distribution, average incomes in 2010 were lower than a decade earlier (in inflation-adjusted dollars), with the lowest-income quintile experiencing the largest decline of 16%. Over the three decades from 1980 to 2010, average family income for the poorest 20% of families shrunk by 7%, whereas the wealthiest 20% of families saw their incomes increase by 51% over the same period (College Board, 2011a). At the same time, states are also cutting their education spending, both in terms of general expenditures and financial aid programs. After slight increases in the 1980s and

1990s, state appropriations per FTE student declined by almost one-fourth (23%) between 2000 and 2010 (in inflation-adjusted dollars). Spurred by the economic crisis, some states recently made dramatic cuts to financial aid programs. Michigan, for instance, reduced financial aid by almost two-thirds (61%), severely cutting the state's primary needs-based programs, on which many low income students rely (NCSL, 2011).

Both the long-term trends and short-term changes in college costs, family income, and state support to higher education are likely to have a detrimental effect for students from economically disadvantaged backgrounds seeking to attend college. Thus, the role of *federal* financial aid is even more important in fostering higher education access, persistence and degree completion. On the heels of influential federal reports, such as *A Test of Leadership* (the so-called *Spellings Report*) (U.S. Department of Education, 2006), the Obama administration has publicly announced its commitment to higher education. This pledge has begun with increased funding, for instance for the Pell grant program, and an overarching strategy to increase the number of college graduates to boost the U.S. economy, and has concluded with the *Keeping College Affordable* initiative to attain this goal (The White House, 2009, 2012).

The latter initiative, in particular, addresses college costs and seeks student aid reform to promote affordability and underscores the federal commitment to support aid programs. The Pell Grant, the largest federal grant program directed at low- and middle-income students, practically doubled since President Obama took office, from \$15.3 billion in 2007-08 to \$30.3 billion in 2009-10 (College Board, 2011b)<sup>3</sup>. This comes after an extended period of only cosmetic changes to the Pell program, as a result of which many scholars reported about detrimental effects of the

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<sup>3</sup> All figures are inflation-adjusted (constant 2010 dollars).



Pell's declining purchasing power, particularly for low income students (for a review, see Kane, 2001).

Other aid programs also received increased support over time. However, the effects are often less clear. Tax credits, which have been found to mostly benefit upper-middle and high income families (Burman, Maag, Orszag, Rohaly, & O'Hare, 2005; Kane, 1997; Long, 2003, 2008), more than doubled and increased from \$7 billion in 2007-08 to \$14.8 billion in 2009-10. The provision of federal loans increased by 41% during the same period, although loans have also been found to negatively affect student college access and success (Astin & Oseguera, 2005a; DesJardins, Ahlburg, & McCall, 2002; Savoca, 1991). Even more alarming, interest rates for the subsidized Stafford loans, the largest need-based loan program, may be doubling from 3.4% to 6.8% in 2013, after Congress approved a measure in June 2012 of maintaining rates for only one more year (Helderman, 2012). This comes at a time of continued economic fragility in which many college graduates struggle to find work and the nation as a whole crossed the \$1 trillion threshold in student debt (Nelson, 2012). In contrast, funding for the federal work-study program, that has been found to positively impact persistence and degree completion, particularly for low income students (Hossler, Ziskin, Kim, Cekic, & Gross, 2008; Pascarella & Terenzini, 2005), remained practically unchanged over the past decade (College Board, 2011b).

The complexity of all these interrelated elements and developments has palpable implications for individuals, colleges, the higher education system, and the U.S. economy. Thus, studying the effects that specific financial aid tools in conjunction with students' college experiences and the organizational/institutional context have on degree completion can be relevant on several levels. For the individual student, it highly matters that an aid system is designed to fulfill its objectives and provide aid tools that have been proven to work. To increase

access, persistence and degree completion students need to know the factors – financial aid and others – that best support their individual goals so they can make informed decisions and optimize choices.

Having a complete understanding of the various factors that influence college success, in turn, can have an impact on students' college-going decisions and their institutional choices. As institutions rely on student enrollment for their operation, this can create incentives for colleges and universities to focus on most effective aid elements and design campus policies and programming that strengthens student persistence and degree completion. Furthermore, utilizing a comprehensive conceptual framework, as this study employs, can also benefit colleges and universities directly. An integrated perspective that draws from economic, sociological, and organizational theory and persistence frameworks can provide an insight into how various elements interact and foster or inhibit student success. Thus, a comprehensive, heterogeneous framework can contribute to overcoming the “multiplicity” of policy recommendations and the often contradicting findings that in the past resulted from the use of various homogeneous frameworks and often irritated campus administrators seeking improved outcomes (St. John et al., 2000).

Studying financial aid and other factors that potentially affect degree completion is also relevant from a higher education system and economic perspective. The federal government is currently the largest provider of financial aid in the U.S. higher education system. However, education is a discretionary item in the federal budget, thus prone to spending cuts in times of economic hardship. From a policy perspective, it is therefore essential to design an effective aid system and implement tools that help fulfilling its purpose. For this, cost-benefit considerations

become crucial, as policy makers and legislators have to ensure most efficient tools are in use for the various objectives and target populations.

Using rigorous studies and scholarly work that examines not only the differential effects of various types of financial aid on students from different income backgrounds, but also incorporates college experiences and organizational/institutional context, is key in informing policy and helping to improve the higher education system. In alignment with the objectives of the Obama Administration, this could boost overall degree completion, assist with the goal of regaining America's top spot in graduation rates, and most importantly, provide higher numbers of well educated college graduates for the economy.

### Purpose

This study seeks to contribute to the literature on college success by examining the complex effects of financial aid, students' pre-college and college experiences, and institutional context on six-year degree completion. In particular, I will examine the extent to which various forms of financial aid, such as subsidized and unsubsidized loans, need-based and merit grants, and federal work-study differentially impact students from different income backgrounds. With the intent of indentifying factors that increase degree attainment beyond economic and financial aspects, I also seek to analyze how student background characteristics, academic and social experiences in college, and institutional context influence the likelihood of completing a bachelor's degree at a 4-year institution.

To better understand the factors that foster degree attainment, the following research questions guide this study:

- 1) What background characteristics, pre-college and college experiences, and pull factors impact six-year degree completion for dependent, full-time students at 4-year institutions, after controlling for financial aid received?
- 2) Accounting for individual-level characteristics, which institutional-level factors influence students' likelihood of degree attainment?
- 3) What is the influence of various forms of financial aid, particularly need-based and merit grants, subsidized and unsubsidized loans, and federal work-study, on six-year degree completion? Do effects vary by income group?

An important hypothesis guiding this study in the search for influential characteristics and elements is that degree attainment is affected by a complex set of factors at the individual and institutional level, and both economic and non-economic measures. Yet, scholars examining student persistence and degree completion have often approached the study of these outcomes by using narrow theoretical and conceptual frameworks. Only more recently, scholars have advocated for a more interdisciplinary perspective that integrates pertinent theoretical aspects from various social science disciplines, such as economics, psychology, sociology, organizational theory, and persistence and college impact theory (Chen, 2008; Goldrick-Rab et al., 2009; St. John et al., 2000).

This study seeks to contribute to scholarly efforts that perceive persistence and degree completion as complex phenomena, influenced by a multitude of heterogeneous factors. Thus, I will pursue a comprehensive review of the literature that assesses these student outcomes from various disciplines and research streams, with the goal of creating an integrated conceptual framework. For this, I will review theoretical models and pertinent studies based on economic, sociological, and organizational theory. I will further review student departure and persistence

theory, notably the model of student departure (Tinto, 1975, 1993), attrition theory (Bean, 1980, 1982, 1990), and the student/institution engagement model (Nora, 2004).

### Scope

The primary focus of this study is six-year degree completion for full-time, dependent students enrolling at 4-year colleges and universities in the U.S. To specify the focus, key terms ought to be defined. First, the concept of degree completion has to be distinguished from student persistence. Research on student persistence has defined this construct in a number of ways. In general, it refers to the desire and action of a student to stay within the system of higher education (Berger & Lyon, 2005). Prevalent conceptions of persistence include within-year persistence, fall-to-fall persistence, and first-to-second-year reenrollment (Hossler et al., 2009). Graduation or degree completion, in turn, is the state in which a former student has completed a prescribed course of study in a college or university, for which persistence is a prerequisite (Hagedorn, 2005). Thus, persistence is a crucial determinant of any attainment level and, therefore, is often considered a necessary, if not sufficient, condition for degree attainment. However, since degree completion is “the true bottom line” (Adelman, 1999, p. v) for college administrators, policy makers, and most importantly, students and their parents, I will focus on this outcome measure. Only for the review of the literature in the second chapter, studies examining degree completion *or* persistence will be examined, as the process towards attainment cannot be easily separated from that of student persistence (Pascarella & Terenzini, 2005) and the majority of scholarly attention has focused on the latter aspect.

Second, to study possible differential effects of financial aid for students from various backgrounds, the distinguishing variable – socioeconomic status or income – has to be specified. Family income and socioeconomic status (SES) are commonly used measures in educational

attainment research. SES measures an individual's or family's economic and social position in relation to others and is mostly based on income, education, and occupation. Income, in contrast, focuses on earnings received, which can originate from wages, salaries, profits, rents, or government transfers (National Center for Education Statistics, 2011a). Income is frequently used as a proxy for SES, due to its availability and interpretability. Given the purpose of this study and the importance of family income in determining financial aid support, I will use income as the distinguishing factor.

For this study, three primary data sources are used. Student-level data is drawn from the 2004-2009 BPS survey, a nationally representative, longitudinal database sponsored by the U.S. Department of Education's National Center for Education Statistics. The BPS includes cohort data for first-time beginners in postsecondary education at three points in time; initial enrollment and then three and six years after starting college. The BPS collects data on a variety of topics, including student background and high school characteristics, college and work experiences, persistence and degree attainment.

Institutional-level data is drawn from two sources, NCES's Integrated Postsecondary Education Data System and the Delta Cost Project (DCP). IPEDS collects data on institutional characteristics, enrollment, academic program offerings, revenue and expenditure data from all postsecondary institutions in the U.S. The DCP database is based on IPEDS data and includes institutional data on postsecondary finance, staffing, completions, and student aid for academic years 1986-87 through 2008-09. The DCP was originally commissioned to mitigate many of the problems in pursuing long-term trends analyses with IPEDS. Adjustments have been made to harmonize and standardize the data to account for changes over time in standards and IPEDS reporting formats. These adjustments also ensure, however, reasonable consistency in the

patterns and allow broad comparisons of revenue and expenditure patterns between public and private institutions, which is essential to this study.

To estimate effects on six-year degree completion, I rely on a combination of two advanced statistical approaches. First, I use propensity score matching, a quasi-experimental, causal inference approach (Rosenbaum & Rubin, 1985; Rubin, 2006) to statistically adjust the sample. This adjustment enables to more accurately compare students who received certain financial aid types to peers with similar characteristics that did not receive such aid. Thus, this statistical technique can reduce the effect of selection bias and produce more reliable estimates.

Second, I use hierarchical generalized linear modeling (HGLM) to examine factors impacting degree completion at the student and institutional level. The multilevel approach has advantages over conventional analyses, such as OLS or logistic regression, as it takes the dependence among students within institutions into account and provides more efficient and reliable estimates in case of unbalanced, nested data structures (Raudenbush, Bryk, Cheong, & Congdon, 2004).

Integrating these two advanced estimation approaches is a very recent phenomenon and a field of increasing scholarly attention (Rickles, 2012). Through the combination of propensity score matching and a multilevel (HGLM) approach, I seek to provide more reliable estimation of the effects of student and institutional level influences to improve our understanding of the myriad factors impacting student degree completion.

## CHAPTER 2: THEORY AND LITERATURE FRAMING THE STUDY

Research in the social sciences has examined student persistence and degree completion for several decades. Due to conceptual shortcomings and methodological challenges, particularly when estimating effects of financial aid on degree completion, scholars in recent years have begun advocating for multidisciplinary theoretical frameworks and the use of advanced statistical techniques. In support of this development, this study employs a quasi-experimental, multilevel modeling technique to examine factors that impact six-year degree completion. The multitheoretical model guiding this study draws from a number of theories and theoretical models in economics, sociology, and organizational theory, and the literature on student persistence in higher education.

Given the vast volume of scholarly work pertaining to the area of student success, multiple ways exist of organizing and structuring the review of the literature that guides this study. One that resonated with me is the distinction of theory and theoretical models, based on Kerlinger (1986) and Braxton, Shaw Sullivan, and Johnson (1997). Kerlinger (1986) defines *theory* as “logically interrelated constructs that present a systematic view of phenomena by specifying relationships among variables, with the purpose of explaining and predicting the phenomena” (p. 9). *Theoretical models* move one step beyond the often abstract parameters and relationships of a theory, expanding these to more concrete explications of constructs (Braxton et al., 1997). For this, a theoretical model can do both draw from multiple theories and incorporate elements and influential relationships derived empirically.<sup>4</sup>

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<sup>4</sup> Depending on the degree to which empirically derived constructs are incorporated, the distinction between theoretical and empirical model is often blurred in the literature. Due to the often interchangeable use of the terms, I will review both theoretical and empirical models.



Following this distinction and with the objective to conceptualize a multitheoretical model (see Chapter 3), I will summarize the literature in two main sections. In the first section, I will review *theories* pertaining to student persistence and degree completion. These originate largely in distinct social science disciplines, specifically economics, psychology, sociology, and organizational theory. However, due to a limited availability of psychological measures in the BPS data, I will focus solely on economic, sociological, and organizational perspectives that are pertinent to this study. In the second section, I will focus on *theoretical and empirical models* on persistence and student departure that either originated or have been largely tested through higher education scholars. In summarizing pertinent theoretical models that frequently draw from multiple theories, I will review the model of student departure (1975, 1993), the student attrition model (Bean, 1980, 1983, 1990), and the student/institution engagement model (Nora, 2004; Nora & Cabrera, 1996).

## Theories Pertaining to Persistence and Degree Completion

### *Economic Theory*

#### Human Capital Theory

Using economic perspectives to study degree completion and persistence is a more recent phenomenon (Chen, 2008). Most of this work is based on *human capital theory* (Becker, 1962, 1980) and related *price response theory* (Heller, 1997; Leslie & Brinkman, 1987), which in turn builds on the more general *supply and demand theory* in higher education (Radner & Miller, 1970, 1975).

Human capital theory is a theoretical approach drawn from the field of microeconomics (more specifically, labor economics) that has been useful in the study of the effects of financial

and non-financial factors on students' college-going behavior. *Human capital* is defined as the sum of productive capacities possessed by an individual or society, which encompasses knowledge, talents, skills, and understandings (Paulsen, 2000). The basic assumption of human capital theory is that individuals' choices are the result of decisions to invest in (higher) education, training, health and nutrition in order to augment their productive capacities and derive economic benefits. Individuals can increase their stock of human capital through a variety of educational activities and training. For higher future monetary and non-monetary returns, they can either choose to attend a college or university, or work a low-paying job with great learning potential. In each case, their investment in human capital leads to higher productivity, which is rewarded with higher future income, or returns, according to the theory (Becker, 1980).

The basic model builds on the assumption that people behave rationally and are well informed about their choices. It posits that in order to make sensible investment decisions, individuals implicitly calculate whether enrolling or re-enrolling in college is worthwhile, by comparing expected benefits with the expected costs (Paulsen, 2000). The two main components that drive costs for a high school graduate of traditional college-going age who considers attending college are (1) direct costs, and (2) forgone earnings or opportunity costs. Direct costs are the out-of-pocket expenses a student faces when attending college, such as tuition, fees, books, and cost of living. Opportunity costs, often also referred to as indirect costs or earnings foregone, refer to the earnings a student was not able to obtain through work or other activities, because of his or her college attendance.

The model acknowledges that individuals might not be able to perfectly predict the costs and benefits of a college degree. However, they are assumed able to form unbiased expectations about what will happen under each applicable scenario and, therefore, make choices that

maximize the return on their investment in human capital (or utility) accumulated over time. In this consideration, human capital theory builds on the concept of net present value (Ehrenberg & Smith, 2006). Because individuals prefer immediate gratification in their investment decisions, they maximize the expected present value so that both future benefits and costs are reduced (discounted) in value for decision-making purposes.

Human capital theory also builds the foundation for student price response theory (Heller, 1997; Leslie & Brinkman, 1987), which in turn draws from the fundamental concept of supply and demand for the theory of price determination (Radner & Miller, 1970, 1975). Price response theory applies the core economic assumption of an inverse relationship between price and quantity demanded to higher education. It assumes that students act rationally when confronting college enrollment and re-enrollment decisions and posits that, as tuition at a given institution increases enrollment declines, because students would be able to improve the return to their investment at a different institution. To include competition for students in the analysis, Hopkins (1974) conceptualized the dual aspect of the effect of tuition increase on enrollment as either a “substitution effect” or a “net discouragement effect”. When colleges increase their tuition, a student may choose to enroll in a different college (substitution effect). Alternatively, he or she could simply decide not to enroll in college at all or, in case a college or university was already attended, to withdraw from higher education entirely (net discouragement effect).

*Relationship to Student Subgroups and Different Types of Financial Aid.* In its basic form, human capital theory assumes that students from various backgrounds, for instance low- and high income students, are subject to the same economic considerations and have the same access to higher education institutions (Goldrick-Rab et al., 2009). Certainly, low income students have fewer family resources available, but the basic model also assumes that capital

markets work perfectly. This means that students, regardless of background, can borrow money at the same rates in order to pay for college. Incentives for low income students to do so are not smaller or larger than those for their high income peers, since wealthier students forego interest earnings they would have accrued, if they had invested their money rather than spending it on college tuition and fees. Interest rates received by wealthier students and those paid by low income students for borrowing money are the same, therefore the total real cost of college is also the same for both groups. In the human capital framework, the decision whether to enroll or re-enroll in college, thus, solely depends on the expected benefits (returns) to a college education compared to interest rates for borrowing and saving, which are assumed to be independent from family income.

The human capital model can also be used to explain how different types of financial aid impact student outcomes. As mentioned above, in its basic form human capital theory assumes that students have full and equal access to credit markets and make college decisions to maximize the net present value of their lifetime income. However, in reality credit imperfections exist and not every individual has access to credit at the same rate and under the same conditions. According to Cameron and Taber (2004), these variations directly influence the net price students pay for college, and even though the differences might be small, they can lead to large responses in educational attendance and attainment by making beneficial human capital investments impossible. Therefore, for students with access to only few resources, such as low income students, a relatively small loan can have a huge impact on decisions related to higher education persistence and degree completion (Goldrick-Rab et al., 2009).

Different types of financial aid have different value to the individual. It is commonly assumed that grants, which do not need to be repaid, have a much higher value to the student

than loans, which need to be repaid with interest. To illustrate this, I will elaborate the differences in value of a grant, an unsubsidized and subsidized loan, building on the logic of Goldrick-Rab et al. (2009).

In the first scenario, a student receives a grant of \$5,000 to cover college costs. If the student decides to deposit the money in a bank for 10 years and 3% interest annually, she would have \$6,720 (including principal and interest) at the end of this period. In the second scenario, a student who took out an unsubsidized loan at 5% interest also puts this money in a bank, earning 3% interest. After 10 years, the student would owe \$1,425 due to the interest difference—she would get \$6,720 from the money the student deposited in the bank, but would owe a total of \$8,145 on the loan she took out after 10 years. In the last scenario, the student takes out a subsidized loan, where the federal government pays the interest the student owes for the four years she is enrolled in college. Thus, the student only pays interest for the loan for six instead of 10 years. Under this scenario, the student still receives \$6,720 from the deposit in the bank, but would owe \$6,700 on the loan after 10 years, meaning she would have a marginal amount of \$20 left. The point of these scenarios is to show that different forms of aid have different values. Students are much better off with a grant, especially when compared to an unsubsidized loan (\$8,145 better off to be exact). The difference is less stark when a grant is compared to a subsidized loan, but with \$6,700 still very sizeable. Given these differences in value to the student, scholars expect the impact of grants on college enrollment and persistence decisions to be substantially higher than those of subsidized loans or even unsubsidized loans. Evidence regarding this will be discussed later in this section.

*Limitations of Human Capital Theory.* Despite its widespread use among economists and applicability to education and higher education, human capital theory has several limitations (for

a thorough review of its applicability to financial aid and tuition research, see DesJardins and Toutkoushian (2006)). Leaving criticism for its purely economic focus on education-related decisions from other social science disciplines aside, the major challenge is that several of its assumptions fail to hold (Goldrick-Rab et al., 2009). First, evidence indicates that college costs are not the same for all students. Students with high income parents could face relatively lower costs, as their parents may seek to create incentives for college attendance and degree completion by offering them money. This would create a financial incentive for wealthy students much in the same way a higher salary would.

Second, research shows that credit markets do not work perfectly, as elaborated above. Low income students cannot borrow at the same rate that their high income peers can invest. As Goldrick-Rab et al. (2009) note, one reason for this is the different nature of human capital when compared to other more traditional forms of capital (i.e. land, buildings, machines). In contrast to these forms of capital, human capital cannot be held as collateral. Once a class has been attended or a degree obtained, it cannot be taken away by the lender. In other words, the lender cannot reclaim the education the borrower received, in case the student fails to pay back the loan. This makes lending to finance education riskier and lenders more likely to offer better conditions to individuals with lower default risk—high income and high-SES students. This inherent market bias in student lending may have played a role in the federal government’s recent decision to become the central lender of student loans that are now administered through higher education institutions.

Another limitation of the human capital approach is that it fails to incorporate how college costs differ for student subgroups. Research shows that low income students are, on average, less academically prepared for college than otherwise comparable wealthier students, which makes

them also less likely to attend higher education (Adelman, 1999, 2006; Walpole, 2007). Those low income students, who get into college despite lower academic preparation, have to put forth a greater effort to obtain the same grades. In this process, they may incur what economists call “psychic” or “psychological” costs, which refers to the strain and frustration from having to sit through lectures and reading hard-to-comprehend materials (Goldrick-Rab et al., 2009).

Research has shown that these psychological costs incurred by less well-prepared students can explain some of the variation in student outcomes, particularly differences in college attendance and degree completion for low income students (Adelman, 1999, 2006).

Despite its limitations, it should be noted, however, that the main prediction of human capital theory is supported by most rigorous research evidence (see subsection below). Studies have confirmed that reducing financial cost makes students more likely to attend and finish college. Human capital theory also contributes to research on persistence and degree completion in that it treats education as an important investment in which individuals weigh future returns and costs in the form of time, energy, and money spent. In the context of higher education, therefore, students’ decisions whether to invest in their own productive capacities and human capital by paying tuition and fees and persisting in college are influenced by economic factors. Price response and supply and demand theory further justifies the view that the price students pay, influenced through tuition and financial aid, can impact student demand for higher education. The decision whether to persist in or graduate from college is, therefore, similar to any other economic activity—a process in which an individual assesses his or her payment capability and weighs the costs and benefits of investing limited resources in different ways.

## Financial Nexus Theory

The *financial nexus theory* is a relatively recent attempt to overcome the limitations of standard economic models. Developed by St. John, Paulsen, and Starkey (1996), the approach has established new linkages between two primary aspects of college-going behavior—college choice and persistence/degree completion—that have been traditionally viewed as two distinct sets of behavior in theory and research (Astin, 1975; Bean, 1980; Pascarella & Terenzini, 1991; Paulsen & St. John, 2002a; Tinto, 1993). Beyond that, the nexus approach seeks to integrate the analysis of the influence of *perceptions* on finances with the analysis of the effects of actual college costs and financial aid, using a differentiated price-response model (St. John et al., 2005).

According to Paulsen and St. John (2002a), the nexus model was developed to incorporate a longitudinal perspective, or a process view, on the sequence of college-going activities. It focuses on how factors that affect earlier choices (i.e. the choice of college) could also affect subsequent decisions (i.e. persistence and degree completion). In particular, the model incorporates two sets of factors that influence persistence; first, students' perceptions of financial factors that they view as very important at the time of the initial college choice decision (i.e. availability of high aid or low tuition). Second, building on previous research, the model also incorporates the actual values (dollar amounts) of financial variables, such as tuition and fees, financial aid, and cost of living that students actually experience at the time of a subsequent persistence decision.

More specifically, the nexus model posits that, initially, students compare the costs and benefits of attending a particular institution based on their pre-matriculation perceptions or expectations about financial factors. A favorable decision, according to the model, would lead to enrollment and establish an “implicit contract” between the student and the college (Paulsen &



St. John, 2002a). Once enrolled, students compare the actual costs and benefits with their earlier perceptions and expectations. In case of a favorable comparison, the student perceives the implicit contract as valid, which leads to a re-enrollment decision. Although somewhat limited in quantity, empirical analyses have supported central elements of the nexus theory and confirmed that students engage in a sequence of related choices, in each of which their decisions are affected by financial factors (Paulsen & St. John, 1997, 2002a; St. John et al., 2005; St. John et al., 1996). More recently, other studies have also confirmed a strong positive impact of initial, cost-related college choice factors on four-year and six-year degree completion (Astin & Oseguera, 2005a; DeAngelo, Franke, Hurtado, Pryor, & Tran, 2011).

Beyond its focus on financial factors, the financial nexus theory is beneficial for the study of persistence and degree completion as it intersects with other sociological theory. As Paulson and St. John (2002) elaborate, the student-choice construct in the model can be related to the sociological construct of habitus discussed in the next subsection. An individual's habitus essentially creates a filter that shapes reality and determines what a student sees, how a student interprets and values what she sees, and what action will result from it. According to the authors, on the nexus between college choice and persistence decisions, a student's habitus would implicitly frame, constrain, and inform behavioral patterns and responses to financial factors in college decisions that are consistent with the views of others in the student's social class. Phrased differently, an individual's habitus serves to contextualize his or her choices and represents a set of relatively stable predisposition in regard to what the student perceives, values, and responds to regarding financial aspects of choice and persistence decisions (Berger, 2000b; Paulsen & St. John, 2002a). Given its use in examining the role of finances in persistence and degree completion and its capability to build an understanding of the differences in students'

experiences by income or socioeconomic group, I will apply elements of the financial nexus theory to this study.

#### Additional Elements for a Heterogeneous Research Approach

Building on both the explanatory capabilities and limitations of economic theories such as human capital theory, price response and supply and demand theory, scholars have attempted to build better and more comprehensive theories to explain student persistence and degree attainment. For instance, in their recent call towards a more interdisciplinary perspective in studies of financial aid and college success, Goldrick-Rab et al. (2009) explore the merits of various theoretical approaches that could help explain outcome differences for students from different income and racial/ethnic groups. Drawing from economic theory, they discuss, for instance, how differences in individuals' time horizons, variations in the expected return on investments, differences in work preferences, and imperfect information can differentially impact college outcomes. They further discuss how theoretical approaches from behavioral economics and sociological theory, such as loss aversion, relative risk aversion, the social meaning of money, and the concept of work centrality can advance our understanding of various measures of student success. The distinguished work of Goldrick-Rab et al. (2009) and others (see Chen, 2008; Hossler et al., 2009) merits consideration and incorporation into future studies examining persistence and degree completion. However, current analyses—including this study—are limited to the scope of variables and factors currently compiled in national datasets, such as the BPS or National Postsecondary Student Aid Survey (NPSAS).

In order to better explore why students from different income backgrounds may respond to financial aid in different ways, I incorporate the two economic concepts of liquidity constraints and price elasticity. As discussed above, capital markets in reality are imperfect and

create limitations on the amount an individual can borrow or on the interest rate she can pay. A rise in the costs of borrowing often tends to prevent individuals from fully optimizing their behavior. Liquidity constraints are hypothesized to have a higher impact on low income students and individuals from disadvantages socioeconomic backgrounds, as their risk of default and subsequently the costs of borrowing are higher. Therefore, increases in grant aid (regardless of merit or need-based aid), may help reducing liquidity constraints through the reduction in net costs to the students (Chen, 2008).

The price elasticity of demand is a measure used in economics to show the responsiveness, or elasticity, of a quantity demanded for a good or service to a change in its price. More precisely, it is an expression of the proportionate change in quantity to a one percent change in price (holding all other factors constant). For instance, if a 5% increase in tuition leads to a 2.5% decrease in enrollment, the price elasticity of demand would be 0.5 (all values below 1 are referred to as inelastic). A higher level of price elasticity indicates a higher level of sensitivity to changes in price. In the higher education context, low income students pay a larger proportion of family income for a college education, when compared to their high income peers (Archibald, 2002). Thus, they may have a relatively higher level of price elasticity, while their wealthier peers have a more inelastic demand (Chen, 2008). As a result, low income students may be more sensitive to changes in price (tuition) or financial aid offered.

#### Limitations in Financial Aid and Degree Attainment Research Using Economic Theory

Financial aid and degree completion are topics examined by a great number of researchers, most certainly hundreds in the U.S. alone. Over the last decades, these scholars have produced a myriad of studies advancing our understanding of the effects of financial aid,

persistence, and degree attainment. However, there are some notable limitations in these empirical studies, which will be discussed in the following section.

*Limitations Through Aggregation.* Most researchers use aggregated variables of financial aid, thus neglect possible differential effects by aid subtypes (Chen, 2008; Goldrick-Rab et al., 2009; Hossler et al., 2009; St. John et al., 2000). Due to the unavailability of actual dollar amounts of financial aid in early studies, researchers often resorted to incorporating indicator variables of financial aid. Later studies started including a single variable representing the total amount of financial aid each student received. Such a measure, while an improvement over indicator variables, ignores the fact that different types of aid might have different effects. St. John et al. (2000) represents one of the early exceptions to this practice, calling for a more nuanced research approach that separates aid subtypes, such as grants, loans, and federal work-study. While recently more studies have sought to incorporate detailed measures of grants and loans, effects of the federal work-study program remain largely understudied (Scott-Clayton, 2011)

To the extent more recent studies do incorporate separate measures for different forms of aid, most studies, however, use only one aggregated loan measure either in form of an indicator or total amount borrowed. Yet, different types of loans have different values and benefits to the student weighing investment decisions in one's own human capital, as discussed above. Therefore, different types of loans may impact student persistence and degree completion in different ways. For instance, subsidized loans such as Perkins and subsidized Stafford loans, which are awarded based on the financial need of the student, should have a higher value to the individual due to the fact that the federal government pays interest as long as students are enrolled in college. In contrast, unsubsidized Stafford loans, which are non-need-based, require

students to pay interest almost immediately. It seems reasonable to assume that subsidized loans would help students more to persist and obtain a degree than unsubsidized loans, thus should be included as separate measures in analyses.

Besides limitations through the form of financial aid measures used, many scholars also neglect possible interaction between aid and non-aid variables, which would allow studying differential effects among student subgroups (i.e. students from different income, socioeconomic, and racial/ethnic groups). A few studies have investigated aid effects by race/ethnicity and gender (Hu & St. John, 2001; St. John et al., 2005). However, research focusing on possible differences by income or socioeconomic group is still very limited. As various forms of financial aid most likely have differential effects on students from different income backgrounds, this limits our understanding of the efficacy of financial aid and the role educational policies and interventions in form of aid can play in reducing gaps in student persistence and degree attainment by income and SES groups. Only recently, a few studies have started to take these differences into account, often by running separate regression analyses by income groups (Paulsen & St. John, 2002a; Walpole, 2003, 2007).

Given these shortcomings in the literature, this study seeks to incorporate a nuanced approach and include detailed and specific measures of various types of financial aid, such as merit and need-based grants, subsidized and unsubsidized loans, and federal work-study measures. This study also seeks to differentiate the effects of various types of financial aid by student income groups.

*Methodological Limitations in Financial Aid Research.* Researchers have also experienced methodological difficulties in identifying causal impacts of financial aid on persistence and degree completion, a requirement for testing any theory intended to inform

policy or practice. While there are several challenges, recent discourse appears to focus on limitations resulting from selection bias or endogeneity, omitted variable bias, and the disregard of the longitudinal nature of the effects of financial aid (Alon, 2005; Cellini, 2008; Dowd, 2008; Goldrick-Rab et al., 2009; Hossler et al., 2009).

A key problem financial aid researchers have identified is the question whether aid eligibility and receipt of aid are independent factors that influence persistence or degree completion. Known as endogeneity and self selection bias, the problem results from the fact that aid eligibility is influenced or even determined by factors such as students' race/ethnicity, income/SES, cultural values, aspiration, which can also affect student outcomes, such as academic performance, persistence, and degree attainment (Hossler et al., 2009). Alon (2005), who was one of the first scholars to point out this limitation, describes the problem as the following: The same factors that enhance need-based aid eligibility (i.e. economically disadvantaged family background) are negatively related to persistence and graduation. In contrast, financial aid is assumed to enhance persistence and graduation. Thus, the negative effect of need-based aid eligibility may mask the positive effects of financial aid receipt. This is the reason why non-experimental studies very likely suffer from selection bias, which means that if selection bias is not accounted for, estimated effects may be inaccurate (Alon, 2005; Cellini, 2008; Curs & Singell, 2002; Goldrick-Rab et al., 2009). Researchers have proposed several quasi-experimental techniques, such as regression discontinuity, propensity score matching, and instrumental variable designs, in order to address this problem in future analyses (for a recent review, see Bettinger, 2005; Cellini, 2008).

According to leading scholars, omitted-variable bias is also a common problem throughout financial aid research (Goldrick-Rab et al., 2009; Hossler et al., 2009; St. John et al.,

2000). Limitations stem mostly from two aspects. First, as St. John et al. (2000) note, relatively few studies that examine the effects of financial aid on persistence and degree completion, examine the interplay with student characteristics, college experiences, and institutional influences on the students. In contrast, many higher education researchers who focus on the latter aspects only control for financial aid variables, if at all, thus frequently ignore crucial interaction effects. Results from these mostly separate lines of inquiry are seldom brought together, which is in part due to the second major problem—the limited availability of comprehensive measures in common datasets used (Goldrick-Rab et al., 2009). For instance, commonly used national datasets to study financial aid, such as the NPSAS or BPS, contain detailed measures about the students' financial circumstances. They do not, however, contain many measures on high school academic preparation or the college experience (at least in the past). In contrast, the National Educational Longitudinal Study (NELS), which is most often used to study college completion while accounting for high school preparation, does not contain detailed financial aid information. Also, datasets that have often been used to study college impact and the college experience, such as The Freshmen Survey from the Cooperative Institutional Research Program (CIRP) at UCLA, often do not contain college completion data and detailed financial aid information. As a result, omitted-variables bias appears to be relatively common, yet insufficiently recognized in the literature (Goldrick-Rab et al., 2009).

Lastly, scholars examining persistence and degree completion and the effects of financial aid adopt a limited time perspective (Chen, 2008; DesJardins & McCall, 2010). With a few exceptions (Chen & DesJardins, 2008; DesJardins et al., 2002; DesJardins & McCall, 2010; Ishitani & DesJardins, 2002), most researchers consider only two points in time—college entry and the point of interest in their study (mostly one year in persistence studies; four or six years in

degree attainment studies). These cross-sectional approaches to modeling longitudinal processes in college, however, artificially restrict variables that change over time, such as financial aid. Thus, as DesJardins et al. (2002) note, studies should incorporate a longitudinal perspective in measuring persistence, degree completion, and the impact of financial aid, as they would better be able to determine the temporal and interaction effects of different factors on college success.

Given the limitations in the literature, this study applies a propensity scoring technique to reduce selection bias. I also use the latest version of the BPS data, which contains an increased number of measures on students' background, academic preparation, and the college experience, and merge institutional data from IPEDS to reduce effects of omitted-variable bias. However, due to the complexities of the statistical analysis, this study focuses only on two points in time—college entry and the time of degree completion.

## Empirical Evidence

Student retention is an explicit goal of the federal financial aid program (Burgdorf & Kostka, 2006). Yet, when compared to research in the realm of college access and choice, there is considerably less empirical evidence regarding the impact of financial aid on degree completion (Goldrick-Rab et al., 2009; Hossler et al., 2009; St. John et al., 2000). Additionally, the conceptual and methodological challenges discussed above, and the fact that more advanced econometric and quasi-experimental techniques have only been applied in the past five to ten years, leaves only a relatively limited number of highly relevant, high-quality studies.

Examining results of most pertinent studies, results show that student financial aid in general (not distinguished by type) has a positive impact on persistence and degree completion. (Alon, 2007; Bettinger, 2004; Braunstein, McGrath, & Pescatrice, 1999; Cabrera, Nora, & Castañeda, 1992; Cuccaro-Alamin & Choy, 1998; DesJardins et al., 2002; DesJardins & McCall,



2010; Dowd & Coury, 2006; Dynarski, 1999; Gladieux & Perna, 2005; Herzog, 2005, 2008; Hu & St. John, 2001; Ishitani & DesJardins, 2002; Perna, 1998; Scott-Clayton, 2011; Singell Jr, 2004; Somers & St John, 1993; St. John, 1998; St. John, Andrieu, Oescher, & Starkey, 1994; St. John, Hu, Simmons, & Musoba, 2001; St. John et al., 2005; St. John et al., 1996; Stinebrickner & Stinebrickner, 2004; Stratton, O'Toole, & Wetzel, 2008). However, there are a few prominent exceptions that find either negative or not significant influences on these outcomes (Herzog, 2008; St. John, 1998, 2000; St. John et al., 2005; Stinebrickner & Stinebrickner, 2004). Hossler et al. (2009), who also extensively reviewed the literature on this topic, distinguished studies even further but did not find differences in results based on whether financial aid measures were treated as dichotomous or continuous variables.

A few studies that do differentiate by type of aid focus specifically on the effects of grants, although most do not distinguish effects for need-based or merit-based aid awards. When assessing the impact of grants in aggregate form, most high-quality studies find either positive or not significant results, suggesting that this form of aid has an impact on the likelihood a student persists or obtains a degree (Alon, 2005; Bettinger, 2004; DesJardins et al., 2002; Dowd & Coury, 2006; Dynarski, 1999; Herzog, 2005; St. John et al., 2005). For instance, Dynarski (1999) found that \$1,000 in aid increases educational attainment by 0.16 years and the propensity to persist by 4 percentage points. Other researchers found similar results and estimate that a \$1,000 increase in grant aid was associated with a 1 to 5 percentage point (Singell Jr, 2004) or 1.5 percentage point (Alon, 2007), respectively, increase in retention.

Scholars have noted that true experiments (with random assignments) evaluating the impact of financial aid would greatly improve understanding on the subject (Cellini, 2008; Dynarski, 2002; Kane, 2001). However, experimental evidence is quite limited. One small

experimental trial on the impact of financial aid was conducted by MDRC, distributing \$2,000 grants to 264 African American mothers on welfare that attended Community Colleges in New Orleans. The study found that over a period of seven semesters, students receiving grants experienced higher retention rates and slightly higher credit attainment (Brock & Richburg-Hayes, 2006). A second, large-scale project is currently undertaken in Wisconsin. The Wisconsin Scholars Longitudinal Study (WSLS) is the first statewide longitudinal study of the impact of need-based grants on college persistence and graduation (WSLS, 2012) and promises to greatly inform our knowledge on this subject, once it is concluded.

As noted by St. John et al. (2000), evidence indicates that the composition of college net price, meaning both the amount of tuition and fees students pay and financial aid amounts received, affect student outcomes differentially. Particularly, low income students appear to respond to equal changes in price/tuition and financial aid differently. More specifically, response to grants appears to be smaller than the response to tuition changes, and also differ by type of aid received. Although more focused on college access, scholars find that the response to the federal Pell grant program is smaller than for other types of aid (for a thorough review, see Dynarski & Scott-Clayton, 2006; Leslie & Brinkman, 1987).

The number of high quality studies that specifically focus on the effects of loans is also very limited. Generally, the discussion on the efficacy of loans is related to the debate about credit restraints (see above). As Goldrick-Rab et al. (2009) note, most economists believe that students, regardless of income, are not credit constrained in this sense, thus have equal access to credit markets (Dynarski & Scott-Clayton, 2006; Stinebrickner & Stinebrickner, 2004). Examining results in the literature on the specific effects of loans, scholars overall find mixed results. Whereas some studies find a positive impact on persistence and degree completion at

two-year and four-year institutions (Cuccaro-Alamin & Choy, 1998; Hu & St. John, 2001; Somers, Woodhouse, & Cofer, 2004), other scholars report either negative or not significant results (Astin & Oseguera, 2005a; DeAngelo et al., 2011). Evidence is also inconclusive, if effects of unsubsidized and subsidized forms of aid are examined (Dowd & Coury, 2006; Singell Jr, 2004).

Evidence on the effects of financial aid packaging is even more limited. Being one of the few studies, Hu and St. John (2001) use a differentiated approach to examine whether persistence outcomes are impacted by loans only, grants only, loans and grants combined, or other aid package formats. They found that the combination of grants and loans increases the propensity to persist for all students at four-year institutions. DesJardins and McCall (2010) seek to examine the temporal dimension of financial aid, using an event history model. They found that the composition and timing of financial aid elements has an impact on student success. More specifically, they found that “frontloading” aid—a term used to describe the practice of providing more grants in the first two years a student enrolls, which over time are replaced by loans—have a slight detrimental effect on persistence.

For some researchers, the federal work-study program is an intriguing form of financial aid. They hypothesize that working on campus increases chances to persist and obtain a degree, as it helps students to socially integrate into higher education communities (Astin, 1975, 1993; St. John, Asker, & Hu, 2001). Indeed, the literature generally confirms this relationship, as most studies report either a positive or not significant impact on persistence and degree completion (Alon, 2005; DesJardins et al., 2002; Dowd & Coury, 2006; Hu & St. John, 2001; St. John et al., 1994; St. John, Hu, et al., 2001). In fact, some studies even report that work-study has the or one of the largest effects, compared to other forms of financial aid (Alon, 2005; DesJardins et al.,

2002). However, a very recent study assessing the impact of federal work-study, using an instrumental variable, difference-in-difference approach finds no such relationship (Scott-Clayton, 2011). Analyzing administrative data from West Virginia to identify causal effects, Scott-Clayton finds no evidence that work-study improves student outcomes.

Considering economic and financial aid measures overall, they have performed well in the explanation of student college-going behavior, specifically aspects of access and choice. However, a multitheoretical view and the inclusion of sociological concepts may provide additional insights into what influences student persistence and degree completion for various income and SES groups (Paulsen & St. John, 2002a; St. John et al., 2000; Wells, 2008). This follows the notion of Bourdieu (1986) who claims that in order to understand how a society creates and maintains income and social class distinctions, the discussion of capital must be expanded beyond economic capital alone.

### *Sociological Theory*

Sociological theories treat students' persistence and dropout decisions as a consequence of the social attributes of individuals, institutions, and society. Over the past decades, sociological theories, particularly social reproduction theories, have been used extensively to study educational and occupational attainment. Building on the work of Emile Durkheim and Max Weber, social reproduction scholars examine how social class and social relations within society is produced and reproduced and how socioeconomic status promotes or deters educational and occupational attainment (Blau & Duncan, 1967; Bourdieu, 1977; Bourdieu & Passeron, 1990; Sewell, Haller, & Portes, 1969).

According to MacLeod (1995), social reproduction scholarship exists on a continuum with one end representing deterministic models and the other autonomy/agency models.

Deterministic models (Bowles & Gintis, 1976) assert that social institutions, particularly educational institutions such as schools, explicitly guide low-SES individuals towards low-skilled labor to maintain the status-quo of society, thus “determine” educational outcomes. In contrast, models that stress autonomy and agency of the individual (Willis, 1977) posit that individuals are fully aware of their social contexts and make choices and decisions in a free manner independent of social constraints.

The relationship between structure (i.e. schools, higher education institutions) and agency is a central subject in Pierre Bourdieu’s (1977, 1986) theorizing on social reproduction. His discussion of various forms of capital and habitus proves particularly helpful in how societal structures and human subjectivity concurrently operate to reproduce social order. He contends that through social reproduction, specifically the elite in society monopolize exclusive institutions of higher education. Through this monopolization, the elite manage to attend these colleges and universities, which in turn enable them to reinforce their privilege and retain their status. However, Bourdieu’s theory also posits that one’s class position does not automatically determine one’s life chances, and that individuals—specifically low-SES students—do have choices within existing social structures for educational and status advancement.

### Social Reproduction Theory

Given the persistent and even widening gaps in college access, persistence, and degree completion between low income/SES and high income/SES students (Astin & Oseguera, 2004; Kane, 2004; Walpole, 2007), Bourdieu’s theory of social reproduction has become increasingly popular with social scientists seeking a conceptual framework to explain inequities in educational and status attainment (Berger, 2000b; McDonough, 1994).

One of the key elements in Bourdieu's (1977, 1986) social reproduction theory is its focus on all forms of capital to account for the structure and functioning of the social world. Going beyond theoretical frameworks that solely rely on *economic capital*, in his theory, Bourdieu introduces multiple types of capital, most prominently *cultural capital* and *social capital*. Bourdieu continually refined his concepts and, over time, added various other forms of capital, such as symbolic, artistic, and intellectual capital (Berger, 2000a). For this study, however, I seek to remain true to Bourdieu's early conception of his theory, focusing primarily on cultural and social capital.

*Cultural Capital and Habitus*. In his theory, cultural capital is a symbolic, rather than a material, resource (Bourdieu, 1977, 1986). It refers to the system of attributes, such as language skills, cultural knowledge, and mannerisms, that is derived in part from one's parents and that defines an individual's class status. Cultural capital has no intrinsic value in itself. However, it can be converted, manipulated, and invested to obtain or secure other highly valued or scarce resources, including economic capital (i.e. money or property rights). Cultural capital can also be conceived of as a type of knowledge, specific to each social class, that members of the same class value, but that is not taught in school (McDonough, 1997). In his later refinement of the theory, Bourdieu further distinguished between three basic forms. First, it can exist in the *embodied state*, in the form of long-lasting dispositions of the mind and body; second, in the *objectified state*, in the form of cultural goods such as books, pictures, instruments etc.; and third, it can exist in the *institutionalized state*, a form of objectification, which can be seen, for instance, in educational qualifications (Bourdieu, 1986).

A key element to understand Bourdieu's construct of cultural capital is *habitus*. His theory posits that individuals with access to similar types and amounts of capital share a common

habitus, which he defines as a system of lasting, transposable dispositions, based on past experiences that function as a matrix of perceptions, appreciations, and actions (Bourdieu, 1977, 1986). In other words, individuals that have access to similar levels of capital (of all form) and live similar lifestyles develop a shared worldview as a result of common experiences and interaction (Berger, 2000a). Bourdieu further asserts that habitus manifests itself at a cognitive level, as certain class-specific preferences and tendencies become routinized as part of an individual's worldview. Habitus then functions as a subconscious filter, used to classify oneself and others based on common preferences and expectations. However, it can also serve as a mechanism for marginalizing others who have had access to different amounts and types of capital, thus, have developed a different habitus (Berger, 2000a).

In regard to college-going behavior, habitus can be thought of a tacit understanding that shapes students' behavior and choices, particularly the choice to persist and obtain a degree. For low income students these choices may be negatively impacted by an experienced disconnect between their own low-SES habitus and the perceived middle- and upper-middle-class culture and aims of postsecondary education.

As Berger (2000a) notes, one of the biggest challenges to Bourdieu's theory is its operationalization. There is no single defined way in which scholars conceive of cultural capital and how they operationalize this construct. Past research focusing on secondary and postsecondary education has used, for instance, students' attitudes, self-assessments, and behaviors that are used to succeed in school or college (McDonough, 1997). Also, engaging with faculty and peers outside of class, volunteerism, and participation in extracurricular or leadership activities have been perceived of practices that reflect cultural capital, as they represent

navigational skills of the culture of educational institutions that are not explicitly taught in school, yet are helpful for success in higher education (Arellano, 2011).

*Social Capital.* Social capital is defined by Bourdieu (1986) as the social networks and relationships that entitle individuals to the privileges and assets enjoyed by the group to which they belong. More specifically, he defines it as “[...] the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition—or in other words, to membership in a group—which provides each of its members with the backing of the collectivity owned capital, a 'credential' which entitles them to credit [...]” (p.51).

As McDonough and Nuñez (2007) note, cultural and social capital have sometimes been interpreted as overlapping in meaning. However, cultural capital focuses on the information that is helpful to navigate educational and other status systems. Social capital, in contrast, emphasizes the actual relationships and relational aspects that help individuals find this information (i.e. through social networks), as well as provide sense of encouragement and motivation. In case of high-SES individuals, social capital in form of influential social networks is used to gain access to information and exclusive social institutions (i.e. selective colleges and universities) and to maintain a dominant social position. In order to assess the amount of social capital individuals possess, Bourdieu further distinguishes between the size of the network, the number of connections an individual can mobilize, and the magnitude of capital (all forms) each of the connections possesses.

Similar to cultural capital, scholars have operationalized social capital in various ways. Studies have often focused on individuals' networks and how these can either foster or impede educational advancement. For this, scholars have used students' peers, educational agents (i.e.



teachers/professors, counselors, staff), or family members that can play a critical role, and they have examined aspects of role modeling, advocacy, and emotional support (McDonough, 1997; Reed, 2011; Stanton-Salazar, 2001).

### Empirical Evidence

In regard to cultural capital, research shows that educational aspirations play a crucial role in low income and low-SES student college-going behavior (McDonough, 1997, 2005; Paulsen & St. John, 2002a; Reed, 2011; Walpole, 2003, 2007). As Walpole (2007) states, low income students with low-SES habitus are more likely to have lower educational aspirations and accept a marginalized place in society. Paulson and St. John (2002) report similar findings and show that low-SES students, despite earning A grades in secondary education, were least likely to have high educational aspirations (i.e., aim to attain a bachelor's degree). This lack of educational aspirations is reinforced through the limited exposure of these students to postsecondary role models in their immediate environment, particularly within their own family. Analyzing Educational Longitudinal Study (ELS) data, Reed (2011) reports that greater educational aspirations and parental expectations can significantly increase low-SES student persistence.

As Dika and Singh (2002) note in their review of the literature, social capital takes on various forms in the literature. However, they conclude that most forms of social capital are positively related to educational achievement and attainment. Social networks, both pre-college and while enrolled, have also been found to positively impact higher education outcomes. Studies show that first-generation students (who are also more likely to be low income students) rely heavily on siblings, peers, relatives, and high school contacts for purposes of planning their postsecondary education (McDonough, 1997, 2005). Other scholars have found positive effects

for low-SES students resulting from faculty interactions (Astin, 1993; Reed, 2011), and high school and college counselors (McDonough, 2005). Although the measure can be categorized as social or cultural capital, scholars have also pointed towards the importance of navigational skills. Learning how to navigate higher education is fundamental for the transition between secondary and postsecondary education, particularly for low-SES and first-generation students (Attinasi, 1989; Hurtado & Carter, 1997).

Bourdieu's work advances current persistence and degree completion work by providing a conceptual framework on how education institutions as contested sites of social and cultural importance perpetuate conditions that contribute to low rates of success for low income and low SES students. His theory, particularly the roles of education in social reproduction and individual agency, proves very useful to address gaps in the current persistence literature (Reed, 2011). However, to provide additional explanatory power in addition to economic and social factors discussed above, organizational characteristics and influences need to be considered in studying student degree completion.

### *Organizational Theory*

Organizational theory comprises the study of organizational design and structure, relationships of organizations with their external environments, and the behavior of individuals and groups within organizations. Most applications of organizational theory to the field of higher education focus on issues of governance, academic leadership, and organizational effectiveness, as Berger and Milem (2000) note. Despite an increase in most recent years (Oseguera & Rhee, 2009; Rhee, 2008; Titus, 2004, 2006a, 2006b, 2006c), they still, however, largely ignore aspects of the college experience and student outcomes.

In the following, two theoretical approaches will be reviewed that can be utilized to examine organizational influences on persistence and degree completion, Berger and Milem's (2000) organizational behavior and student outcome model, and resource dependency theory (J. Pfeffer & Salancik, 1978, 2003).

### Organizational Impact Model

Berger and Milem's (2000) organizational impact model draws on organizational behavior theory (Bolman & Deal, 2008), literature on peer group effects and peer climate (Astin, 1993; Weidman, 1989), and student involvement theory (Astin, 1984). Their model uses the concept of systemic behavior and posits that both institutional and student characteristics influence student outcomes.

The organizational impact model, while accounting for student background and experiences in college, focuses on two main constructs, organizational and peer group characteristics. Building on organizational behavior theory (Astin & Scherrei, 1980; Bolman & Deal, 2008), Berger and Milem further distinguish two main elements within their construct of organizational characteristics of an institution—structural-demographic features and organizational behavior. The structural-demographic features of a college or university include, for instance, student body size, selectivity, control (public vs. private), and location (urban vs. rural). They contend that these measures of the institutional environment are particularly important for multi-institution studies of college impact (Berger & Milem, 2000). Building on existing work (Blau, 1994), they posit that structural-demographic features of an institution are important during all phases of the college-going process; choice, admission, and actual enrollment. For instance, they hypothesize that institutional selectivity has a positive impact on academic achievement and persistence/degree completion outcomes. They further posit that size

is an import factor in retention and degree attainment. Linking size to the theory of student involvement, they argue that larger institutions may limit the number of opportunities students have to become involved. However, in an alternative view, larger institutions may actually have more resources available to provide better structures and support to integrate students on campus, which would lead to higher rates of persistence and degree attainment.

The second element within the organizational characteristics construct is organizational behavior, which focuses on the decision-making models within the institution. Drawn from general organizational theory, these models can be, for instance, political, bureaucratic, collegial, or symbolic and focus on the daily patterns of functioning and decision-making within an organization (Bolman & Deal, 2008). Berger and Milem (2000) argue that patterns of organizational behavior have an independent effect on student outcomes, but can also be interrelated with structural-demographic features. For instance, they hypothesize that institutional size is related to bureaucratic organizational behavior, which is often characterized by a formal, hierarchical structure. Bureaucratic organizations possess high goal-clarity and seek to maximize coordination and communication (Weber, 1954). Berger and Milem (2000) further posit that organizational behavior can affect student involvement, which in turn can impact college outcomes. For this, they build on Astin and Scherrei's (1980) and Berger and Milem's (1997) work that found that bureaucratic organizational behavior is positively correlated with student involvement and may help some students to get more actively involved on campus.

The second main construct in Berger and Milem's (2000) model—peer group characteristics—builds on the concepts of organizational climate and organizational socialization. Organizational climate, in their model, is defined in terms of current shared patterns of organizational life and the members' perceptions of these patterns. Thus, the three

primary features of organizational climate include the emphasis on common views among organizational members, a focus on current patterns of perception and behaviors by organizational members, and the malleable, transitory nature of an organization's climate (Peterson & Spencer, 1990).

Organizational socialization builds on the notion of college being one of the primary socializing organizations for adults in society (Feldman & Newcomb, 1993). More specifically, Berger and Milem's framework draws from Weidman's (1989) model of undergraduate socialization, in that it integrates peer group theory and specific change-producing mechanisms. Peer and reference group theory has been frequently used by scholars from various disciplines to help explain college impact and outcomes (Astin, 1985; Feldman & Newcomb, 1993). For this, scholars emphasize the importance of selection, or student entry characteristics, as determinants of student behavior, but also articulate the importance of peer influence in shaping student perceptions. Evidence in the literature supports this assertion and finds that the collective, dominant characteristics of students at a particular campus, also known as human aggregate, exert a conforming influence on the development of students (Berger & Milem, 2000). Peer group and human aggregate research has focused on multiple areas, and confirmed influences on student outcomes through patterns of involvement (Astin, 1984), personality characteristics (Myers, 1980), and, more recently, student diversity (Hurtado, 2001; Hurtado, Milem, Clayton-Pedersen, & Allen, 1998; 1999) and institutional retention climate (Oseguera & Rhee, 2009).

### Resource Dependency Theory

Initially published in 1978, resource dependency theory (J. Pfeffer & Salancik, 1978, 2003) today has become one of the most influential conceptions in organizational theory and strategic management (Hillman, Withers, & Collins, 2009). Resource dependency theory (RDT)

characterizes the organization as an open system that depends on contingencies in the external environment. It further explains organizational behavior in terms of internal adjustments to changes in the environment and the availability of vital resources (such as finances) necessary for the functioning of the organization (J. Pfeffer & Salancik, 1978).

Unlike other organizational theories, RDT recognizes the often crucial influence of external factors on organizational behavior and perceives managers and administrators as agents that can reduce environmental uncertainty and dependence. Central to these actions, according to Hillman et al. (2009), is the concept of power, which is the control over vital resources. RDT hypothesizes that organizations generally seek to reduce external influences or others' power over them, and often attempt to increase their own power over others. Phrased differently, RDT hypothesizes that organizations that are faced with resource constraints strive to manage their interdependencies with other organizations so that external forces and uncertainties are reduced. In response to changes in the environment, organizations strategically make choices to manage dependency on vital resources, although such actions are inevitably never completely successful and produce new patterns of dependence and interdependence (Hillman et al., 2009; J. Pfeffer & Salancik, 1978).

RDT further posits that these patterns of dependence influence interorganizational and intraorganizational power distributions, which in turn impact organizational behavior. With respect to higher education institutions in the not-for-profit sector, Leslie and Slaughter (1997) contend that cuts in state higher education budgets and the increase in accountability measures influence power distribution within colleges and universities. As states increasingly link scarce financial resources to performance and performance indicators, power becomes centralized at the campus level. This centralization of power at the administrative level is partly reflected in an

increase in the share of expenditures on administrative functions, with possible detrimental effects for core functions, such as teaching, research, and student services (Leslie & Slaughter, 1997; Titus, 2006c).

Pfeffer and Salancik's theory underscores the importance of the external environment and its impact on intraorganizational changes. However, as Scott (2008) notes, the extent to which organizations respond depends on their individual characteristics and the specific patterns of dependencies and relationships to the environment. Higher education institutions possess several unique characteristics, particularly when compared to organizations in the private or government sector. Thus it is essential to consider these internal characteristics in how colleges and universities respond to changes in the external environment (Titus, 2006c). Particularly their size (Mintzberg, 1983), loosely-coupled nature of subunits (Cohen & March, 1974), and multiplicity of purpose (Kerr, 2001) are hypothesized to influence how higher education institutions react to changes in resources from external entities. However, despite this hypothesized relationship, research for the most part did not yet link organizational behavior as response to changes in the environment to student outcomes.

Titus (Titus, 2004, 2006c) was the first that proposed a conceptual framework explicitly linking the influence of organizational behavior on student persistence via a resource dependency framework. Drawing upon the concept of systemic organizational behavior (Berger & Milem, 2000) and RDT (J. Pfeffer & Salancik, 1978, 2003), he examined the extent to which student persistence is influenced by institutional revenues and internal allocation of expenditures.

Building on Berger and Milem's (2000) organizational impact model and RDT, and drawing from Titus's (2004, 2006b, 2006c) conceptual framework, this study seeks to examine the impact of organizational factors, particularly structural-demographic measures, peer

characteristics/climate, and organizational behavior in form of internal financial allocations on six-year degree completion.

### Empirical Evidence

Although basic institutional characteristics, such as selectivity, size, institutional type, or control have been used in studies on college impact for quite some time (Astin, 1993; Pascarella & Terenzini, 2005), the study of organizational impact on student persistence and degree completion is a relatively recent phenomenon. Particularly, the combination of conceptual advancements on the role of higher education organizations (Berger, 2000b, 2001; Berger & Braxton, 1998) and recent methodological advancements, such as multilevel modeling techniques (Raudenbush et al., 2004), have resulted in increased scholarly attention and advanced our understanding on this important topic. However, more research is needed that examines organizational influences on persistence and degree completion by subgroups, such as income, gender, or race/ethnicity.

In regard to structural-demographic characteristics, institutional selectivity, often used as an indicator for institutional quality, has been used most frequently in single-level (i.e. OLS regression, logistic regression) and multilevel analyses. For instance, Perna (1998) pursued a study on degree attainment using the BPS survey and found a positive impact on degree completion. In fact, most studies, regardless of analytical technique find selectivity to have a positive influence on student persistence and degree completion measures (Astin & Oseguera, 2005a; DeAngelo et al., 2011; Oseguera & Rhee, 2009; Rhee, 2008; Titus, 2004, 2006b). Control (private institution) has also been frequently included, with most evidence pointing towards a positive effect on this outcome variable (Astin & Oseguera, 2005a; Oseguera, 2005; Titus, 2006c). The evidence on institutional size, however, appears less conclusive. Pascarella and



Chapman (1983) integrated institutional size and find indirect positive effects on baccalaureate degree completion. Also Titus (2004), using a multilevel model, reports a positive influence on four-year persistence. However, others studies report a negative impact or no significant results (Oseguera, 2005; Oseguera & Rhee, 2009; Rhee, 2008).

It can be argued, whether student-composition measures, such as the percent of students being female, first-generation, or student of color can be included in the structural-demographic or peer characteristic/climate category of Berger and Milem's (2000) model. However, drawing upon the concept of structural diversity (Hurtado, Dey, Gurin, & Gurin, 2003), I will include studies examining similar measures in the former category. In reviewing the literature, inconsistent results are reported for measures on structural diversity. For instance, Titus (2006c) and Rhee (2008), using a student diversity index (Chang, 1999) and the percent of minority students on campus, respectively, report a positive influence on six-year degree completion. However, using a faculty-perceived diversity measure, Rhee (2008) shows a negative influence on the same outcome measure. Titus (2006c) examined the impact of the share of women on campus and found a positive impact on six-year degree completion. However, other studies examining student persistence find no significant relationship (Oseguera & Rhee, 2009; Rhee, 2008). Structural measures for first-generation and income/SES composition have been used less frequently in the literature. However, Oseguera (2005), using a single-level analysis and CIRP data, finds aggregated income to have a positive influence on four-year and six-year degree completion.

In regard to Berger and Milem's (2000) category of peer characteristics and peer climate, scholarly work examining effects on persistence and degree completion is limited. In a recent study, Oseguera and Rhee (2009) examined institutional retention climate. Using a multilevel

model, they found that aggregated student intentions to either dropout or transfer are negatively related to six-year retention. They also included a measure for aggregated student academic preparation and found this to be a strong positive predictor of six-year retention. In his 2004 study, Titus included a measure for aggregate institutional commitment, based on the individual students' measures. He finds that aggregate institutional commitment has a positive impact on four-year retention rates.

The construct of organizational behavior in Berger and Milem's (2000) model, to my knowledge, has been examined the least in regard to student outcomes. Integrating a resource dependency perspective with organizational behavior, Titus (2006a, 2006c) studied the influence of institutional revenue and expenditure patterns on six-year degree completion and four-year persistence. Using multilevel modeling techniques, he found tuition revenues to be a positive predictor for both of these outcomes. On the expenditure side, he also reports a positive influence on both outcome measures, if institutions increased their total educational expenditures per full-time equivalent (FTE) student. Consistent with the tenets of RDT, Titus (2006a) also finds a negative impact of the share of institutional resources (expenditures) spent on administration on four-year student persistence.

### Theoretical/Empirical Models Pertaining to Persistence and Degree Completion

Influential theoretical conceptions and empirical models specifically focusing on the student departure process and student persistence have also been developed in the realm of higher education research over the past decades. Based on the distinction made at the beginning of this chapter, in the following second main section I will review notable scholarly work and theoretical/empirical models from this realm that center on aspects of student persistence and degree completion.

## *Interactionalist Theory and Model of Student Departure*

### Background and Model Specifications

The interactionalist perspective emerged in the 1970s and became well-developed in the 1990s (Chen, 2008). At its core, this perspective treats the student departure process as a dynamic interaction between individuals and institutions (Tinto, 1992) and, from the outset, drew elements from multiple theories, notably from psychology and sociology.

The interactionalist framework originated from the work of Spady (1970, 1971) and his assertion that retention is dependent on students' experiences, particularly the degree of social and academic integration into the college environment. Building on Spady's work and connecting Durkheim's (1951) theory of suicide to the process of students leaving higher education, Tinto (1975, 1993) refined and reformulated the interactionalist perspective and advanced his *model of student departure*.

Tinto emphasized the longitudinal process of student attrition from college and clearly distinguished between academic and social factors that influence student retention. Further, he incorporated and emphasized the importance of student background factors and pre-entry attributes, goals and institutional commitments. In his most recent version of the theory, Tinto (1993) also acknowledged the impact that external factors can have on student departure and incorporated external commitments into his framework.

Tinto's (1975, 1993) model states that students enter college with various individual characteristics that can influence student departure. These pre-entry attributes include family background, including socioeconomic status, parental education, and parental expectations, as well as precollege schooling experiences, and individual skills and abilities. His model posits that such entry characteristics directly influence the student's initial commitment to an institution

and to the goal of college graduation, but can also directly impact an individual's departure decision. Initial institutional commitments and student intentions, which in Tinto's (1993) conceptualization of his model are also influenced by the student's external responsibilities and commitments, in turn affect the student's degree of integration into the academic and social systems of the college or university. In other words, initial student goals and commitments influence the degree and quality of formal and informal interaction with both the academic and social aspects of the college experience.

According to his reconceptualized (1993) model, both academic and social college experiences can have formal and informal dimensions. The model states, that successful academic integration requires the students to meet explicit standards of the college or university. This can be indexed by academic performance, as grades offer assessment of a student's ability to meet an institution's standard for academic achievement. Tinto also posits that informal interactions with faculty or staff members foster an individual's academic integration. Social integration in turn pertains to the degree of congruency, or fit, between the individual student and the social system of the college or university. Tinto contends that mechanisms of social integration include more formally structured extracurricular activities and informal interactions with their peers. Both, academic and social integration in combination with external commitments affect the formation of students' subsequent goals and institutional commitments, and ultimately influence the decision to persist or depart. In other words, his theory posits that the higher academic and social integration, the more important the goal of college completion and the level of institutional commitment, which increases a student's likelihood to persist in college.

Tinto's model of student persistence and the interactionist framework have been tested extensively by a host of researchers (Braxton & Lee, 2005; Braxton & Lien, 2000; Braxton et al., 1997; Braxton, Vesper, & Hossler, 1995; Cabrera, Nora, et al., 1992). Research findings have largely supported the predictive validity of the model in regard to precollege variables. However, results are mixed when central structural relations among academic integration, social integration, and institutional and individual goal commitments are subject to empirical testing (Arbona & Nora, 2007; Braxton & Lien, 2000; Braxton et al., 1997; Cabrera, 1993). According to Cabrera (1993), these mixed results have often been attributed to inconsistencies in the measurement of the construct and also to the lack of control for variables external to the institution.

Braxton, Shaw Sullivan, and Johnson (1997) pursued a meta-study and examined extensively research studies on the interactionist framework. They found that studies generally provide weak to moderate support for the propositions generated in Tinto's model, with only a few elements receiving strong support. Of the two central components, only social integration was found to have a strong influence on subsequent levels of commitment to the goal of graduation from college.

In contrast, for academic integration, the second central element in Tinto's model, "robust empirical backing" was only found with multi-institutional approaches (Arbona & Nora, 2007; Braxton & Lien, 2000; Braxton et al., 1997). Single institution studies only provided modest support for Tinto's proposition. Evidence for the component of academic integration also differs across institutional types and appears to depend on how the construct is defined. When academic integration encompasses college grades, it consistently shows strong effects on degree completion (Murtaugh, Burns, & Schuster, 1999). But when academic integration is measured by

composites of survey items, which ask students to report their level of satisfaction with their academic experience and the level of support they receive from faculty, studies find strong positive effects on degree completion among students attending four-year institutions (Braxton et al., 1995). Braxton et al. (1997) also found that students' academic performance (e.g. college GPA), which is often used as a proxy for academic integration, was found to exert an independent influence on degree completion and, therefore, should be treated as individual factor in empirical studies.

### Critique of the Model

Tinto's highly acclaimed model of student departure, like most theoretical and conceptual models, is not without its critics. Besides the above mentioned empirical issues, mostly pertaining to internal consistency and its main elements of academic and social integration, a few scholars have also focused on critiquing Tinto's theory conceptually. Most prominent among them are Tinto (1982, 1986, 1992, 1993) himself, in the refinements of his theory, Attinasi (1989, 1992), Tierney (1992), Rendón, Jalomo, and Nora (2000), and St. John et al. (2000). The scope and depth of the critiques varies substantially, ranging from a call for more qualitative research to refine the existing theory (Tinto, 1986) to a challenge of its overall validity on the basis of its rationale and internal coherence, with the objective of replacing it entirely with a new cultural, anthropological model (Tierney, 1992). Examining critiques in detail is beyond the scope of this study, thus I will focus on the two most pertinent elements.

The interactionalist perspective is concerned with the interaction among individuals and institutions. A crucial element for this, however, is student involvement, which is conceived of as the mechanism through which students engage in the academic and social lives of the college. As Tinto (1993) notes, his model, at its core, is a model of student engagement or involvement in the

learning communities of college. The engagement element, however, which is based on Astin's (1984) highly impactful theory of student involvement inserts problematic issues, particularly for less traditional students.

Astin's theory refers to involvement as the "amount of psychical and psychological energy a student devotes to the academic experience" (p. 27). Empirical research shows strong support for the theory's assumption, indicating that the more intensely students engage in their own education, the greater the achievement, satisfaction with educational experiences, and persistence in college (Astin, 1985; Pascarella & Terenzini, 1991; Tinto, 1993). However, scholars focusing on less traditional students report that these individuals often find it difficult to get involved in college (Rendón et al., 2000; Terenzini et al., 1994). Traditional students, who are more likely to come from middle to upper-middle income/SES backgrounds, are predominantly white, and come from families in which at least one parent attended college. These students often perceive college attendance as a normal rite of passage and a part of their family tradition. Thus, they are more likely to use their economic, social, and cultural capital to understand and manipulate the traditions and practices of college to their advantage. Nontraditional students, in contrast, who frequently come from lower income/SES backgrounds, attend part-time, are minority students, or are the first in their family to attend college, often find it hard to be involved as the transition into college in itself is more difficult for them (Jalomo, 1995; Terenzini et al., 1993).

A second major critique on the interactionalist perspective has been its insufficient consideration of economic factors (Chen, 2008; Hossler et al., 2009; St. John et al., 2000). With only a few exceptions, early proponents of the theory did not incorporate financial aid variables or college cost. The underlying assumption was that personal or family finances were important

only in helping to shape students' educational aspirations and, consequently, institutional choice, but were disregarded as instrumental in playing a role in persistence decisions (Tinto, 1987). The implicit assumption in earlier versions of Tinto's student departure model was that, once students enrolled in college financial need was met. He further argued that students who said they were leaving for financial reasons, may be using this as an excuse for other reasons, possibly a change in commitment (Tinto, 1987). However, research that tested this proposition with student data from the 1980s and 1990s found that financial aid in fact was not adequate and is a contributing factor in persistence and graduation decisions (Cabrera, Nora, et al., 1992; Kane, 2004; St. John, 1991; St. John et al., 1994; St. John & Noell, 1989; St. John et al., 1996). Indeed, in a national study St. John et al. (1996) found that finance-related factors, such as student aid, aid type, college costs, and other costs, explained about half of the total variance in the persistence process.

Consistent with the mounting evidence, Tinto (1993) revisited his student integration model and incorporated, among other things, student finances as a key component into his theory. However, this did not substantially influence subsequent studies, as much of the scholarly work on persistence and degree completion using the interactionist framework continued to disregard finances and economic factors (Chen, 2008; St. John et al., 2000).

#### *Student Attrition Model*

Bean (1980, 1982, 1983, 1990) has been among the critics of Tinto's interactionist framework, particularly for its lack of attention to external factors that can shape individual perceptions and commitments. Over the years, he has advanced an alternative model to explain the college persistence process. Bean's work builds upon models of organizational turnover (March & Simon, 1958; Price, 1977; Price & Mueller, 1981), who emphasize on aspects of



integration, job satisfaction, and intent to stay, and models of attitude-behavior interactions (Bentler & Speckart, 1979; Fishbein & Ajzen, 1975), that stress the importance of the formation and genuine influence of individuals' intentions.

In their model, Bean and his associates argue that student attrition is analogous to turnover in work organizations and stress the importance of behavioral intentions (to stay or leave) as predictors of persistence behavior. In this context, the student attrition model presumes that behavioral intentions are shaped through a process whereby beliefs shape attitudes, and attitudes, in turn, affect behavioral intents—the actual attrition or retention behavior for Bean (1990). Beliefs are presumed to be influenced by students' experiences with the different components of the institution—institutional quality, academic courses, and friends/peers. The student attrition model also recognizes that factors external to the institution can play a major role in affecting both attitudes and decisions while the student is still attending college.

Bean's (1990) most recent adoption of the attrition model utilizes elements from the interactionist perspective, such as academic integration, social integration, and goal and institutional commitment. It introduces organizational variables (environmental "pull" variables) and intention variables (intentions to leave or re-enroll). In regard to background variables, Bean proposes that students are most likely to remain in college, if they perform well in high school, come from higher economic backgrounds, and enjoy substantial parental support. He further hypothesizes that student retention increases with higher satisfaction rates of the college, academic integration (defined as study skills and habits, relationship with faculty, major certainty, and lack of absenteeism), and social integration (close friends on campus, informal contact with faculty, social support system). Environmental pull variables, which according to

his model impact persistence negatively, encompass the lack of finances, having a significant other elsewhere, having the opportunity to transfer, and familial and work responsibilities.

As a last set of variables, Bean (1990) hypothesizes that student retention is positively influenced by certain attitudes, which include satisfaction with college life, positive self-development, identification with the practical value of an education, self-confidence, and stress management. Besides the level and quality of academic and social integration, these attitudes are influenced by organizational variables, which in his model encompass admissions, courses offered at the college, schedule, rules and regulations, academic services, social services, and financial aid. Individuals' attitudes are seen as intermediary outcomes in the model, which then impact the students' assessment of institutional fit and institutional commitment (or loyalty). These aspects, in turn, shape their intentions to either leave the institution or remain enrolled.

Over time, Bean and his associates have tested different variations of the student attrition model (Bean, 1980, 1983; Berger & Braxton, 1998), mostly supporting the presumed role of organizational variables, personal variables, and environmental variables in shaping both attitudes and intentions to persist. However, Bean and Vesper (1990) found that only six of the environmental, personal, and organizational variables accounted for the most variance observed in their study in a Midwestern college. They suggest that non-intellectual factors play a vital role in dropout decisions and found direct and indirect effects for a measure of family approval. In regard to other central elements in the attrition framework, Bean (1980) found that persistence decisions were positively influenced by institutional commitment and satisfaction, and negatively by having the opportunity to transfer. Cabrera et al. (1992) tested environmental pull variables in Bean's model and found that parental and peer encouragement and satisfaction with financial support increases the likelihood of persistence.

The student attrition model, like other frameworks of persistence and degree attainment, has limitations. Critiques focus mostly on three main elements. First, with a few exceptions, for instance Titus (2004), most studies using the attrition framework are conducted at single institutions (Berger & Braxton, 1998; Cabrera, Castaneda, Nora, & Hengstler, 1992; Oseguera, 2004). This makes it difficult to assess not only the differential effects of structural characteristics of the institutions, but also the impact of environmental pull variables, as true variances across institutions cannot be explored. Second, studies using Bean's model often fail to examine institutional context variables, for instance place of residence, peer group influences, and campus climate characteristics, all of which have been found to influence persistence and degree completion in college (Astin, 1993; Astin & Oseguera, 2005a; Hurtado & Carter, 1997; Oseguera & Rhee, 2009). Lastly, the attrition model fails to incorporate a number of other variables that have been proven influential on degree attainment. For instance, the model does not include precollege pull factors, such as family and work responsibilities, psychosocial factors, and family and peer encouragement (Nora, 2004; Nora, Barlow, & Crisp, 2005; Oseguera, 2004). They also often fail to incorporate educational aspirations and variables indicating a student's commitment to a specific institutions, all of which have been found highly influential on persistence and attainment (DeAngelo et al., 2011; Oseguera, 2005). Further, even though the student attrition model specifies financial aid and a lack thereof as influential elements, most studies do not incorporate detailed variables on the amounts and types of financial aid students receive, nor do they examine effects resulting from college costs (St. John et al., 2000).

### *Student Adjustment and Student/Institution Engagement Models*

The critique on both Tinto's (1975) student integration model and Bean's (1980) student attrition model fostered the creation of the student adjustment model (Arbona & Nora, 2007; Cabrera, Nora, Terenzini, Pascarella, & Hagedorn, 1999; Nora & Cabrera, 1996), which in its essence, is an integrated model drawing from both of these frameworks.

According to Nora and Cabrera (1996), the student adjustment model also regards persistence as an interwoven set of interactions between students and institutions. Similar to Tinto (1993), the authors distinguish between a social domain, which encompasses experiences with peers, and an academic domain, that incorporates experiences with faculty and academic staff. The model further posits that if these experiences enhance affective and cognitive development of the student, they will be more committed to their institution and towards attaining a college degree. As for the relationship between these two spheres, the authors presuppose that integration into the academic world on a campus and becoming part of the institution's social life are not mutually exclusive, as "positive experiences in one domain [are] seen as conducive of positive experiences in the other domain" (Nora & Cabrera, 1996, p. 123).

Nora and Cabrera (1996) further acknowledge the importance of precollege characteristics and hypothesize that these exert a direct influence on college academic performance, academic and intellectual development, and persistence decisions. They also regard parental encouragement as crucial in forming educational aspirations, helping students navigate the transition into college, and ultimately fostering the decision to persist in college. Lastly, the authors incorporate campus climate characteristics, more specifically perceptions of prejudice and/or discrimination. They posit that such perceptions have a direct negative effect on

persistence, while also affecting a student's academic performance and his or her social and academic experiences at the institution.

Expanding on Nora and Cabrera's work, Nora (2004) proposed the student/institution engagement model that also emphasizes student-institution interaction. The model also underscores the impact of precollege characteristics and environmental pull factors. These precollege characteristics include, besides measures for precollege academic ability that had been incorporated in Nora and Cabrera's (1996) model, the student's collective high school experiences, financial circumstances, and specific psychosocial factors developed in both home and school environments. The level of encouragement and support students receive from parents and significant others remain crucial also in this model. Nora (2004) further posits that environmental pull factors, such as family responsibilities, work responsibilities, and commuter status and distance, have direct and indirect negative influences on student persistence.

The student/institution engagement model further hypothesizes that initial student commitment, expressed through students' educational aspirations and the commitment to attend a specific institution, are both shaped by precollege factors and influential intermediary college outcomes. Students that are strongly committed to their goal of obtaining a degree are also more likely than their less committed peers to participate in the types of academic and social activities that provide support. The model further posits that a student's commitment to persistence and degree attainment is solidified through academic and social experiences, specifically encouragement and support received in interactions with faculty, staff and students in both academic and non-academic arenas (Arbona & Nora, 2007). In his model, academic and social experiences encompass formal and informal interactions with faculty, involvement in learning

communities inside and outside of class, social experiences (with peer groups and involvement in organizations), campus climates, and validating and mentoring experiences.

The model hypothesizes that precollege experiences, initial commitments, and experiences in college impact cognitive and noncognitive student outcomes, such as academic performance, academic and intellectual development, and noncognitive gains in various areas. These, in turn, are assumed to influence students' final commitments, particularly educational aspirations, degree attainment, and institutional commitment. In other words, Nora's (2004) model conceptualizes the choice between withdrawal and persistence as impacted by the sum of all these elements, precollege characteristics and environmental pull factors, commitments, college experiences, and intermediary outcomes.

Nora and associates have tested various elements of both the Student Adjustment and Student/Institution Engagement Model (Arbona & Nora, 2007; Cabrera, Castaneda, et al., 1992; Cabrera, Nora, & Castaneda, 1993; Cabrera, Nora, et al., 1992; Cabrera et al., 1999; Nora, 1987, 2003, 2004; Nora et al., 2005; Nora, Barlow, & Crisp, 2006a, 2006b; Nora & Cabrera, 1996). Although more focused on minority students, the two models address several crucial assertions related to factors affecting persistence and degree completion for first-generation and low income students.

They found that the degree of academic preparedness that students bring with them upon entering college is equally important for all students, regardless of background. Similar levels of educational preparedness yield the same degree of influence on student persistence. Examining effects for Latino/a students, Nora and Cabrera (1996) found that when students entered college with a rigorous academic background, they are just as likely to perform well academically when compared to their white peers. They also found that physical separation from one's family and

community does not hinder persistence, as long as students maintain a strong emotional support system. After testing their model and addressing specific assertions regarding minorities, Nora and Cabrera (1996) found the student adjustment model useful in explaining student persistence for traditional and nontraditional students.

Similar results yielded a study conducted by Cabrera et al. (1999) in regard to the impact of precollege academic preparedness. In addition to the findings in the previous study, the authors found a positive relationship between family and friend encouragement and commitment to college graduation and the institution overall.

In 2007, Arbona and Nora published a study on undergraduate degree attainment, utilizing Nora's (2004) more recent adoption of the student adjustment model. Analyzing NELS 1988-2000 data, the authors found significant effects for two precollege variables; parental education and peers who planned to attend four-year institutions. In regard to academic integration, Arbona and Nora (2007) found degree attainment to be impacted by the time of enrollment after high school, enrollment status (full-time/part-time), and the point in time of becoming a part-time student. Two other academic measures were found key in predicting attainment in their analysis: larger proportions of credit hours and achieving a higher GPA.

### *Empirical Evidence*

All theoretical models discussed in the second section of this chapter possess several commonalities. Tinto's model of student departure and Bean's attrition model are perhaps the most diverging from each other, yet have a similar core, as Hossler (1984) notes. The two models regard persistence as the result of a complex set of interactions over time and build on the assumption that a successful match between the student and the institution fosters persistence and ultimately degree attainment. They also point to the importance of precollege characteristics

in how well students would be able to adjust to the institution (Cabrera et al., 1993). As Cabrera et al. (1993) further note, a close examination of the two theories reveals overlap in terms of organizational factors (courses and academic integration), although often subsumed under a different terminology between the two models, and commitments to the institution (institutional commitment, institutional fit and quality). However, differences remain most prominently in the main emphases of the models. Whereas the student departure model focuses mostly on the two aspect of social and academic integration, thus utilizes a more internal lens to the processes within the institution, the student attrition model emphasizes the role of factors external to the institution, affecting both students' attitudes and decisions (Cabrera et al., 1993).

Nora and Cabrera's (1996) student adjustment model, which has been refined and advanced to Nora's (2004) student/institution engagement model drew from both Tinto's and Bean's work and created an integrated model. Using both an external and internal perspective of the institution and integrating elements that have been found to affect student persistence, such as precollege characteristics, initial commitments, and social and academic experiences, Nora's (2004) constitutes one of the most advanced theoretical models for undergraduate persistence. Thus, it serves as the conceptual model for variable selection at the student-level for this study.

#### Empirical Findings on Factors Related to Persistence and Degree Completion

Due to significant overlap of individual variables and variables blocks among the theoretical models discussed above, the following review of the pertinent literature will use an integrated approach for presenting empirical findings on relevant aspects. Findings on student financial aid variables, sociological constructs, and organizational measures, however, are excluded from this review, as these have been discussed in the first section of this chapter.



## Background and Precollege Characteristics

All theoretical models discussed above incorporate student background and precollege characteristics. Researchers have consistently found that factors such as gender, race/ethnicity, SES, secondary school grades, test scores, academic preparation, and educational aspirations directly influence persistence and degree completion (Anderson, 1987; Astin, 1993; DeAngelo et al., 2011; Dey & Astin, 1993). This holds true for multi-institution and single institution studies and also for studies that examined effects for different racial/ethnic and income groups (Astin, 1982; Mow & Nettles, 1990).

Research results have been mixed regarding the influence of gender on retention and degree completion. Examining persistence, Astin (1975) and Tinto (1993) found that gender was significantly related to the outcome, with women being more likely to be retained. DeAngelo et al. (2011) studied the impact of gender on four, five, and six-year degree attainment and also found that women are more likely to obtain a degree than men. However, other researchers have found less of an impact (St. John, Hu, et al., 2001) or emphasized the growing importance of interaction effects with gender (Pascarella & Terenzini, 1998). For instance, when examining progressively more inclusive regression models, St. John et al. (2001) find that gender failed to remain significant in the final model, when institutional characteristics were added. (Reason, 2009; St. John, Hu, et al., 2001). Titus (2006b) employed a multilevel model, examining six-year degree completion for low-SES students and also did not find significant effects for gender.

Race and ethnicity variables are prevalent in the study of persistence and degree completion and have been found to significantly impact these student outcomes (Carter, 2006; Reason, 2009). In her review of the literature, Carter (2006) states that minority students are more likely than their white peers to leave college without a degree. Differences in persistence

and attainment often remain, even after controlling for first-generation status and student income or SES. Both Astin and Oseguera (2005) and DeAngelo et al. (2011) find similar results, using nationally weighted data from the 2004 Freshman Survey. They find that American Indian, African American, and Latino/a students are less likely to obtain a degree when compared to their white peers. However, they also show that Asian American students are more likely to complete a degree program, when focusing on five- and six-year degree attainment. Similar results have also been found elsewhere in the literature (Carter, 2006; Pascarella & Terenzini, 2005).

Academic resources, often measured as high school grade point average, class rank, or in terms of quality and rigor of the high school have emerged as one of the strongest predictors of bachelor degree attainment (Adelman, 1999, 2006; Astin, 1993; Astin & Oseguera, 2005a).

In addition to the academic resources that students develop during their high school years, social capital also plays a crucial role in student persistence and degree attainment. As discussed in the theory section, parental education is highly influential on the student's likelihood of being retained or obtaining a degree.

Unlike the student departure and student attrition frameworks, Nora's (2004) theoretical model includes environmental pull factors at the precollege level, that are posited to negatively impact persistence and degree completion. He also incorporates encouragements from family and friends and hypothesizes that this positively influences these student outcomes. As stated above, Nora and associates generally confirm hypothesized relationships and find that work responsibilities and commuting to college have a negative impact on persistence, whereas family encouragement was found to increase the likelihood for both of these outcomes (Nora, 1987; Nora et al., 2005; Nora & Crisp, 2009).

Research consistently shows that student SES and family income influence higher education outcomes such as persistence and degree completion (Adelman, 1999, 2006; Walpole, 2003). Family wealth, however, has only been included in more recent studies and found to exert an independent influence on student success beyond income measures (Jez, 2010; F. T. Pfeffer, 2011). More research is needed at the crucial intersection of income, wealth, and student academic success, as recent findings point towards important and complex dependencies.

### Institutional Commitments

Nora's (2004) model also hypothesizes that initial student commitments influence persistence and degree attainment, similar to Tinto's (1993) version of the departure model. In a multi-institutional study using Tinto's framework, Braxton, Vesper, & Hossler (1995) examined and confirmed the influence of level of commitment. They found positive effects for the level of commitment to an institution and the level of initial commitment on the goal of graduating from college. These findings were confirmed for different racial/ethnic groups and gender. Using also a national dataset and multilevel analytical approach, Titus (2004) found similar results and confirmed a positive impact on four-year persistence rates.

### Academic and Social Experiences in College

Academic and social interaction lies at the heart of the college experience. Hence, aspects of both elements have been included in Tinto's (1993), Bean's (1990), and Nora's (2004) model, although to varying degrees. As elaborated above, an extensive review of studies using Tinto's framework has shown only modest support for the impact of academic integration on degree completion (Braxton & Lien, 2000; Braxton et al., 1997). Furthermore, the evidence differs across institutional types and appears to depend on how the construct is defined. When academic

integration is equated with college grades, which in Bean's (1990) and Nora's (2004) models are hypothesized as intermediary outcomes, research consistently finds strong effects on persistence and degree attainment (Astin & Oseguera, 2005a; Murtaugh et al., 1999). Also, when using a more nuanced approach on measuring academic integration using, for instance, students' level of satisfaction and the level of support they receive from faculty, strong positive effects are often found (Braxton et al., 1995). However, less of an effect is found when the construct is measured by satisfaction with the academic experiences and course curriculum (Cabrera, Nora, et al., 1992; Oseguera, 2004).

Grades and test scores are generally viewed as background characteristics in models of persistence and degree completion. However, they have also been used as proxies for academic integration. Bean (1990) and Nora (2004) incorporate college GPA in their models, mostly as intermediary outcomes that impact student persistence. Several studies, using both national and single institution data have confirmed the hypothesized relationship and found college grades to be a very strong predictor of persistence and degree attainment, even after controlling for precollege academic preparation and grades (Astin, 1993; Astin & Oseguera, 2005a; Herzog, 2008; Hu & St. John, 2001)

Social integration is the second pillar in Tinto's (1975; 1993) model of student departure. However, it is also a central element in both Bean's (1990) and Nora's (2004) frameworks. Studies generally support the hypothesized relationship between this construct and persistence and degree completion at residential colleges and universities, as found in a review of the literature (Braxton & Lee, 2005; Braxton et al., 1997). However, similarly to academic integration, there is significant variation in the approach of measuring social integration. Living arrangements, most often measured in whether or not students live on or off-campus, live with

family, or in sorority/fraternity housing have been consistently found to influence the level of social integration and, subsequently the likelihood of persistence (Astin, 1975, 1993; Pascarella & Terenzini, 1998, 2005). Significant relationships were also confirmed in multi-institution studies, which defined social integration in terms of measures of peer relations, participation in extracurricular activities and student clubs, participation in student government, and satisfaction with social life (Astin, 1993; Braxton et al., 1995). However, relationships appear to vary by race/ethnicity, gender, and income group. Stage (1988), for instance, found that social integration when measured by peer group relations, residency, and time spent engaging in social activities was more influential in degree completion among men than women. More recently, Franke and DeAngelo (2012) examined aspects of social integration by income groups and found that freshmen's plans to engage in student organizations and plans to participate in community service work, increased the likelihood of first to second year persistence only for low- and lower-middle income students.

External factors that can distract students from their college experience, and might “pull” them away, have been incorporated to varying degrees into persistence and degree completion models. Only in his latest (1993) version, Tinto incorporated external commitments into his framework. Nora's (2004) student/institutional engagement model specifically hypothesizes pull factors at the precollege level, however, does not specifically incorporate them at the stage of academic and social experiences. Only Bean (1990) posits that environmental pull factors, such as lack of finances, work and family obligations, and the opportunity to transfer negatively influence persistence at the college level. Although not specially focusing on Bean's framework, studies generally confirm significant relationships on persistence and degree completion. Working full-time while enrolled in college is generally found to have a strong negative impact

on students' chances to persist (Astin & Oseguera, 2005a; DeAngelo et al., 2011; Somers et al., 2004). However, assessing the effects of less than full-time work shows mixed results. Examining six-year degree completion, Cuccaro-Alamin et al. (2004) only find negative influences if students worked more than 34 hours, whereas Titus (2006) confirmed this relationship for individuals working 11 to 20 hours a week. In another national study examining four-year retention, Titus (2004) found the amount students worked to have a positive effect on persistence, thus supporting the argument that working (on campus) can support integration into campus life.

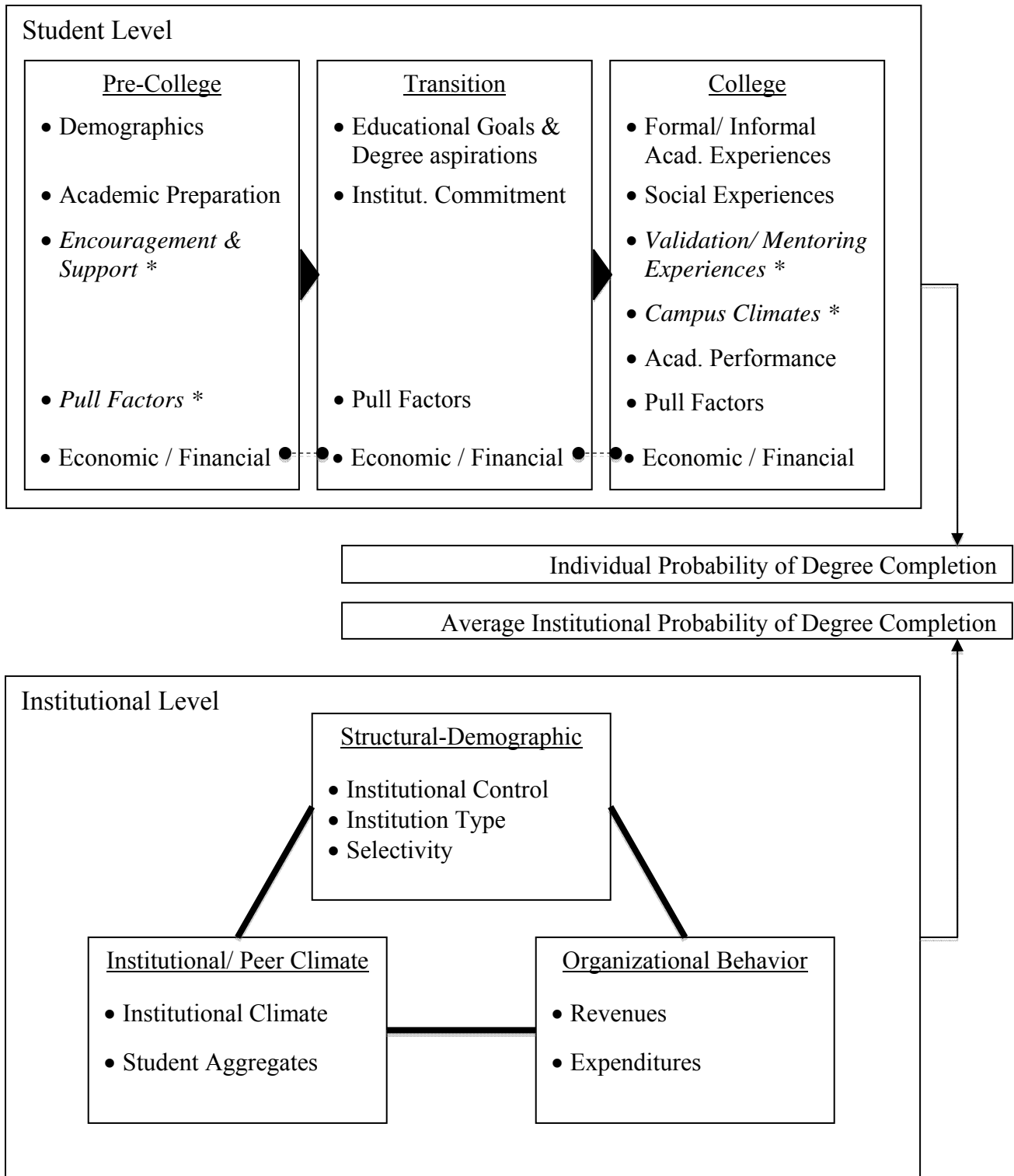
### Synopsis and General Conceptual Model

The conceptual model for this study builds on the discussed literature in the fields of economics, sociology, organization, and persistence studies in higher education. For the organization of the model, I draw from Titus's (2004, 2006a, 2006c) multilevel approach in that I conceptualize student-level and institutional-level influences on six-year degree attainment. On the student level, I build on theoretical/empirical models (Bean, 1980; Nora, 2004; Tinto, 1993) that have been introduced and tested in the literature and incorporate additional variables based on the theory review in the first section of this chapter. Figure 2.1 displays the general conceptual model, based on the review in this chapter. In addition to variables actually examined in this study (see empirical model in chapter 3), Figure 2.1 also includes measures that have been found or are generally hypothesized to be influential on persistence and degree completion, but could not be empirically tested due to data limitations in the BPS:04/09<sup>5</sup>.

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<sup>5</sup> Measures/variable blocks not tested in the final empirical model (see chapter 3) are marked with a “\*”.

**Figure 2.1:** General Conceptual Model



\* Measures/ variable blocks not included in final empirical model (see chapter 3).

Student-level characteristics and experiences hypothesized to impact the individual's probability of degree completion are displayed in the top section of Figure 2.1, whereas institutional-level influences are shown in the bottom part. Drawing from conceptualizations in Tinto (1993) and Nora (2004), I organize student-level influences temporally to better reflect the trajectory of students from secondary into postsecondary education. In this model, I incorporate three main phases: pre-college phase, transition from high school to higher education, and college attendance phase. Pre-college characteristics and experiences, and influences during college have been conceptualized in most theoretical/empirical models on persistence and student departure (Bean, 1980; Nora, 2004; Tinto, 1993). The transition phase, in contrast, has not been explicitly theorized; educational commitments and goals have been used to "link" pre-college and college constructs (Nora, 2004; Tinto, 1993). Using a process-oriented perspective and drawing from the conceptualization of intertemporal linkages in the financial nexus theory (Paulson & St. John, 2002; St. John et al., 1996), which emphasized the importance of financial aspects during the college choice process and later while enrolled, I include the transition phase to better model influences and decisions during this crucial (re)orientation-phase for individuals.

Each of the phases contains multiple variable blocks, representing characteristics, influences, and experiences specific to the individual phase that are hypothesized to affect degree attainment. In addition, each phase incorporates pull factors, hypothesized to negatively impact degree completion, in extension of Bean's (1980, 1982) and Nora's (2004) work. Furthermore, each phase contains economic/financial factors in a separate variable block, to highlight the



hypothesized pivotal role of financial aspects in student degree attainment and their intertemporal linkage<sup>6</sup>.

### *Student-Level Influences*

At the student level, student demographics are the first variable block within the *pre-college phase*. Measures included in this block seek to capture characteristics the student has little control over and typically encompass age, gender, race/ethnicity, parental education, and family status. The second block seeks to capture students' academic preparation and pre-college abilities. Measures included in this variable block are high school grade point average, admission test scores (SAT or ACT), high school type, and students' course taking patterns. Particularly in high school, encouragement and support from family members, peers, and teachers/staff to attend higher education has been found influential on student success in higher education (Nora, 2004; McDonough, 1997, 2005; Walpole, 2003), thus are conceptualized in the general model. Based on Nora's (2004) work, I also hypothesize that pull factors at the pre-college phase, such as students' work and/or family responsibilities, exert a negative influence on degree attainment in higher education. However, the BPS does not contain information on these aspects and no measures on encouragement and pull factors could be included in the final, empirical model (see chapter 3). Although often subsumed in the demographics category, I hypothesize that financial and economic factors exert an independent influence within each of the three phases, yet are linked intertemporally.<sup>7</sup> Based on recent scholarly work, I incorporate family wealth in this

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<sup>6</sup> Intertemporal links are represented through dotted lines in Figure 2.1.

<sup>7</sup> For instance, a students' family income and wealth may influence college selection and choice, particularly when considering financial aspects, and simultaneously affect the amount and type of financial aid received, not only the first year, but during the entire time of higher education attendance.

category in addition to family income to better capture parent and student socioeconomic aspects.

The *transition phase* seeks to capture influences on student degree completion that result from the physical and psychological reorientation that individuals experience during the transitional process from attending secondary education to college or university. Thus, I subsume student's educational aspirations and specific educational goals in this category, which have been found highly influential on student outcomes. I also include students' commitment towards attending a specific institution in this phase, which can be assessed, for instance, through the reasons a student chooses a particular college or an individual's transfer plans. Pull factors hypothesized to be influential in this phase are, for instance, whether students chose to attend a particular institution for family reasons, and work/family responsibilities that extend from the pre-college phase and may influence college choice and all subsequent stages/elements. Drawing from the financial nexus theory (St. John et al., 1996), I also hypothesize that financial aspects play a crucial role when evaluating whether and which college to attend. Thus, measures that seek to capture the extent to which students were offered financial assistance, which form of aid was offered, and whether individuals perceived aid as adequate for their personal needs are included in the financial/economic variable block in this phase.

Most theoretical and empirical models on student persistence and degree completion emphasize the impact experiences *during college* have on student success, most notably aspects of academic and social integration (Bean, 1980; Nora, 2004; Tinto, 1993). Thus, the conceptual model in Figure 2.1 incorporates a variable block seeking to capture the many facets of student life on campus – formal and informal interaction with faculty and staff, social experiences with peers, involvement in organizations, and in-class and out-of-class learning experiences.

Measures frequently included in this variable block are also students' living arrangements (whether they live on campus) and choice of major. Building on Nora's (2004) model, I also hypothesize that mentoring and validating experiences with faculty, staff, and peers and campus climates, such as perceptions of prejudice and discrimination, exert an influence in degree completion. However, the BPS data does not contain information on these aspects, thus these variable blocks are excluded from the final empirical model. Students' academic and intellectual development is also hypothesized to exert an influence on persistence and degree completion, and measures for academic performance (first year GPA and remedial courses taken) are included into the model.

Based on Bean's (1980, 1982) work, I also include pull factors in the college phase. Measures in this block, for instance, seek to capture detrimental effects resulting from work responsibilities (outside and on-campus), distance the institution is away from home, family responsibilities, and significant other elsewhere. The impact of financial aid and students' remaining (unmet) financial need is captured in the economic/financial variable block. In this study, I incorporate disaggregated measures for financial assistance and include the specific dollar amounts received in need-based and merit grant aid (from various sources), subsidized and unsubsidized loans (from various sources), and federal work-study. I also include measures for family financial support on tuition and fees, housing, and living expenses.

### *Institutional-Level Influences*

The second main section (bottom part) of the conceptual model in Figure 2.1 shows institutional-level influences on student degree completion. Drawing from organizational impact theory (Berger & Milem, 2000), resource dependency theory (Pfeffer & Salancik, 1978, 2003), and conceptual models in the literature (Oseguera & Rhee, 2009; Titus, 2004, 2006a, 2006c), I

incorporate measures that are hypothesized to impact the average institutional probability of degree attainment in three sectors. In contrast to the student level, sectors are not ordered temporally, as measures and characteristics included represent different influential aspects of the normative context that are not causally or temporally linked.

Even before advanced statistical analyses such as HGLM became available, scholars sought to examine influences of the college environment and institutional context. Traditionally, measures included institutional control (public or private), institutional type, and selectivity to gauge the impact of the academic normative context. These characteristics are incorporated into the *structural-demographic* sector.

Drawing from Berger and Milem's (2000) organizational impact model, which in turn builds on organizational behavior theory (Bolman & Deal, 2008), literature on peer group effects and peer climate (Astin, 1993; Weidman, 1989), and student involvement theory (Astin, 1984), I incorporate two additional sectors: institutional and peer climate, and organizational behavior. *Institutional and peer climate* seeks to capture the effects on student degree attainment resulting from shared patterns of organizational life and individuals' perceptions of these patterns. For this, I include two variable blocks – institutional climate measures and peer aggregates. Based on the literature, effects of the organizational climate can be captured, for instance, through institutional size, the share of students that are part-time, share of minority students, and measures for income/SES, such as the share of students receiving need-based grants. Scholars interested in the contextual effects of organizational and peer climate have also incorporated student aggregates, based on student-level variables (Arellano, 2012; Oseguera & Rhee, 2009; Titus, 2006a, 2006c). Measures can include, for instance, aggregated levels of academic and

social integration, student involvement, and transfer inclination, which will be tested in this study.

Examining the influence of institutional finances on student outcomes, particularly revenues and expenditure patterns, is a very recent development. Building on Titus's (2004, 2006a, 2006c) work and resource dependency theory (Pfeffer & Salancik, 1978, 2003), I conceptualize the various revenue streams an institution can tap into and expenditure patterns as manipulable and representative of implicit or explicit institutional priorities and relationships with the institution's environment. In other words, I hypothesize that institutional revenues and expenditures can be influenced through administrative and institutional action, and resulting (measurable) patterns are an expression of institutional priorities and organizational behavior. For this, various measures at the revenue and expenditure side can be included, such as revenues generated from tuition and fees, auxiliary enterprises, government sources, or endowment. On the expenditure side, measures that are hypothesized to impact student degree attainment are spending on teaching and the academic function, student services, research, and administration.

## CHAPTER 3: METHODOLOGY

Scholars concerned with aspects of student success in postsecondary education still have new grounds to explore, particularly at the intersection of degree completion, financial aid, and income. Guided by the literature review, this study seeks to examine the impact of various forms of financial aid, student characteristics and experiences on six-year degree attainment. Using a multitheoretical lens, I also focus on the normative context of higher education institutions and their organizational strategies and how this can affect an individual's likelihood of degree completion. Findings from this study can contribute to policy discussions at the federal, state, and institutional level aimed at fostering overall student success.

### Research Questions and Hypotheses

This study builds on multiple literature streams reviewed in the previous chapter. Drawing from economic, sociological, and organizational theory and the higher education literature on college impact and success, the purpose of this study is threefold. First, I seek to advance our understanding of the causal effects of various forms of financial aid and extend most recent scholarly efforts using advanced statistical techniques to reduce estimation biases. Second, using a nationally representative dataset, I seek to examine the institutional/organizational impact that college and university context exerts on student success, once individual-level factors and financial aid has been accounted for. Lastly, in support of recent calls to apply interdisciplinary perspectives to the study of student persistence and degree completion, I advance a multitheoretical framework to examine possible influences at the student and institutional level. The main research questions guiding this study are as follows:

- 1) What background characteristics, pre-college and college experiences, and pull factors impact six-year degree completion for dependent, full-time students at 4-year institutions, after controlling for financial aid received?
- 2) Accounting for individual-level characteristics, which institutional-level factors influence students' likelihood of degree attainment?
- 3) What is the influence of various forms of financial aid, particularly need-based and merit grants, subsidized and unsubsidized loans, and federal work-study, on six-year degree completion? Do effects vary by income group?

To answer these questions, I use a conceptual framework that integrates hypothesized influences at the individual and institutional level, presented later in this chapter. In the following sections, I will describe the study's hypotheses, data sources, empirical model and variables, analytical approach, and limitations.

To address the research questions stated above, the following three main hypotheses are tested in this study<sup>8</sup>.

*Hypothesis I (H<sub>1</sub>): Effect of background characteristics, pre-college and college experiences, and pull factors*

Given the empirical evidence on the influence of background characteristics, pre-college and college experiences on persistence and degree attainment, it is hypothesized that these measures will affect six-year degree completion, even after financial aid factors, and institutional characteristics and influences have been statistically controlled for. Thus, the first null hypothesis

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<sup>8</sup> A more detailed description of hypothesized relationships can be found in the section *Empirical Model and Variables*.

(H<sub>1</sub>) states, that students' background characteristics, pre-college and college experiences, and pull factors will have no effect on six-year degree attainment.

*Hypothesis II (H<sub>2</sub>): Institutional influence after controlling for individual-level effects*

Based on theoretical considerations and empirical findings, institutional context is also hypothesized to influence six-year degree attainment. Particularly, institutional normative context (structural-demographic characteristics), institutional and peer climate, and organizational behavior are expected to influence individuals' probabilities of completing a degree. For instance, I hypothesize private and highly selective institutions exert a positive contextual effect on the likelihood of degree completion, whereas institutions whose student body is largely comprised of part-time students may lower the chances of degree attainment. Further, size and peer transfer climate are assumed to have detrimental effects. Based on organizational impact and resource dependency theory, I also hypothesize that core expenditures, and institutional prioritization of teaching and student services will increase students' chances of degree completion, whereas spending on administration is hypothesized to have the opposite effect.

The third null hypothesis (H<sub>2</sub>) states: Institutional characteristics and context will play no role in six-year degree attainment.

*Hypothesis III (H<sub>3</sub>): Differential financial aid effects*

According to economic theory discussed in the previous chapter, financial aid is generally hypothesized to positively influence student persistence and degree completion. However, different forms of financial aid (such as grants, subsidized loans, and unsubsidized loans) have different value to the individual, thus may impact degree attainment differentially.



Grants and scholarships, particularly when compared to loans, have the highest value, since money received does not have to be repaid. Thus, grants are hypothesized to exert a positive influence on students' likelihood of degree attainment. Subsidized and unsubsidized loans, in contrast, have a lower value to the individual, hence are expected to marginally or even negatively impact the probability of degree completion. Less is known about the impact of the federal work-study program. However, due to its hypothesized effect of better integrating students into the campus environment and providing individuals with an additional form of financial assistance, work-study is assumed to increase chances of degree attainment.

Beyond these general relationships, it is further hypothesized that effects of various forms of financial aid vary by income. Grants are hypothesized to have the highest effect on students who can least afford to attend higher education. Thus, federal, state, and institutional need-based grants are expected to have a greater impact on low income students' probabilities of degree attainment, when compared to more affluent peers. In contrast, loans, particularly unsubsidized loans are hypothesized to have a detrimental effect on low income students, due to comparatively high costs.

The null hypotheses, thus, are the following: First ( $H_{3-1}$ ), financial aid (regardless of specific form) has no causal effect on student degree attainment. Second ( $H_{3-2}$ ), there are no differential financial aid effects for students from different income backgrounds.

## Data Source, Instrumentation, and Sample

### *Data Source*

Data for this study is drawn from three sources. Student-level data is drawn from the 2004-2009 Beginning Postsecondary Students (BPS: 04/09) survey, a longitudinal database

sponsored by the U.S. Department of Education's National Center for Education Statistics. The BPS data contains a nationally representative sample of undergraduates who entered postsecondary education for the first in academic year 2003–04.<sup>9</sup>

The BPS:04/09 contains cohort data for first-time beginners at three points in time; initial enrollment, and three and six years after commencing higher education. In 2004, participating students were interviewed about a variety of subjects, including their academic and social experiences during the first year, work while enrolled, education plans and long-term goals, demographic characteristics, and family responsibilities and background. The first follow-up (BPS:04/06) was conducted in 2006, and students were interviewed with a focus on their enrollment patterns since 2004, including any transfers, stopout periods, attendance intensity, and completion of certificates and degrees. Those who were no longer enrolled were asked about their employment experiences. The second follow-up (BPS:04/09) was conducted in 2009 and focused on degree completion for those still enrolled after 2006, graduates school enrollment, and employment of those no longer enrolled.

The BPS:04/09 study draws on many sources of data. Information about the beginning postsecondary students during their first year comes from the National Postsecondary Student Aid Study (NPSAS:04), which includes a student interview, institutional records, federal financial aid applications, and federal student loan and Pell Grant records. Data on 2003–04 beginning postsecondary students in 2006 and 2009 is primarily based on the follow-up student

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<sup>9</sup> The first-time beginning students in the BPS:04/09 study were identified in the 2003-04 National Postsecondary Student Aid Study (NPSAS:04). NPSAS is a nationally representative sample of about 90,000 undergraduate, graduate, and first professional students in about 1,600 postsecondary institutions in the 50 states, the District of Columbia, and Puerto Rico who are eligible to participate in federal Title IV student aid programs. Approximately 19,000 respondents were identified in the NPSAS:04 survey as first-time beginning postsecondary students and became the sample for the BPS:04/09 longitudinal study. While the NPSAS:04 study sample represents the approximately 19 million undergraduates enrolled in 2003–04, the BPS:04/09 study sample represents the approximately 4 million undergraduates who were first-time postsecondary beginners in 2003–04.

interviews. However, both the 2006 and 2009 studies integrate students' enrollment records from the National Student Clearinghouse and data from the same federal databases used in the base year; the 2006 study also contains information from college admissions test agencies, and the 2009 study includes college transcript data from July 1, 2003, through June 30, 2009. In 2009, about 15,000 students completed the interview, resulting in a weighted interview response rate of 82 percent. National Student Clearinghouse data or transcript data provided information on another 1,500 cases, resulting in an overall weighted response rate of 89 percent.

Institutional-level data is drawn from two sources, NCES's Integrated Postsecondary Education Data System (IPEDS) and the Delta Cost Project (DCP). The Higher Education Act of 1965 and subsequent amendments established that postsecondary education institutions participating in financial aid programs annually report data on enrollments, graduation rates, faculty and staff, institutional finances (revenues and expenditures), tuition and fees, and student financial aid. The DCP data is based on IPEDS and also includes institutional information on postsecondary finance, staffing, degree completions, and student aid for academic years 1986-87 through 2008-09. The DCP was originally commissioned to mitigate many of the problems in pursuing long-term trends analyses with IPEDS. Adjustments have been made to harmonize and standardize the data to account for changes over time in standards and IPEDS reporting formats. These adjustments also ensure, however, reasonable consistency in the patterns and allow broad comparisons of revenue and expenditure patterns between public and private institutions, an essential component of this study. For my analyses, I have included 2004 IPEDS and DCP data, the year students initially enrolled in postsecondary education.

### *Sample*

The BPS:04/09 sample is comprised of 18,640 students, of which 16,680 (89.5%) had enough data from the student interviews and administrative sources at the conclusion of the data collection to be classified as BPS:04/09 study respondents. Given the purpose of the BPS, this included a variety of students with multiple educational and occupational pathways, for instance first-time beginners in postsecondary education starting at a 2-year or 4-year institution, studying part-time or full-time.

Multiple filters were applied to the BPS data to create the final analytical subsample. The students considered were initially enrolled full-time in a bachelor's degree program at 4-year institutions. The sample was further restricted to include only U.S. citizens and permanent residents. Due to significant differences in aid eligibility, calculation, and support between dependent and independent students, only dependent students were included in the analytic sample. Students receiving athletic scholarships were excluded. After applying these restrictions, N=6,561 students remained in the final sample, attending n=651 4-year colleges and universities in the U.S.

Using the final weighted dataset, about two-thirds (64.3%) of the students in the subsample enrolled in public institutions. 28.6% attended colleges and universities that are classified as highly selective, 56.0% as moderately selective, 9.2% as minimally selective, and 6.2% as other (open admission; for-profit institution). 2.6% of the students attended Historically Black Colleges and Universities (HBCU) and 6.1% were enrolled in institutions classified as Hispanic Serving Institutions (HSI).

## Empirical Model and Variables

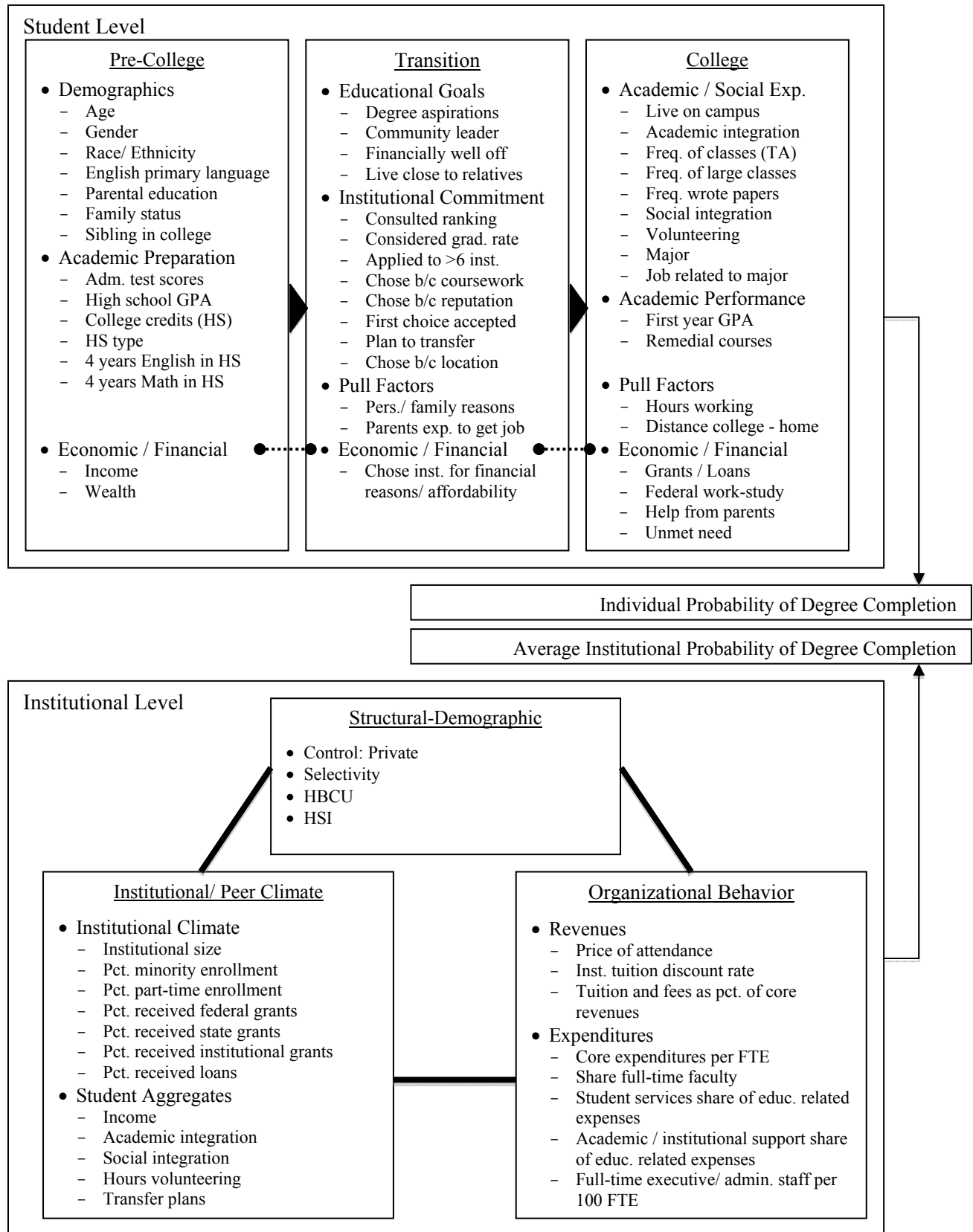
The general conceptual framework guiding this study – introduced in the previous chapter – posits that, at the student level, various characteristics, experiences, and attitudes during the pre-college, transition, and college attendance phase exert an influence on students' likelihood of degree completion. Simultaneously, the college context and institutional-level characteristics are also assumed to influence student behavior. Particularly, structural-demographic characteristics, institutional and peer climate, and organizational behavior are hypothesized to exert an influence on the average likelihood of degree attainment. For the empirical model used in this study, I draw from multiple theories in economics, sociology, and organizational theory as well as theoretical models on student persistence and degree completion. I also build on Titus's (2004) framework of college student persistence, which clearly distinguished and conceptualized influences on the student and institutional levels.

Figure 3.1 illustrates the specific empirical model used in this study, building on the more general conceptualization laid out in Chapter 2. Influences on the students' likelihood of degree attainment are included in the top part of the model, specifying variables and measures during pre-college, transition, and college attendance phases. The bottom segment of Figure 3.1 describes institutional influences on degree completion. The following section discusses the variables and measures included in the empirical model in more detail.

### *Dependent Variable*

The dependent variable (DV) for this study is bachelor's degree attainment six years after enrollment at the initial institution. The data is restricted to students who entered colleges or universities as full-time students in a bachelor-granting degree program. For the BPS:04/09,

**Figure 3.1: Empirical Model**



students entered in the academic year 2003-2004. Final assessment of their educational attainment was conducted in 2009 through multiple sources; student interviews, institutional data, and degree verification from the National Student Clearinghouse. The DV was derived from the BPS measure ATHTYF6Y and recoded into a dichotomous variable, with students receiving a 4-year degree at the initial institution of enrollment as “1” and those who did not as “0”. Only students who graduated from the same institution of initial enrollment were examined, a more narrow definition when compared to students graduating within six years from any institution. Since institutional context and the campus environment changed for these so-called mobile completers, this approach allows for a better examination of institutional influences on the individuals’ likelihood of degree completion.

Due to the nested data structure (students within institutions), which requires a multilevel analytical approach, there are two major sets of independent variables. First, student-level measures represent students’ background characteristics, high school experiences, financial aid variables, and academic and social experiences in college and focus on within-institution variance among students. Second, institutional-level variables include structural-demographic characteristics and organizational behavior measures, examining between-institution variance. Table 3.1 summarizes the coding scheme for all variables used in this study, and data origin.

#### *Independent Student-Level Variables*

At the student level, the empirical model is organized temporally to better reflect the trajectory of students. The three main phases in the model encompass pre-college, transitional phase from secondary to postsecondary education, and college attendance. Each of these phases contains two major variable blocks: at pre-college, demographics and academic preparation; in the transition phase, educational goals and institutional commitment; and during college,

**Table 3.1: Analytical Model Variables**

Variables	Coding	Source
<b>Dependent Variable</b>		
Six-year degree completion	0=no, 1=yes	Derived from BPS:04/09
<b>Student-Level Variables</b>		
<i>Pre-College Phase</i>		
<i>Demographics</i>		
Age: 19 years or older	0=no, 1=yes	BPS: 04/09 survey item
Gender: Female	0=no, 1=yes	BPS: 04/09 survey item
African American	0=no, 1=yes	BPS: 04/09 survey item
Latino/a or Hispanic	0=no, 1=yes	BPS: 04/09 survey item
Asian	0=no, 1=yes	BPS: 04/09 survey item
Other Race/Ethnicity	0=no, 1=yes	BPS: 04/09 survey item
White	0=no, 1=yes	BPS: 04/09 survey item
English is primary language	0=no, 1=yes	BPS: 04/09 survey item
<i>Parental Education</i>		
High school or less	0=no, 1=yes	Derived from BPS:04/09
Associate degree or some college	0=no, 1=yes	Derived from BPS:04/09
Bachelor's degree	0=no, 1=yes	Derived from BPS:04/09
Master's degree or higher	0=no, 1=yes	Derived from BPS:04/09
<i>Family Status</i>		
Married	0=no, 1=yes	Derived from BPS:04/09
Single parent	0=no, 1=yes	Derived from BPS:04/09
Divorced/separated/widowed	0=no, 1=yes	Derived from BPS:04/09
Sibling in college	0=no, 1=yes	BPS: 04/09 survey item
<i>Academic Preparation</i>		
Admission test scores (ACT or SAT)	continuous; rescaled by 100	BPS: 04/09 survey item
High school GPA	1=C & below, 2=C to B-, 3=B- to B, 4=B to A-, 5=A- to A	Derived from BPS:04/09
Earned college credits in high school	0=no, 1=yes	BPS: 04/09 survey item
Private high school attended	0=no, 1=yes	Derived from BPS:04/09
4 years of English in high school	0=no, 1=yes	Derived from BPS:04/09
4 years of Math in high school	0=no, 1=yes	Derived from BPS:04/09
<i>Economic/Financial</i>		
Low income (<\$32,000)	0=no, 1=yes	BPS: 04/09 survey item
Lower-middle income (\$32,000-\$59,999)	0=no, 1=yes	BPS: 04/09 survey item
Upper-middle income (\$60,000-\$91,999)	0=no, 1=yes	BPS: 04/09 survey item
High income (>\$92,000)	0=no, 1=yes	BPS: 04/09 survey item
Parents own investment >\$10,000	0=no, 1=yes	BPS: 04/09 survey item
<b>Transition Phase</b>		
<i>Educational Goals</i>		
Bachelor's degree aspiration	0=no, 1=yes	Derived from BPS:04/09
Master's degree aspiration	0=no, 1=yes	Derived from BPS:04/09
Doctorate aspiration	0=no, 1=yes	Derived from BPS:04/09
Professional degree aspiration	0=no, 1=yes	Derived from BPS:04/09
Be a community leader	0=no, 1=yes	BPS: 04/09 survey item
Be financially well off	0=no, 1=yes	BPS: 04/09 survey item
Live close to relatives	0=no, 1=yes	BPS: 04/09 survey item
<i>School Choice &amp; Initial Commitments</i>		
Consulted a ranking	0=no, 1=yes	BPS: 04/09 survey item
Considered graduation rate in choice	0=no, 1=yes	BPS: 04/09 survey item
Applied to 6 or more institutions	0=no, 1=yes	Derived from BPS:04/09
Chose institution b/c of coursework	0=no, 1=yes	BPS: 04/09 survey item
Chose institution b/c of reputation	0=no, 1=yes	BPS: 04/09 survey item
Chose institution b/c of location	0=no, 1=yes	BPS: 04/09 survey item
First choice school accepted	0=no, 1=yes	BPS: 04/09 survey item
Plan to transfer	0=no, 1=yes	BPS: 04/09 survey item



Variables	Coding	Source
<i>Pull Factors</i>		
Chose institution for personal/family reasons	0=no, 1=yes	BPS: 04/09 survey item
Parents expected to get a job	0=no, 1=yes	BPS: 04/09 survey item
<i>Economic/Financial</i>		
Chose institution b/c affordable or financial reason	0=no, 1=yes	BPS: 04/09 survey item
College Phase		
<i>Academic and Social Experiences</i>		
Live on campus	0=no, 1=yes	Derived from BPS:04/09
Academic integration index*	continuous; rescaled (10)	BPS: 04/09 survey item
Freq. of classes attended taught by TA	0=never, 1=sometimes, 2=often	BPS: 04/09 survey item
Freq. of large lectures attended	0=never, 1=sometimes, 2=often	BPS: 04/09 survey item
Freq. wrote papers for courses	0=never, 1=sometimes, 2=often	BPS: 04/09 survey item
Social integration index**	continuous; rescaled (10)	BPS: 04/09 survey item
No volunteering	0=no, 1=yes	Derived from BPS:04/09
1-10 hours volunteering	0=no, 1=yes	Derived from BPS:04/09
11-20 hours volunteering	0=no, 1=yes	Derived from BPS:04/09
20+ hours volunteering	0=no, 1=yes	Derived from BPS:04/09
Major declared	0=no, 1=yes	Derived from BPS:04/09
Job related to major	0=no, 1=yes	BPS: 04/09 survey item
GPA in first year	continuous; rescaled (10)	BPS: 04/09 survey item
Any remedial courses taken	0=no, 1=yes	BPS: 04/09 survey item
<i>Pull Factors</i>		
Not working (excl. work-study)	0=no, 1=yes	Derived from BPS:04/09
1-10 hours working (excl. work-study)	0=no, 1=yes	Derived from BPS:04/09
11-20 hours working (excl. work-study)	0=no, 1=yes	Derived from BPS:04/09
20+ hours working (excl. work-study)	0=no, 1=yes	Derived from BPS:04/09
Distance institution from home (log)	continuous; nat. log.	BPS: 04/09 survey item
<i>Economic/Financial</i>		
Federal need-based grants (Pell, SEOG, other)	continuous; \$1,000	BPS: 04/09 survey item
State need-based grants	continuous; \$1,000	BPS: 04/09 survey item
Institutional need-based grants	continuous; \$1,000	BPS: 04/09 survey item
State non-need and merit grants	continuous; \$1,000	BPS: 04/09 survey item
Institutional non-need and merit grants	continuous; \$1,000	BPS: 04/09 survey item
Outside grants (private and employer)	continuous; \$1,000	BPS: 04/09 survey item
Federal subsidized loans (Stafford, Perkins; excl. PLUS)	continuous; \$1,000	Derived from BPS:04/09
Stafford unsubsidized loans	continuous; \$1,000	BPS: 04/09 survey item
State loans	continuous; \$1,000	BPS: 04/09 survey item
Private (alternative) loans	continuous; \$1,000	BPS: 04/09 survey item
Federal work-study	continuous; \$1,000	BPS: 04/09 survey item
Help from parents - pay housing	0=no, 1=yes	BPS: 04/09 survey item
Help from parents - pay living expenses	0=no, 1=yes	BPS: 04/09 survey item
Help from parents - pay tuition & fees	0=no, 1=yes	BPS: 04/09 survey item
Unmet need (after EFC and all aid)	continuous; \$1,000	BPS: 04/09 survey item
Institutional-Level Variables		
Structural-Demographic		
Control: Private	0=no, 1=yes	Derived from BPS:04/09
High selectivity	0=no, 1=yes	Derived from BPS:04/09
Low selectivity	0=no, 1=yes	Derived from BPS:04/09
Other (open admission; for-profit)	0=no, 1=yes	Derived from BPS:04/09
HBCU	0=no, 1=yes	BPS: 04/09 survey item
HSI	0=no, 1=yes	BPS: 04/09 survey item
Institutional Context & Peer Climate		
Institutional size: Enrollment (log)	continuous; nat. log.	BPS: 04/09 survey item
Pct. minority enrollment	continuous; percent	BPS: 04/09 survey item
Pct. part-time enrollment	continuous; percent	IPEDS/DCP
Pct. students receiving federal grant aid	continuous; percent	IPEDS/DCP
Pct. students receiving state/local grants	continuous; percent	IPEDS/DCP
Pct. student receiving institutional grants	continuous; percent	IPEDS/DCP
Pct. students receiving loans	continuous; percent	IPEDS/DCP

Variables	Coding	Source
<i>Student Aggregates</i>		
Income (aggregate)	continuous	Derived from student-level
Transfer plans (aggregate)	continuous	Derived from student-level
Academic integration index (aggregate)	continuous	Derived from student-level
Social integration index (aggregate)	continuous	Derived from student-level
Hours student volunteering (aggregate)	continuous	Derived from student-level
Organizational Behavior		
<i>Revenues</i>		
Price of attendance (log)	continuous; nat. log.	IPEDS/DCP
Institutional tuition discount rate	continuous; percent	IPEDS/DCP
Tuition and fees as a pct. of core revenues	continuous; percent	IPEDS/DCP
<i>Expenditures</i>		
Core expenditures per FTE student (log)	continuous; nat. log.	IPEDS/DCP
Share of faculty full-time	continuous; percent	IPEDS/DCP
Student services share of education and related expenses	continuous; percent	IPEDS/DCP
Academic and institutional support share of education and related expenses	continuous; percent	IPEDS/DCP
Full-time executive/admin. staff per 100 FTE (log)	continuous; nat. log.	IPEDS/DCP

Note: \* Index derived from the following BPS items: Participated in study groups, had social contact with faculty, met with an academic advisor, or talked with faculty about academic matters outside of class.

Note: \*\* Index derived from the following BPS items: Attended fine arts activities, participated in intramural or varsity sports, or participated in school clubs.

academic and social experiences and academic performance. In each of the three main phases, the model also contains phase-specific pull factors and economic/financial measures hypothesized to exert an influence on degree attainment. In the following, independent variables included in the conceptual model are discussed in temporal order (by phase) and variable block.

### Pre-college Phase

*Demographics.* The demographics cluster contains seven variables: age, gender, race/ethnicity, English as primary language, parental education, family status, and sibling in college. These measures are subsumed in the demographics category because they capture characteristics the student has little control over. They specify the background and environment the individual came from, rather than her choices or experiences. Due to limited variability, the age variable in the BPS dataset was coded into a dummy, indicating that a student is either 18

years and younger, or 19 years and older. Based on previous research, parental education was recoded into four categories to create groups of conceptual significance and sufficient size. Family status was also recoded into three indicator variables. Lastly, a measure for sibling in college was included in this variable block. This variable was selected, as it may show the positive impact of increased social capital through a family member that is also attending a higher education institution.

*Academic Preparation.* Variables in this block seek to capture individuals' academic preparation before college, and their high school context. Consistently, research finds high school GPA and admission test scores to be highly predictive of student persistence and degree completion (Adelman, 2006; Astin & Oseguera, 2005a; DeAngelo et al., 2011), thus these measures are included in this study. The type of high school (public or private) is also included, as it may help explain students' academic preparation. Given the importance that high schools with abundant resources (most privates, relatively to public high schools) may play in successfully preparing their students for higher education attendance, this is an important measure. In regard to academic preparation, two more indicators were included that measured whether students had taken four years of Mathematics and English during high school. The last variable in this block measures whether students earned college credits already in high school, an indicator hypothesized to capture both academic preparation and students' social and cultural capital with respective positive effects on degree attainment.

*Economic/ Financial Factors.* Traditionally, family income is subsumed under the demographics category in studies on student persistence and degree completion (Adelman, 1999). Based on St. John's et al. (1996) notion of a financial nexus between college choice and persistence, this study hypothesizes that financial aspects and economic capital measures exert

an independent influence within each temporal phase, yet are liked across the three stages. Thus, measures for family income (four income groups) are included in this separate variable block.

Additionally, I insert a variable that measures whether or not parents own investment worth more than \$10,000, since in recent studies wealth was found to exert an independent influence on student academic success in college (Jez, 2010; F. T. Pfeffer, 2011). Beyond the pure economic capital measured, this is also hypothesized to capture parental and student cultural capital based on Bourdieu's (1977, 1986) conceptualization. Although the measure used does not measure entire family wealth, or net worth, it does allow for a coarse examination of the effects of wealth independent of family income, currently not pursued in similar studies.

#### Transition Phase

*Educational Goals.* The importance of educational aspirations and goals has been well documented in the research literature on persistence and degree completion (Nora, 2004; Nora et al., 2005; Pascarella & Terenzini, 2005; Tinto, 1993). Thus, variables for students' educational aspirations will be included. In addition to overall aspirations, other motivational aspects that may influence degree attainment are included that have been found influential in the literature (Astin & Oseguera, 2005a). These contain measures specifying whether students strive to become community leaders, seek to be financially well off, or want to live close to relatives when attending higher education.

*School Choice and Institutional Commitment.* The variables in this category seek to capture information on the transition process from high school to higher education, what students perceived important during this process, and why they chose to attend a particular institution. Specifically, this category includes variables on whether students consulted a ranking and considered graduation rates in their institutional choices. The number of college applications

submitted during the choice process is also included, because it is hypothesized to tap into aspects of cultural capital not captured anywhere else. Furthermore, variables included are whether students chose a specific institution due to their overall course offering, thus may foster specific academic goals, or because of the reputation of the college or university attended. The latter is also hypothesized to capture elements of students' cultural capital. Lastly, this block incorporates two measures that seek to assess the level of initial commitment – whether students were accepted at their first choice institution (generally assumed to be a positive predictor of persistence and degree completion) and initial transfer plans. In the literature, initial transfer plans have been found one of the largest negative predictors of degree completion, particularly when assessing attainment at the initial institution of enrollment (Astin & Oseguera, 2005a; DeAngelo, forthcoming; DeAngelo et al., 2011), thus are incorporated into this study.

*Pull Factors and Economic/ Financial Factors.* Building on the conceptualization of pull factors in Bean's (1983, 1990) and Nora's (2004) work, I also incorporate three variables that are hypothesized to negatively influence the likelihood of degree attainment. Specifically, I include measures assessing whether students chose a particular institution because of personal or family reasons, or because of the general location. I also incorporate a measure that seeks to capture whether parents expect their children to get a job when attending higher education. This variable is hypothesized to capture parental influences on student decisions and elements of cultural capital not included in general work-related measures on students while in college.

St. John et al. (1996) found evidence on the nexus of financial aspects and how these can influence college choice and persistence. Building on their conceptualization, I include a measure that seeks to capture whether students chose their particular college due to financial reasons or general affordability.

## College Attendance Phase

*Academic and Social Experiences.* The literature has long established the importance of students' academic and social experiences for the integration into the college environment, thus variables seeking to capture such information will be included in this study. However, the BPS is primarily designed to examine economic and financial influences on individuals in postsecondary education. Variables that seek to assess students' academic (formal) and social (normative) environment, despite a broader inclusion in the latest version of the BPS, are still limited, particularly when compared to measure in other national student surveys.

One of the most consistent findings in the literature is that students who live on campus are more likely to persist, thus a measure for students' living arrangements is included. Further, the BPS dataset includes a factor measuring the degree of academic integration, which has also been included. To capture specific academic experiences of students in their freshmen year, I also incorporate variables on the frequency students attended classes that were taught by a Teaching Assistant, large lectures, and wrote papers for the courses attended. Aspects of students' social integration are incorporated into the analysis through a factor on their social integration index provided with the dataset, and the time students devoted to volunteering, an aspect often found a positive predictor for student integration on campus (Astin, 1993).

Previous research on degree completion (i.e. Titus, 2004; 2006) also focused on whether student had already declared a major in their first year, thus a dichotomous measure will be included. In addition, I also incorporate a measure that seeks to capture whether jobs students worked, were related to their chosen major, which is hypothesized to exert a positive influence on degree attainment. Lastly, I include students' GPA and an indicator whether students took any

remedial courses during their first year, two measures highly influential on persistence and degree completion, particularly when assessing the impact of financial aid (see Herzog, 2008).

*Pull Factors.* Based on previous research, I also include pull factors during the college attendance phase. These include measures for the amount students worked, which excludes federal work-study hours. This is important, as I seek to assess the impact of this form of federal financial aid as part of this study. I also include a measure for the distance the institution attended is away from the home of a student.

*Economic/ Financial Factors.* This variable block contains all financial aid variables for this study. Based on research by Hu and St. John's (2001), Herzog (2008) and others, I seek to examine the differential influences of specific forms of financial aid. Thus, I include separate measures for need-based and merit aid, subsidized and unsubsidized loans, work-study, and family support. Specifically, I incorporate variables for federal need-based grants (Pell, SEOG, other), state need-based and institutional need-based grants. I also include measures for the amounts of state and institutional merit-based grants received, and other (outside) grants.

In regard to loans, I distinguish between the amounts students borrowed in subsidized loans and unsubsidized loans, based on their differential value for the individual (see discussion in Chapter 2). Specifically, I include the amounts of federal subsidized loans (Stafford, Perkins), which specifically excludes amounts borrowed by students' parents under the Parental Loan Program (PLUS loans). I further incorporate the amounts borrowed in unsubsidized loans from federal, state, and private sources.

Due to its hypothesized positive impact on persistence and degree completion for low, and lower-middle income students, I also include the amount students received in financial aid through the federal work-study program. It should be noted that I also intended to assess the

impact of parental (PLUS) and institutional loans, but these variables had to be excluded from the analysis due to multicollinearity or lack of variability.

Family resources and support from family members has also been found influential on persistence and degree attainment in previous research, thus I include indicators for students that received help from their parents to pay for housing, living expenses, or tuition and fees. Lastly, to control for the difference in the price students pay for attending a specific institution, particularly when expected family contribution and all forms of aid are already considered, I include a measure for unmet financial need (actual dollar amount). Based on previous findings in the literature (Herzog, 2008; Titus, 2004), such a measure is hypothesized to better assess the true financial need of a student than tuition and fees or total cost of attendance.

#### *Independent Institutional-Level Variables*

Drawing from organizational impact theory (Berger & Milem, 2000), resource dependency theory (J. Pfeffer & Salancik, 1978, 2003), and conceptual models in the literature (Oseguera & Rhee, 2009; Titus, 2004, 2006b, 2006c), I also include independent variables at the institutional level. These variables are hypothesized to influence the average likelihood of degree completion at an institution and, consequently, the probability of degree attainment for individuals attending the particular college or university. Figure 3.1 displays the hypothesized relationships graphically.

Categories at the institutional level are not ordered temporally. Rather, variables and variable blocks represent different aspects of the normative context at an institution that are hypothesized influential in the literature.

Structural-Demographic Characteristics



Most frequently, single-level and multilevel studies examining persistence and degree attainment seek to gauge the influence of the academic normative context, often conceived of as the impact from structural-demographic characteristics. In this category, I incorporate measures for control (private), selectivity, HBCU and HSI status.

### Institutional Context and Peer Climate

Institutional and peer climates have also been found influential on various aspects of student success, thus will be incorporated into this study. Particularly, I will include a general measure on the size of the institution attended, expressed through total undergraduate enrollment. Further, I incorporate measures on the percent of students that attend part-time and the share of minority students on campus. Given the focus on the impact of financial aid on degree attainment, I also insert measures on the share of students that received federal, state/local, and institutional grants, and loans into the model.

All data sources used in this study – BPS and IPEDS/DCP – are limited in their availability of peer climate measures, which have been found influential in the literature (Bonous-Hammarth, 2000; Oseguera & Rhee, 2009). Thus, I use aggregated student-level variables to be included at the institutional level for analysis. These measures include aggregates for income, transfer plans, academic and social integration, and hours spent volunteering.

### Organizational Behavior

Most recent research also examined institutional finances, particularly revenues and expenditure patterns, and their influence on measures of student success. As previously discussed, I draw from resource dependency theory and conceptualize the various revenue streams an institution can tap into and expenditure patterns as manipulable and representative of

implicit or explicit institutional priorities and relationships with the institution's environment. Thus, I conceptualize institutional revenues and expenditures patterns as organizational behavior. For the analysis, I build on previous research and include two measures for the capacity to generate revenues from students, expressed through the price of attendance and the percent of core revenues from tuition and fees. In order to assess the degree to which institutions might use institutional financial aid policy to attract and graduate students, I also incorporate a measure on the average tuition discount rate, a variable not used in similar studies before. Initially, I intended to include additional institutional revenue measures, such as revenues received from state/local governments (government reliance) and revenue from independent/auxiliary operations. However, due to high missingness or multicollinearity, these variables had to be excluded from the analysis.

Regarding institutional expenditures, core expenditures per FTE have been found to influence degree completion (Titus, 2006b), hence will be included in the analysis. To assess whether institutional prioritization of teaching and learning, and student services may influence individual degree completion, I incorporate measures for the share of full-time faculty, student services share of education-related expenses, and the academic and institutional support share of education related expenses. Lastly, I seek to examine the influence of centralization of power at the administrative level. Previous research hypothesized that an increase in the share of expenditures on administrative functions has potentially detrimental effects on student success (Leslie & Slaughter, 1997; Titus, 2006c), however was unable to produce significant findings when total expenditures or percentage shares were used. Thus, I include a measure that represents the number of full-time executive/administrative staff per 100 FTE students, as a proxy for general size and potentially influence of campus administration within the institution.

## Analytical Approach

Educational researchers frequently choose to study the effects of treatments or interventions on educational outcomes. Although specific focus areas often differ widely, at the heart of many investigative efforts is the intent to establish a causal link between treatment and the outcome. This study is no exception, as it seeks to examine the impact of various financial aid tools (treatment) on the probability students completed a degree within six years at their initial institution of enrollment. However, when observational or nonexperimental data is used for such investigations, endogeneity bias can adversely impact our ability to make causal inferences about treatment effects (Graham & Kurlaender, 2011).

Experimental research and randomized trials offer the most plausibly unbiased estimates and are often considered the “gold standard” to establish causal links between treatments and outcomes (Cook, 2002; Cook, Shadish, & Wong, 2008). Yet, experimental studies are rarely mounted in educational research, mostly due to their high costs, impracticability or moral objections. Thus, the majority of studies in education and related fields are based on observational and nonexperimental data. Research using such data is faced with a critical methodological challenge – how to ensure that the groups being compared are similar enough to conclude that an observed treatment effect is a true causal effect of treatment on outcome, rather than the result of systematic preexisting differences between the groups that may also influence the outcome?

As a solution, scholars have introduced various quasi-experimental research designs that offer approaches to causal inference when using observational data. Used with different frequency across academic disciplines, the four most prominent approaches are 1) panel estimation techniques, 2) instrumental variable (IV) designs, 3) regression discontinuity (RD),

and matching and reweighting techniques (Cook, 2002; Nichols, 2007). For this study, panel estimation techniques and regression discontinuity are not applicable due to the nature of the data used. Instrumental variable designs have been applied to the estimation of effects of financial aid, mostly in economic studies (see Alon, 2007; Scott-Clayton, 2011). However, with the goal of examining the effects of pre-college, college, and financial aid effects on student degree completion, matching and reweighting techniques are most appropriate estimation designs.

Multiple matching and reweighting approaches have been developed over time, mostly based on Rosenbaum and Rubin's counterfactual framework (Rosenbaum & Rubin, 1985; Rubin, 1979, 2006). One of the most prominent techniques – propensity score matching/reweighting – will be carried out in this study and subsequently be discussed. This is followed by the introduction of the analytical model, using an HGLM technique and adjustments for complex survey designs.

#### *Counterfactual Framework and Propensity Score Matching*

Propensity score analysis was developed by Rosenbaum and Rubin (Rosenbaum & Rubin, 1985; Rubin, 1979, 2006) and has been used predominantly by researchers in epidemiology and biostatistics, economics, and sociology. Although the approach was introduced to the educational research community in the mid 1980s, only in the past few years scholars developed an increased interest in propensity score methods (Graham & Kurlaender, 2011).

Propensity score techniques rely upon the counterfactual framework advanced by Neyman (1923) and Rubin (Rubin, 1978, 1979). Guo and Fraser (2010) describe the counterfactual as a *potential outcome*, or “the state of affairs that would have happened in the absence of the cause” (p.24). Through the use of the counterfactual, it is possible to make causal

inferences from observational data (Shadish, Cook, & Campbell, 2002). However, as Holland (1986) states, it is impossible to estimate the counterfactual directly, since no single unit – student in this case – can be observed as being both recipient of a treatment and non-recipient. Instead, he recommends comparing an individual who receives treatment to an individual with similar characteristics who does not receive the treatment (in this case the receipt of financial aid) to estimate the effect on the outcome.

In regard to this study, for a student that received a specific financial aid package (i.e. grants and loans), the counterfactual is the hypothetical impact on six-year degree completion (outcome), had the student *not* received financial aid. In contrast, for a student not receiving financial aid the counterfactual is the potential likelihood of graduating within six years if that student *had* received this form of financial aid.

The treatment in this study is defined as receiving a specific financial aid package, for instance receiving financial aid in the form of grants-only, compared to not receiving such aid (note: various treatments in form of different aid packages will be examined, which necessitated multiple, separate estimations).

According to Rosenbaum and Rubin (Rosenbaum & Rubin, 1985; Rubin, 2006), the propensity score is defined as the conditional probability of an individual of being in the treatment group (receiving aid), given a group of observed covariates. Given the binary nature of the treatment variable (1=receipt of a specific financial aid package; 0=no aid), they suggest using logistic or probit analyses to estimate an individuals' propensity (probability) score for being in the treatment group.

The model is described as:

$$e(x_i) = pr(W_i = 1 | X_i = x_i) \quad (1)$$

where  $W_i$  represents the binary treatment ( $W_i = 1$  for receiving financial aid,  $W_i = 0$  for control condition) for the  $i$ th student ( $i=1, \dots, N$ );  $X_i$  represents a vector of covariates predicting selection into the treatment group (Guo & Fraser, 2010).

### Propensity Score Approach

One of the overarching premises of the counterfactual framework is that selection bias can be eliminated, or at least sufficiently reduced, by eliminating differences between the groups that received and did not receive a treatment (Graham & Kurlaender, 2011). For this, researchers have developed multiple approaches. Generally, three major techniques can be distinguished, although various classifications can be found in the literature (Graham & Kurlaender, 2011). In its simplest form, propensity scores can be used as regression adjustments, in that they are included as a covariate in the primary analysis of interest. An alternative is matching treatment and control groups, using techniques such as nearest-neighbor matching, stratification matching, and kernel or caliper matching. The third option is reweighting the dataset by using the estimated propensity score for receiving the treatment as a weight or reweight (for details, see Guo & Fraser, 2010; Nichols, 2007).

In their review of various techniques, Graham and Kurlaender (2011) conclude that matching or reweighting techniques are preferable compared to simple regression adjustments. The choice between matching and reweighting largely depends on study design, purpose and researcher's preference. Given the complex survey design of the BPS data, which requires appropriate analytical techniques (see next section), the multilevel conceptual and analytical model, and inclusion of continuous financial aid variables to estimate treatment effects, using the reweighting approach is most appropriate.

Regardless of approach chosen, propensity score analyses are carried out in two stages: first, estimation and evaluation of the propensity score; second, using the propensity score in the main analysis. Most commonly, in the first stage, a logistic or probit regression model is fit to the data to estimate propensity scores. Due to the nature of the dependent variable, I carried out a logistic regression.

Given the proposed combination of a propensity score technique and a multilevel analytical approach, the estimation strategy to generate the propensity scores has to be carefully weighed. Individually, propensity score estimation and multilevel modeling have been increasingly used over the past decade in educational research. However, understanding of the *nexus* of these two methodological advances is still in its infancy (Rickles, 2012). Literature on causal inference often ignores, or avoids, the discussion of a multilevel context and vice versa. Only in most recent years, a few studies have examined the appropriate application of propensity score techniques in a multilevel setting (Arpino & Mealli, 2011; Kim & Seltzer, 2007; Rickles, 2012).

In the propensity score estimation stage, this study tested a fixed-effects, logistic regression technique which has been found to produce better results for nested data<sup>10</sup>. However,

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<sup>10</sup> When compared to single-unit or single-level analyses, challenges in multilevel, propensity score estimations result from the fact that in addition to unit-level confounding, also site-level (level-2) confounding and cross-level interactions need to be considered. Generally, scholars have discussed three approaches to estimate propensity scores for multilevel, or nested, data. First, propensity scores can be estimated using a pooled approach, which uses all cases of a dataset and generally ignores the nested data structure in the estimation phase of the analysis. Second, fixed-effects regressions have been employed to better account for the nested data structure. In simulation studies, this technique, which include dummy variables for each cluster unit, outperform models that ignore the hierarchical nature of the data and multilevel, random effects models (Arpino & Mealli, 2011). Third, Kim and Seltzer (2007) discuss the use of multilevel models (both random intercepts and random intercepts and slopes models) when estimating propensities and suggest the implementation of a matching algorithm within each cluster. However, this approach is not feasible with only few units within each cluster, a common problem in multilevel educational research studies (such as this one).

Given recent discussions, this study tested a fixed-effects regression to estimate propensity scores for students receiving treatment in form of financial aid. The estimation model that was used for this approach, and took

evaluation of the balancing properties and bias reduction showed that this approach did not produce desired outcomes and multiple covariates remained unbalanced in the data. Thus, a regular logistic regression, using a pooled estimation approach was carried out to estimate students' probabilities (their propensity scores) to receive the aid treatments under study.

### Propensity Score Estimation

For both propensity score estimations, I fit a logistic regression model of the following form to the data:

$$P(W_i | X_i = x_i) = E(W_i) = \frac{e^{x_i\beta_i}}{1 + e^{x_i\beta_i}} = \frac{1}{1 + e^{-x_i\beta_i}} \quad (2)$$

where  $W_i$  represents the binary treatment ( $W_i = 1$  for receiving financial aid,  $W_i = 0$  for control condition) for the  $i$ th student ( $i=1, \dots, N$ );  $X_i$  represents a vector of conditioning variables, and  $\beta_i$  the vector of regression parameters (Guo & Fraser, 2010).

In selecting the specific predictors to be included in the logistic regression model, the researchers must consider pretreatment factors that may impact selection into the treatment or control group that are also related to the outcome (Graham & Kurlaender, 2011). The treatment

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the hierarchical nature of the data into consideration, was identical to the model discussed above. However, it also incorporated indicators for each cluster taking into account structural differences between institutions. To ensure variability at the institutional cluster, three requirements were established. First, each institution, for each treatment pair (no treatment – grants only aid; no treatment – grants and loans; no treatment – grants, loans, and work-study) had to have at least one case (student) that received treatment and one not receiving treatment. Rickles (2012) also established a variability corridor for the treatment variable at the institution of 20-80% to ensure proper estimation of propensity scores. However, in order not to sacrifice too many cases for the analysis, I have widened this corridor to 15-85%.

Estimation results were examined using bias reduction estimations, common support evaluation, and balancing tests after reweighting the data. Results showed, however, that balance was not reached for multiple covariates when using the fixed-effects estimation approach. Additionally, due to the quality restrictions in the generation of propensity scores, the number of cases would have been reduced to  $N_G = 5,517$  to estimate the effects of grants-only financial aid packages,  $N_{GL} = 5,332$  for students having grants and loans in their financial aid package, and  $N_{GLW} = 4,197$  for individuals that had grants, loans, and federal work-study support in their financial aid package. Given these substantial drawbacks, I resorted to a pooled, logistic regression to estimate propensity scores.



in this study is financial aid in various forms (more specifically, aid packages). Thus, various background and socioeconomic characteristics, academic preparation, educational goals, and precollege factors were included in the estimation model. Variable selection also utilized previous research, for instance Herzog's (2008) propensity score estimation model, which contained first-year college residence, and initial transfer inclination. In total, the propensity score estimation model contained 22 covariates and additional interaction terms.

Although parsimony is not necessary in selecting a logistic regression model to fit for the propensity score estimation – in fact, research indicates that including more covariates improves the estimation (Guo & Fraser, 2010) - it is essential that the model contains predictors that effectively model the selection process and that the treatment and control groups formed from the resulting propensity score estimates are balanced with respect to the observed covariates (Cook et al., 2008). Thus, evaluating the balance of the estimation is crucial when assessing the quality of prediction. For the estimation, I relied upon the STATA command *pscore* in conjunction with post-estimation commands *pstest* and *psgraph*, which include a highly rigorous post-estimation balancing test (Nichols, 2007). During the estimation, the *pscore* command examines the balance of covariates included in the estimation model for the treatment and control group within estimated strata. It also examines the area of substantial overlap between the characteristics of beneficiaries and non-beneficiaries of the treatment (common support area), another requirement for applicability of this method (Guo & Fraser, 2010; Rubin, 2006). Common support area charts, bias reduction reports, and t-tests assessing the balance of covariates in the raw and matched data are reported in the appendix and discussed in the results chapter.

Given the interest of this study in the effects of various financial aid tools, multiple aid packages and their effects will be examined. Following the model in Herzog (2008), which was restricted to a single institution, I estimate three different propensity scores to examine the effects of various aid packages on degree completion. The first propensity score is estimated for students that received grants-only in their financial aid package (treatment 1); the second for individuals that had grants and loans in their financial aid package (treatment 2); and the third propensity score estimation focuses on students that received grants, loans, and federal work-study (treatment 3). Details for the distribution among students in the dataset, and propensity score models are also provided in the appendix.

### Reweighting

This study uses a reweighting, propensity score approach. In reweighting the dataset, I rely on suggested calculations by Guo and Fraser (2010) and Nichols (2008) to create weights for two main estimation effects: the average treatment effect (ATE) and the average treatment effect for the treated (ATT). The average treatment effect represents the average response to treatment for a random sample from the population, whereas the ATT represents the average response to treatment for a sample of individuals that chose (or were assigned) treatment. Thus, the ATE effect provides an estimate of the difference in an outcome between individuals receiving a certain financial aid package and individuals that did not receive it among students that had similar probabilities of receiving financial assistance. In other words, the ATE provides an estimate for causal financial aid effect, after biases are removed. The ATT is often of interest in studies evaluating policy efficacy and reported in addition to the ATE (Guo & Fraser, 2010; Reynolds & DesJardins, 2009). The following formula was used to calculate the weight for the average treatment effect:

$$\omega (W, x) = \frac{W}{\hat{e}(x)} + \frac{1-W}{1-\hat{e}(x)} \quad (3)$$

where  $W$  corresponds to the value of treatment (1,0) and  $\hat{e}(x)$  represents the propensity score.

The ATT is given by:

$$\omega (W, x) = W + (1 - W) * \frac{\hat{e}(x)}{1-\hat{e}(x)} \quad (4)$$

where  $W$  corresponds to the value of treatment (1,0), and  $\hat{e}(x)$  represents the propensity score (Guo & Fraser, 2010; Nichols, 2008).

### *Hierarchical Generalized Linear Modeling Approach*

The main analysis in this study is carried out using a hierarchical generalized linear model (HGLM) approach. In addition to estimating the effects of student-level variables, this technique takes the nested data structure into account and properly estimates the influence of institutional-level characteristics on student degree completion.

Prior research examining persistence and degree completion has frequently ignored the nested structure of students within institutions (Chen, 2008; Hossler et al., 2009), particularly before the year 2000. Only in recent years and through the proliferation of advanced statistical techniques, such as HLM, scholars have begun to account for student-level and institutional-level influences on these crucial student outcomes (Oseguera & Rhee, 2009; Rhee, 2008; Titus, 2004, 2006b, 2006c). However, to my knowledge, no study has been published to date that seeks to combine a quasi-experimental technique, such as propensity score matching, with a multilevel (HGLM) approach, examining multiple levels of influences on student degree completion and the impact of financial aid.

Hierarchical Linear Modeling (HLM), or multilevel modeling, is an appropriate statistical technique to analyze clustered data. The approach provides a statistical model that allows

examination of the distinct effects of individual/student-level and institutional-level variables. For this, HLM separates variance occurring at the various levels in the analysis (Raudenbush & Bryk, 2004). By partitioning the variance—for this study between individuals and institutions—analysts can more accurately identify significant predictors at multiple levels of observations. Single-level statistical techniques build on a variety of assumptions, one of which is the independence of standard errors. However, research has shown that, in similar data structures, random error components are actually dependent on the institutional context and more homogeneous within groups (De Leeuw & Meijer, 2008; Raudenbush & Bryk, 2004). Ignoring this homogeneity can cause underestimation of standard errors, thus resulting in inflated estimation results and Type I statistical error. Furthermore, when compared to single-level techniques, HLM models allow for the examination of cross-level effects, for instance, how student-level predictors are mediated by institutional-level variables.

Given the binary outcome variable in this study, I use hierarchical generalized linear modeling. HGLM, also known as generalized linear mixed models, is a special case of HLM that allows examination of a binary dependent variable, using a Bernoulli sampling distribution and logit link function. It is applicable when the assumptions of normality and linearity of HLMs are not realistic, such as in the case of a dichotomous outcome measure (Raudenbush & Bryk, 2004).

### HGLM Model

In utilizing multilevel models in general, and HGLM in particular, the outcome variable must vary across institutions. For this study, institutions must vary in their average likelihood of students completing a degree within six years. In HLM, the intra-class correlation (ICC) is often reported to demonstrate variability in the outcome between institutions (Raudenbush et al., 2004). Due to the dichotomous outcome variable, however, the variance at the student-level is

heteroscedastic which impacts the overall accuracy of the ICC. However, it is still informative and was assessed to determine the amount of variation in the outcome variable between institutions. To calculate the ICC, a fully unconditional model was fit which contained neither student-level nor institutional-level variables. The ICC formula is given by:

$$ICC = \frac{Var(u_{0j})}{(Var(u_{0j}) + \frac{\pi^2}{3})} \quad (5)$$

where  $Var(u_{0j})$  represents the variance of the random error component with respect to the institution  $j$ . Because the logistic level-1 sampling distribution, the variance cannot be directly estimated, only approximated by  $\frac{\pi^2}{3}$  (Raudenbush et al., 2004).

The level-1 (student-level) HGLM model uses a dichotomous sampling distribution and logit link:

$$\text{Prob}(Y_{ij} = 1 | \beta_{ij}) = \Phi_{ij}, \quad (6)$$

The level-1 (student-level or within-institution) model is given by:

$$\begin{aligned} \text{Log} \left[ \frac{\Phi_{ij}}{1 - \Phi_{ij}} \right] = & \beta_{0j} + \beta_{1j} * (\text{Pre} - \text{College})_{ij} \\ & + \beta_{2j} * (\text{Transition})_{ij} \\ & + \beta_{3j} * (\text{College Experience} \& \text{Financial Aid})_{ij} \end{aligned} \quad (7)$$

where  $i$  denotes the individual student and  $j$  represents the institution. The variable blocks included in the model represent characteristics and experiences at the three main phases of the empirical model: pre-college and background characteristics, measurements on the transition from secondary to postsecondary education, college experiences and financial aid measures.

In the multilevel model, the intercept in equation (5),  $\beta_{0j}$ , varies between institutions. All other coefficients ( $\beta_{1j}$  through  $\beta_{3j}$ ) in this study are restricted to be the same across all institutions. Thus, a student's average likelihood of degree completion is hypothesized to depend on institutional context and organizational behavior variables. However, the effects of student-level measures (i.e. college experiences, financial aid) are assumed to be the uniform across all institutions attended. In other words, institutional-level variables are assumed not to influence the slopes of student-level predictors.

The level-2 (institution-level or between-institution) model is represented by:

$$\begin{aligned} \beta_{0j} = & \gamma_{00} + \gamma_{01} * (\text{Structural} - \text{Demographic})_{ij} & (8) \\ & + \gamma_{02} * (\text{Peer/Institutional Climate})_{ij} \\ & + \gamma_{03} * (\text{Organizational Behavior})_{ij} + u_{0j} \end{aligned}$$

where  $j$  denotes the institution,  $\gamma_{00}$  represents the average likelihood of degree completion across all institutions, and  $u_{0j}$  the random variance component for institution  $j$ . The variables included in the institutional-level describe how the context at 4-year colleges and universities affect the student's average likelihood of completing a bachelor's degree within six years. These variables include structural-demographic, peer/institutional climate, and organizational behavior measures, and were sequentially entered into the analysis. Following the methodology in Raudenbush and Bryk (2004) and (Titus, 2004, 2006b, 2006c) for the estimation of institutional-level effects, only measures that were found significant in the blocked-entry were entered at the subsequent step of the estimation.

For the final analyses, I ran separate models for the three aid packages under consideration (grants only; grants and loans; grants, loans, and work-study). Within these groups, I ran separate analyses on the unmatched (non-propensity-score-reweighted) data, and analyses

using the ATE and ATT weights for all students. To estimate causal impact and differential financial aid effects for students from different income backgrounds, I ran separate analyses by income group in addition to the full sample.

## Centering

When utilizing multilevel modeling techniques, a consideration of how variables are centered is required (Raudenbush et al., 2004). Three options are generally available, grand-mean centering, group-mean centering, and no centering. For this study, all dichotomous predictors at the student and institutional level have been inserted uncentered into the model. Continuous variables at both levels are grand-mean centered, meaning that the mean value of a given variable for the entire sample is subtracted from the value of the observation.

## Adjustments for Complex Survey Design

The BPS:04/09 dataset was created through a stratified, multistage survey design (Wine, Janson, Wheelless, & Hunt-White, 2012). Survey data generated through such a process possesses specific characteristics<sup>11</sup> that need to be taken into consideration when analyses are

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<sup>11</sup> Generally, survey data are characterized by sampling weights, cluster sampling, and stratification. Sampling weights, also called probability weights, are often found in (regular) survey analysis and are equal to (or proportional to) the inverse of the probability of being sampled. A weight of  $\omega_j$  for the  $j$ th observation means that the  $j$ th observation represents  $\omega_j$  elements in the population from which the sample was drawn. Omitting weights from the analysis may lead to biased estimates and sampling weights also play a crucial part in the estimation of standard errors.

In most complex survey designs, individuals are not sampled independently. Collections of individuals are typically sampled as a group, known as a *cluster*. Often there is even further subsampling within each cluster. For instance, for a national survey such as NPSAS or BPS, colleges and universities may be sampled within a region, then states, then clusters of institutions, and finally students within institutions. The cluster at the first level of sampling are called primary sampling unit (PSU). Cluster sampling typically results in larger sample-to-sample variability than sampling individuals directly, which must be accounted for during data analysis and standard error estimation (Levy & Lemeshow, 2008).

Further, different groups of data are often sampled separately. These groups are called strata in complex surveys. For instance, colleges may be divided into public, private not-for-profit, and private for-profit. Within these three strata, institutions will be sampled from certain regions, states etc. Stratum divisions are usually fixed in

performed (Heeringa et al., 2010; Levy & Lemeshow, 2008). In particular, it is essential to account for stratification, clustering, and sampling weights to produce correct variance components and standard errors. Two procedures for estimating variances of survey statistics are the Taylor series linearization procedure (so-called sandwich estimator) and the bootstrap replication procedure. The Taylor series estimation is a well-known technique used to estimate survey variance components (Heeringa et al., 2010; Levy & Lemeshow, 2008), thus will be used in this study.<sup>12</sup>

### Analytical Software and Reporting

Given the relatively uncharted research area at the nexus<sup>13</sup> of complex survey analysis, multilevel modeling on a dichotomous outcome, and causal inference with propensity score matching techniques, identifying adequate statistical software capable of producing proper estimates is challenging. STATA's *svy* command, which incorporates complex-survey design adjustments, does not allow for multilevel modeling. The HLM software, popular among educational researchers, does not incorporate proper survey-adjustments. To my knowledge, only the MPlus statistical software currently is capable of estimating an HGLM model and using appropriate survey-adjustments for standard error estimations, stratification, clusters, and weights at the student and institutional level. Thus, MPlus 6.08 was used for parameter estimations in this study.

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advance and sampling is done independently across strata. Thus, strata are statistically independent and can be analyzed as such (Heeringa, West, & Berglund, 2010).

<sup>12</sup> MPlus's *Complex Survey Analysis* command will be used to estimate the HGLM models, which incorporates adjustments for stratification, clustering (PSU's), probability weights, and Taylor series standard error estimations.

<sup>13</sup> Various statistical software packages are capable of properly handling multilevel modeling, survey-adjusted estimations, *or* propensity scoring individually. However, estimation challenges arise through the *combination* of these approaches into one empirical/analytical model.



For ease of interpretation, results will be reported as delta-P statistics (d-P), which, in this study, represents the change in probability of an individual to obtain a degree within six years. Essentially, the delta-P shows the increase or decrease in the likelihood of degree completion resulting from a one-unit change in a given predictor variable, holding all other variables constant (Cruce, 2009; Petersen, 1985).

### Missing Data, Data Screening, and Preliminary Analysis

Student-level data from the BPS undergoes rigorous verification and missing data checks. Cases that contain missing observations are imputed, using a two step methodology. First, logical or deterministic imputation is applied for values that can be deduced from logical relationships with other variables. In the second step, remaining missing observations are statistically imputed using a weighted sequential hot-deck (WSHD) methodology (for details, see Wine et al., 2012). Due to the rigorous imputation at the creation of the BPS dataset, cases that had remaining missing values (N=121) were excluded from data analysis in this study.

Institutional-level variables obtained from IPEDS or the Delta-Project also contained missing observations for some institutions. At the institutional level, 11 out of 26 variables contained missing values with on average 2.2% missingness. Logical imputation was applied for variables that overlapped between the two data sources, but remaining missing institutions were also excluded from data analysis in the HGLM model.

I conducted several descriptive and preliminary analyses prior to creating a propensity score matching model and analyzing the data using survey-adjusted multilevel models. More specifically, I relied on a series of cross-tabulations to understand how specific independent variables relate to the dependent variable. These cross-tabulations provided information about

how degree completion rates compared across different student groups and individuals' experiences.

A next step of preliminary analyses focused on correlations among independent variables (the correlation matrix can be found in Appendix A). Identifying significant and substantial correlations between the dependent variable and independent variables helps to eliminate issues of collinearity and narrow the list of independent variables. Additionally, identifying significant and substantial correlations among independent variables assisted with attaining parsimony in the final model. Descriptive statistics, histograms, and P-P plots to examine probability distribution were also assessed for the variables used in the study. Problematic variables were either recoded, transformed, or dropped from the analysis.

A series of diagnostic tests was carried out before the final analytic models were run, using procedures from Hosmer and Lemeshow (2000) and Tabachnick and Fidell (2007). All diagnostics were run separately for the three major sub-analyses, focused on the three types of financial aid packaging. First, all categorical variables were inspected for empty and low frequency cells, but no zero cells and no cells with less than five expected frequency were detected.

Second, the variance inflation factor (VIF) was examined for each of the predictor variables, as a test of multicollinearity within the model, after coefficients and standard errors were visually inspected for exceedingly large values. All student-level variables had a VIF below 3.0, thus were far below a critical threshold and, therefore, all variables were retained in the analytical model. Institutional-level variables generally had slightly higher VIF values, but remained unproblematic. Only the instruction share of education-related expenses, and a variable

measuring the number of full-time, other-than-executive professionals per 100 FTE students showed problematic results and were subsequently dropped from the analysis.

Third, the linearity of the logit of the dependent variable for continuous predictors was examined. For this, all continuous variables were transformed using the natural log and included together with the original predictors in the analysis. Chi-square statistics in the likelihood ratio test were inspected, but no problematic values were detected (using  $p=.001$ ). Lastly, predicted probabilities were plotted against Cook's distance, a measure for multivariate outliers, but no problematic values and/or patterns were detected.

### Limitations

There are multiple limitations to this study. First, like all secondary data analysis, this study is limited by the availability of variables in the dataset. Despite the inclusion of additional pre-college experience variables and measures for educational goals, social and academic experience measures in the latest version of the BPS, the survey is predominantly designed to examine financial and economic aspects in the context of postsecondary education. Thus, detailed measures on the individual's specific college experience, validation experiences, peer climate measures, and psychological aspects are largely absent. Further, due to the design of this study, only first-year college experience measures were included. This limits the extent to which more profound institutional and contextual effects that can occur later in an individual's college experience may influence the likelihood of degree completion.

Second, this study, as many others, is limited by missing data both at the student and institutional level. Although less problematic at the student level through rigorous imputation methods carried out by NCES, the combination of three sources of data for this analysis containing missing cases each, results in a reduced number of observations. In addition, during

the propensity score estimation, cases too far removed from the common support area were identified and excluded from final estimations, which reduced the number of cases even further.

Third, even though a propensity score matching technique has been employed in this study which has been shown to significantly reduce estimation bias, endogeneity may not have been fully removed. For this, a true experiment with full randomization would have to be carried out. Further, despite a broad theoretical and empirical model that incorporated essential variables such as students' educational aspirations, goals, and academic performance in addition to background and socio-economic measures, omitted variable bias may still influence estimation results. Given the restrictions of the dataset, latent constructs such as an individual's motivation, which can influence both the likelihood of financial aid receipt and degree attainment, may not be fully assessed with the variables included in this study.

Another limitation to this study is its narrow focus on the impact of financial aid tools, pre-college and college factors. The study specifically examines students that started as full-time students at a 4-year institution. These students, when compared to the entire student body in the U.S., could be characterized as already being highly successful. Thus, the ability to generalize on the efficacy of various aid programs and their impact on student degree completion, regardless of federal, state, or institutional sources, may be limited. For this, analyses would have to be expanded and incorporate the various ways students enter and may exit higher education and in which financial aid tools can play a role in their persistence decisions and path to degree completion.

Lastly, this study has to acknowledge that the field of statistics and empirical estimation techniques, like any other area of scholarly attention, is imperfect and constantly evolving. Methodologies at the intersection of causal inference with propensity score methods, multilevel

modeling, and complex survey data are still in their infancy and lack reliable theoretical and empirical backing. Thus, estimations and techniques used in this study may be obsolete within a short period of time, as technology and our knowledge on these important topics evolve.

## CHAPTER 4: RESULTS

This study examines factors that impact six-year degree attainment. More specifically, I explore the impact of financial aid and various influences during the pre-college, transition, and college attendance phase. I also examine how the institutional environment of the college or university can impact the individuals' likelihood of degree completion. Using a nationally representative dataset and an analytical approach that combines complex-survey estimation, a causal inference technique (propensity score matching), and a multilevel estimation, this study seeks to answer two underlying research questions: what is the influence of financial aid on degree completion, and what other factors at the student and institutional level impact baccalaureate degree attainment?

This chapter provides detailed results for the analyses performed in this study. In the following, I will first present descriptive statistics and a synopsis of the analytical procedure. Estimation results from the multilevel analyses performed are provided in two subsequent sections, distinguished by the three guiding research hypotheses.

### Descriptive Statistics

The BPS:04/09 is a nationally representative dataset of students attending higher education institutions in the U.S. As such, descriptive statistics and empirical analyses carried out in this study for a chosen subsample can be generalized to this specific population. Table 4.1 displays selected descriptive statistics for the subpopulation chosen in this study. Detailed descriptive statistics can be found in Appendix A.

The overall six-year degree completion rate for dependent, full-time students that enrolled in a bachelor's degree program at a 4-year institution in 2003-04 was 59.8%. However,

this aggregate masks an important underlying trend. When assessing the degree attainment rate by income groups, the data shows that only 46.0% of the students coming from low income backgrounds obtain a degree within six years at their initial institution of enrollment. This compares to 55.6% for lower-middle income students, 62.1% for upper-middle income students, and 70.2% for their high income peers.

The data also shows that more women attend 4-year institutions as full-time, dependent students. Women are slightly higher represented among low income and lower-middle income students with 57.8% and 59.5%, respectively. Gender distribution among upper-middle and high income students is somewhat more balanced, with 55.4% and 53.2%, respectively.

In regard to race/ethnicity, more than three-fifth (70.3%) of the population are White, compared to 8.6% African American, 10.1% Latino/a or Hispanic, 5.8% Asian, and 5.2% students identifying as other race/ethnicity. African American, Latino/a, and Asian students are more concentrated in the low and lower-middle income groups. Generally, representation declines for these racial/ethnic groups as income increases; from 20.5% to 2.7% for African Americans, 22.6% to 5.0% from Latino/as and Hispanics, and 10.5% to 4.3% for Asian students across the four income groups.

For the subpopulation analyzed in this study, three-fourth (75.1%) received one of the presented three financial aid packages or no aid at all. Among all students selected, 17.8% received no aid in their first year of higher education attendance. As expected, this number is lowest for low income students with 4.3% and highest among their high income peers, with 29.8%. About one-fourth (24.7%) of all students received a grants-only financial aid package. However, distribution is u-shaped, thus highest for low income (27.8%) and high income students (28.4%), compared to 21.3% and 21.1%, respectively, for their lower-middle and upper-middle income peers.

Overall, 21.3% of students received some combination of grants and loans in financial aid. This form of aid package is the most frequent for low income students, as more than one in three (33.4%) received such assistance. Usage of this financial aid package decreases with income and is lowest among high income students, with 12.2%. Among the full-time, dependent students chosen for this study, 11.3% received some combination of grants, loans, and federal work-study in their aid package. As expected (due to eligibility and targeting of the programs), low income students were more likely to receive such aid, as nearly one in five students (19.0%) received such assistance. This compares to 16.5% for their lower-middle income, 9.0% for their upper-middle income, and 4.1% of their high income peers.

**Table 4.1:** Selected Descriptive Statistics - Full-time, Dependent Students at 4-Year Institutions (Percent)

Variable	All Students	Income Groups			
	(N=6,561)	Low (n=1,316)	Lower-Middle (n=1,575)	Upper-Middle (n=1,665)	High (n=2,006)
DV: Six-year degree completion	59.8	46.0	55.6	62.1	70.2
Gender: Female	56.2	57.8	59.5	55.4	53.2
White	70.3	41.2	68.5	79.5	83.2
African American	8.6	20.5	9.4	5.3	2.7
Latino/a or Hispanic	10.1	22.6	10.6	6.0	5.0
Asian	5.8	10.5	5.8	3.9	4.3
Other Race/Ethnicity	5.2	5.1	5.7	5.3	4.7
English is primary language	90.0	74.5	89.7	95.2	96.1
No Financial Aid received	17.8	4.3	11.5	20.1	29.8
Grants only financial aid pkg.	24.7	27.8	21.3	21.1	28.4
Grants and loans in financial aid pkg.	21.3	33.4	26.7	17.7	12.2
Grants, loans, work-study in fin. aid pkg.	11.3	19.0	16.5	9.0	4.1
Low income (<\$32,000)	20.1				
Lower-middle income (\$32,000-\$59,999)	24.0				
Upper-middle income (\$60,000-\$91,999)	25.4				
High income (>\$92,000)	30.6				

Note: Weighted with normalized BPS:04/09 study respondents weight (WTA000). Numbers reflect full-time, dependent students (excluding athletes and International students), enrolled in a Bachelor's degree program at 4-year institutions in the U.S.



Table 4.2 provides more detailed information on financial aid that dependent, full-time students received during their first year attending a 4-year college or university. The top section of the table shows average financial aid amounts and unmet need for all students and disaggregated across income groups. The bottom section of the table displays financial aid and amounts for unmet need for students receiving particular financial aid packages – grants only, grants and loans, and grants, loans, and federal work-study.

On average, students received \$7,375 in financial aid from all sources, including subsidized and unsubsidized loans. When disaggregating by income, however, stark differences become apparent. Low income students receive most financial aid when comparing average amounts received across income groups. In total, they receive \$10,737, of which a sizable amount (\$6,081) comes in the form of need-based grants from all sources. Lower-middle income students receive close to nine thousand dollar (\$8,977) in total aid, with \$3,632 in need-based grants. Their upper-middle and high income peers receive \$6,271 and \$4,827, respectively, in total financial aid, including loans. However, low income and lower-middle income students are borrowing higher amounts from all sources (\$2,572 and \$2,557, respectively) when compared to upper-middle (\$2,048) and high income (\$1,315) peers. And, despite the higher amounts of loans they borrow to finance their education, students from low income families are still left with the highest amount of unmet need (\$5,156) after family contribution and all financial aid has been considered. Data in Table 4.2 shows that unmet need declines with income, leaving students from lower-middle income backgrounds on average with \$3,919 and their upper-middle and high income peers on average with \$2,538 and \$1,647, respectively, in unmet need.

Examining financial aid for the three primary treatment groups under study, data shows that students in the grants-only group (treatment 1) received on average less in total financial aid.

**Table 4.2:** Average, First-Year Financial Aid Amounts and Student Need, by Income and Aid Package Received

Variables	All Students	Income Groups			
	(N=6,561)	Low (N=1,316)	Lower-Middle (N=1,575)	Upper-Middle (N=1,665)	High (N=2,006)
Federal need-based grants (Pell, SEOG, other)	924	3,323	989	59	16
State need-based grants	585	1,305	893	330	85
Institutional need-based grants	1,292	1,453	1,750	1,223	885
State merit grants	221	189	205	285	201
Institutional merit grants	1,412	915	1,500	1,484	1,609
Outside grants (priv. and employer)	574	518	654	551	568
Federal subsidized loans (Stafford, Perkins)	1,127	1,775	1,743	970	348
Stafford unsubsidized loans	532	479	386	585	638
State loans	23	15	32	29	15
Private (altern.) loans	369	303	397	465	313
Federal work-study	314	461	428	291	149
Unmet need (after EFC and all aid)	3,122	5,156	3,919	2,538	1,647

Variables	All Students	Financial Aid Package Received (Treatment)		
	(N=6,561)	(1) Grants only (N=1,622)	(2) Grants & Loans (N=1,398)	(3) Grants, Loans, FWS (N=739)
Federal need-based grants (Pell, SEOG, other)	924	890	1,528	2,012
State need-based grants	585	530	866	1,276
Institutional need-based grants	1,292	801	1,515	3,730
State merit grants	221	456	221	145
Institutional merit grants	1,412	2,111	1,512	2,416
Outside grants (priv. and employer)	574	1,017	673	704
Federal subsidized loans (Stafford, Perkins)	1,127	-	2,078	3,065
Stafford unsubsidized loans	532	-	1,177	759
State loans	23	-	39	66
Private (altern.) loans	369	-	695	886
Federal work-study	314	-	-	1,599
Unmet need (after EFC and all aid)	3,122	3,507	2,877	2,945

Data weighted by normalized WTA000 weight.

Note: FWS - Federal Work-Study

Students in this group received \$5,807 from all sources (compared to the overall average of \$7,375) and had a remaining unmet need of \$3,507. Disaggregated amounts for this group also show that students receiving grants-only financial aid packages received slightly less than the average student in federal and state need-based grants. They did, however, receive above average

amounts of institutional merit-based grant awards (\$2,111, compared to \$1,412 for all students). Individuals that received grants and loans (treatment 2), on average, received a notably higher total amount in financial aid, with \$10,306. For this, students were borrowing close to four thousand dollars in the first year (\$3,990) and they received \$6,316 in grant aid, on average. The 11.3% of students who received the most comprehensive financial aid package, in form of grants, loans, and federal work-study, also received the highest total amount of financial support. They received \$16,657, more than twice the average amount of financial aid for all students. In their first year alone, these students received \$10,283 in need-based and merit-based grants from all sources, almost five thousand dollar (\$4,775) in loans, and \$1,599 in aid from the federal work-study program.

### Analytical Procedure

The main analyses in this study are carried out through multiple Hierarchical Generalized Linear Models (HGLM) that incorporate adjustments for complex survey designs. To estimate the causal influence of financial aid on six-year degree attainment, a propensity score reweighting technique was utilized in conjunction with the HGLM modeling approach.

Estimation results in this chapter are presented in two main sections. First, to answer research questions regarding the influence of student-level characteristics and experiences (Hypothesis 1) and institutional-level impact on student degree attainment (Hypothesis 2), a HGLM model was fit to the data. For this, estimations were carried out utilizing regular (unmatched) data weights. Second, to estimate the causal influence of various forms of financial aid on six-year degree completion (Hypothesis 3), I carried out a propensity score reweighted HGLM analysis. Results for these estimations are presented in the second part of this chapter.

Within each main analysis, multiple estimations were carried out. The HGLM model in the first section uses six variable blocks, which were entered sequentially into the analyses. Based on the conceptual model, there are three main blocks at the student-level: pre-college, transition, and college attendance phase (models 1-3). Further, three variable blocks were entered sequentially at the institutional level, incorporating measures for structural-demographic characteristics, institutional and peer climate, and organizational behavior (models 4-6). Following the methodology in Raudenbush and Bryk (2004) and (Titus, 2004, 2006b, 2006c) for the estimation of institutional-level effects, only measures that were found significant were entered at the subsequent step of the estimation.

To estimate financial aid influences in the second main section, multiple analyses were also carried out. For instance, the effects of loans were estimated for students that received aid package two (grants and loans) or three (grants, loans, and work-study). Effects for the federal work-study program could only be estimated for the 11.3% of students in the full sample that received aid treatment three. Given the three different aid treatments, I ran separate estimations for each of the three financial aid packages. Within these packages, I ran separate analyses on the raw (unmatched) data, and regressions using the two (ATE, ATT) propensity score weights, to better examine possible estimation biases. Furthermore, to estimate differential aid effects across income groups, all analyses in the second section of this chapter were run separately on the full sample and by income group. In total, 42 HGLM analyses were performed for this study.

Results presented in this chapter generally display each variable, log-odds coefficient (C), standard error (SE), and significance ( $p$ ). For ease of interpretation, reporting also includes delta-P statistics ( $d-P$ ), which represent the change in the likelihood of degree attainment for a one unit-change in a predictor variable (for details, see Chapter 3).

## HGLM Results

### *Hypothesis I: Effect of Background Characteristics, Pre-College and College Experiences, and Pull Factors*

The first hypothesis addressed the following research questions: What are key student-level predictors of six-year degree completion, regardless of the institution attended? What is the impact of students' background characteristics and high school preparation? To what extent do educational goals and initial commitments in the transition from high school to higher education influence degree attainment? And, what is the degree to which individuals' college experiences affect the probability to obtain a degree within six years? It was hypothesized that various measures and characteristics during the pre-college, transition, and college attendance phase would predict the outcome variable. In total, there are 16 student-level (level-1) variables statistically significant in the final model (model 6); six pre-college, two transition, and eight college experience measures. All results are reported in Table 4.3.

#### Pre-College Phase

*Demographics.* Among students' background characteristics, age (whether students are 19 years or older) shows and maintains a negative significant association across all six models. There is only marginal change in the effect size, when different variable blocks are entered into the model. Assessing the effect at the final model, students that are 19 years or older are 5.63% ( $p < .01$ ) less likely to obtain a degree when compared to their younger peers. Thus, students who delay entry into higher education or decide to attend a college or university after pursuing other options after high school have a higher risk of not completing their degree within six years. This is an interesting finding, particularly in light of the fact that recent, multilevel analyses

**Table 4.3:** HGLM Model Results Predicting Six-Year Bachelor's Degree Completion

Independent Variable	Model 3 <sup>1</sup> (N=6,430)				Model 4 (N=6,430)				Model 5 (N=6,041)				Model 6 - Final (N=5,923)			
	C	SE	p	d-P	C	SE	p	d-P	C	SE	p	d-P	C	SE	p	d-P
<i>Student-Level Variable (Level 1)</i>																
<i>Pre-College</i>																
<i>Demographic</i>																
Age: 19+ years	-0.218	0.068	0.001 **	-5.27	-0.204	0.068	0.003 **	-4.93	-0.229	0.070	0.001 **	-5.54	-0.233	0.069	0.001 **	-5.63
Gender: Female	0.227	0.076	0.003 **	5.46	0.220	0.076	0.004 **	5.30	0.201	0.078	0.010 **	4.84	0.209	0.077	0.007 **	5.03
African American (White)	-0.114	0.149	0.442		-0.160	0.164	0.330		-0.180	0.165	0.275		-0.131	0.165	0.428	
Latino/a or Hispanic (White)	-0.160	0.147	0.276		-0.120	0.152	0.427		-0.208	0.155	0.179		-0.223	0.155	0.149	
Asian (White)	-0.141	0.169	0.403		-0.188	0.170	0.270		-0.282	0.180	0.119		-0.285	0.180	0.114	
Other Race/Ethnicity (White)	-0.161	0.150	0.284		-0.168	0.151	0.265		-0.146	0.160	0.361		-0.146	0.161	0.364	
English is primary language	-0.224	0.152	0.141		-0.204	0.158	0.197		-0.135	0.174	0.438		-0.142	0.173	0.413	
Parental educ: HS or less (BA)	-0.031	0.102	0.763		-0.038	0.103	0.711		-0.091	0.106	0.388		-0.068	0.106	0.520	
Parental educ: AA degree (BA)	-0.170	0.099	0.085		-0.165	0.099	0.094		-0.159	0.101	0.117		-0.157	0.101	0.117	
Parental educ: MA or higher (BA)	-0.025	0.094	0.791		-0.030	0.094	0.748		-0.017	0.097	0.863		-0.015	0.097	0.874	
Parents: Single parent (Married)	-0.515	0.235	0.028 *	-12.68	-0.544	0.239	0.023 *	-13.40	-0.583	0.252	0.020 *	-14.37	-0.567	0.249	0.023 *	-13.97
Parents: Div./sep./wid. (Married)	-0.120	0.089	0.179		-0.135	0.091	0.137		-0.138	0.093	0.137		-0.154	0.093	0.098	
Sibling in college	0.102	0.078	0.189		0.107	0.078	0.171		0.129	0.081	0.110		0.146	0.081	0.070	
<i>Academic Preparation</i>																
Admission test scores	0.062	0.028	0.025 *	1.48	0.032	0.029	0.257		0.013	0.029	0.654		0.012	0.029	0.672	
High school GPA	0.205	0.045	0.000 ***	4.81	0.194	0.045	0.000 ***	4.56	0.201	0.047	0.000 ***	4.72	0.200	0.046	0.000 ***	4.70
Earned college credits in HS	0.067	0.078	0.390		0.054	0.079	0.498		0.050	0.081	0.536		0.052	0.081	0.522	
Private HS attended	0.062	0.089	0.482		0.080	0.091	0.380		0.056	0.095	0.555		0.048	0.095	0.608	
4 yrs of English in HS	0.061	0.105	0.562		0.082	0.105	0.433		0.125	0.105	0.236		0.141	0.105	0.178	
4 yrs of Math in HS	0.148	0.081	0.067		0.114	0.081	0.162		0.081	0.084	0.333		0.085	0.083	0.309	
<i>Economic/Financial Factors</i>																
Low income (<\$32k) (High)	-0.516	0.149	0.001 **	-12.38	-0.489	0.153	0.001 **	-11.70	-0.352	0.162	0.030 *	-8.40	-0.362	0.158	0.022 *	-8.64
Low-mid income (\$32-\$59k) (High)	-0.324	0.110	0.003 **	-7.64	-0.288	0.116	0.013 *	-6.79	-0.188	0.120	0.118		-0.168	0.119	0.157	
Up-mid income (\$60-\$91k) (High)	-0.179	0.094	0.056		-0.172	0.095	0.069		-0.093	0.098	0.340		-0.073	0.095	0.442	
Parents own investment >\$10k	0.169	0.074	0.023 *	4.03	0.174	0.074	0.019 *	4.15	0.187	0.076	0.014 *	4.46	0.180	0.076	0.017 *	4.30
<i>Transition</i>																
<i>Educational Goals</i>																
Master's degree aspiration (BA)	0.171	0.085	0.045 *	4.16	0.148	0.085	0.083		0.123	0.089	0.165		0.111	0.088	0.207	
Doctorate aspiration (BA)	0.151	0.104	0.149		0.132	0.105	0.209		0.087	0.108	0.423		0.068	0.108	0.530	
Prof. degree aspiration (BA)	0.092	0.125	0.461		0.067	0.126	0.593		0.050	0.129	0.699		0.037	0.129	0.773	
Goal: Be a community leader	0.010	0.070	0.893		0.000	0.071	0.995		0.001	0.074	0.991		-0.001	0.074	0.989	
Goal: Be financially well off	0.039	0.079	0.620		0.036	0.079	0.648		0.031	0.082	0.706		0.036	0.082	0.662	
Goal: Live close to relatives	-0.131	0.074	0.076		-0.129	0.074	0.082		-0.115	0.077	0.136		-0.118	0.077	0.126	
<i>School Choice &amp; Institutional Commitment</i>																
Consulted a ranking	-0.033	0.072	0.645		-0.050	0.073	0.488		-0.069	0.076	0.367		-0.067	0.075	0.375	
Considered grad. rate	0.044	0.076	0.559		0.039	0.076	0.605		0.040	0.078	0.608		0.039	0.078	0.617	
Applied to 6+ institutions	-0.018	0.099	0.856		-0.047	0.100	0.638		-0.049	0.105	0.641		-0.055	0.104	0.597	
Chose instit. b/c of coursework	0.025	0.069	0.720		0.041	0.069	0.555		0.005	0.072	0.939		0.008	0.072	0.910	
Chose instit. b/c of reputation	0.217	0.076	0.004 **	5.24	0.194	0.076	0.011 *	4.69	0.188	0.079	0.017 *	4.54	0.177	0.078	0.022 *	4.27
Chose instit. b/c of location	0.110	0.081	0.177		0.108	0.082	0.185		0.088	0.085	0.300		0.110	0.085	0.197	
1st choice school accepted	-0.193	0.109	0.077		-0.204	0.109	0.062		-0.212	0.114	0.062		-0.196	0.112	0.080	
Plan to transfer	-1.110	0.099	0.000 ***	-27.06	-1.089	0.099	0.000 ***	-26.57	-1.050	0.102	0.000 ***	-25.66	-1.086	0.101	0.000 ***	-26.50
<i>Pull Factors</i>																
Chose instit. for pers./family reas.	-0.011	0.071	0.877		-0.008	0.072	0.912		0.006	0.073	0.935		0.004	0.073	0.959	

Independent Variable	Model 3 <sup>1</sup> (N=6,430)				Model 4 (N=6,430)				Model 5 (N=6,041)				Model 6 - Final (N=5,923)			
	C	SE	p	d-P	C	SE	p	d-P	C	SE	p	d-P	C	SE	p	d-P
Parents expected to get a job	-0.001	0.102	0.995		0.015	0.102	0.883		0.016	0.106	0.880		0.036	0.106	0.737	
<i>Economic/Financial Factors</i>																
Chose inst. for financial reason	0.097	0.072	0.179		0.082	0.076	0.282		0.097	0.079	0.215		0.112	0.076	0.140	
College																
<i>Academic and Social Experiences</i>																
Live on campus	0.699	0.092	0.000 ***	17.00	0.680	0.093	0.000 ***	16.54	0.680	0.097	0.000 ***	16.54	0.678	0.096	0.000 ***	16.49
Acad. integration index	0.002	0.010	0.855		0.001	0.010	0.918		0.005	0.010	0.603		0.002	0.010	0.852	
Freq. classes attended by TA	0.055	0.052	0.288		0.037	0.052	0.469		-0.025	0.055	0.647		-0.026	0.055	0.641	
Freq. large lectures attended	0.055	0.048	0.256		0.022	0.049	0.650		0.014	0.052	0.786		0.021	0.053	0.683	
Freq. wrote papers for courses	-0.038	0.073	0.605		-0.021	0.074	0.774		-0.086	0.076	0.258		-0.092	0.077	0.231	
Social integration index	0.021	0.007	0.005 **	0.50	0.023	0.008	0.003 **	0.55	0.024	0.008	0.004 **	0.58	0.026	0.008	0.001 **	0.62
1-10 hrs volunteering (no volunt.)	-0.023	0.079	0.769		-0.018	0.079	0.820		-0.003	0.083	0.975		0.007	0.081	0.930	
11-20 hrs volunteering (no volunt.)	-0.132	0.148	0.371		-0.129	0.149	0.385		-0.144	0.157	0.360		-0.129	0.152	0.394	
20+ hrs volunteering (no volunt.)	-0.095	0.143	0.507		-0.090	0.145	0.533		-0.054	0.155	0.726		-0.063	0.150	0.676	
Major declared	0.044	0.081	0.583		0.063	0.081	0.440		0.142	0.084	0.091		0.141	0.083	0.091	
Job related to major	0.119	0.143	0.403		0.126	0.144	0.382		0.077	0.145	0.596		0.072	0.144	0.615	
GPA in first year	0.089	0.006	0.000 ***	2.12	0.091	0.006	0.000 ***	2.17	0.091	0.007	0.000 ***	2.17	0.091	0.007	0.000 ***	2.17
Any remedial courses taken	0.049	0.095	0.605		0.054	0.096	0.575		0.029	0.099	0.767		0.026	0.098	0.793	
<i>Pull Factors</i>																
1-10 hrs working (not working)	-0.062	0.112	0.580		-0.070	0.113	0.533		-0.069	0.117	0.554		-0.074	0.116	0.528	
11-20 hrs working (not working)	-0.135	0.113	0.230		-0.133	0.113	0.239		-0.158	0.115	0.169		-0.189	0.113	0.097	
20+ hrs working (not working)	-0.468	0.131	0.000 ***	-11.44	-0.458	0.132	0.001 **	-11.19	-0.407	0.136	0.003 **	-9.93	-0.418	0.136	0.002 **	-10.20
Distance from home	-0.097	0.028	0.000 ***	-2.35	-0.098	0.028	0.000 ***	-2.38	-0.105	0.029	0.000 ***	-2.55	-0.103	0.028	0.000 ***	-2.50
<i>Economic/Financial Factors</i>																
Fed. need-based grants	0.048	0.034	0.155		0.053	0.034	0.118		0.059	0.035	0.093		0.060	0.035	0.086	
State need-based grants	0.002	0.036	0.945		0.000	0.037	0.995		-0.003	0.038	0.943		-0.013	0.036	0.712	
Instit. need-based grants	0.032	0.011	0.004 **	0.77	0.033	0.012	0.006 **	0.79	0.033	0.011	0.003 **	0.70	0.033	0.011	0.002 **	0.79
State merit grants	0.038	0.043	0.377		0.016	0.043	0.702		0.040	0.046	0.379		0.014	0.041	0.730	
Instit. merit grants	0.021	0.011	0.061		0.026	0.012	0.033 *	0.62	0.030	0.013	0.020 *	0.72	0.026	0.012	0.028 *	0.62
Outside grants	0.045	0.023	0.054		0.043	0.024	0.073		0.045	0.025	0.067		0.044	0.025	0.075	
Federal subsid. loans	0.019	0.024	0.430		0.014	0.025	0.556		0.010	0.026	0.698		0.011	0.025	0.654	
Stafford unsubsidized loans	-0.072	0.031	0.019 *	-1.74	-0.070	0.031	0.025 *	-1.69	-0.064	0.032	0.046 *	-1.55	-0.065	0.032	0.041 *	-1.57
State loans	0.025	0.074	0.739		0.050	0.070	0.472		0.020	0.075	0.789		0.032	0.070	0.651	
Private (altern.) loans	-0.011	0.013	0.392		-0.007	0.013	0.606		-0.010	0.014	0.477		-0.010	0.014	0.459	
Federal work-study	0.001	0.046	0.981		0.010	0.047	0.836		0.026	0.050	0.602		0.015	0.050	0.756	
Help f. parents - housing	-0.098	0.091	0.281		-0.116	0.092	0.207		-0.141	0.098	0.148		-0.143	0.097	0.138	
Help f. parents - living expenses	0.107	0.074	0.148		0.098	0.074	0.188		0.094	0.078	0.228		0.082	0.078	0.290	
Help f. parents - tuition & fees	0.047	0.094	0.619		0.047	0.094	0.617		0.087	0.101	0.389		0.091	0.100	0.362	
Unmet need (after EFC and aid)	0.022	0.007	0.002 **	0.53	0.022	0.008	0.004 **	0.53	0.014	0.008	0.068		0.014	0.008	0.062	
<i>Institutional-Level Variables (Level 2)</i>																
Structural-Demographic																
Control: Private					-0.145	0.112	0.195									
High selectivity (Mod. selectivity)					0.295	0.099	0.003 **	6.89	0.135	0.104	0.196		0.125	0.104	0.232	
Low selectivity (Mod. selectivity)					-0.519	0.135	0.000 ***	-12.86	-0.309	0.132	0.019 *	-7.63	-0.300	0.138	0.029 *	-7.41
Other selectivity (Mod. selectivity)					-0.269	0.181	0.136		-0.052	0.185	0.780		-0.012	0.179	0.948	
HBCU					0.012	0.335	0.972									
HSI					-0.289	0.257	0.261									

Independent Variable	Model 3 <sup>1</sup> (N=6,430)				Model 4 (N=6,430)				Model 5 (N=6,041)				Model 6 - Final (N=5,923)			
	C	SE	p	d-P	C	SE	p	d-P	C	SE	p	d-P	C	SE	p	d-P
<b>Institutional Context and Climate</b>																
Enrollment									0.066	0.050	0.185					
Pct. minority enrollment									0.007	0.003	0.025 *	0.17	0.006	0.003	0.023 *	0.14
Pct. of part-time enrollment									-0.009	0.004	0.023 *	-0.22	-0.011	0.004	0.005 **	-0.26
Pct. receiving federal grants									-0.015	0.005	0.003 **	-0.36	-0.017	0.004	0.000 ***	-0.41
Pct. receiving state/local grants									-0.002	0.002	0.312					
Pct. receiving institutional grants									-0.001	0.002	0.697					
Pct. receiving loans									0.002	0.003	0.448					
<i>Peer Aggregates</i>																
Income									0.064	0.132	0.626					
Transfer plans									-0.003	0.003	0.431					
Acad. integration index									-0.035	0.031	0.259					
Social integration index									0.003	0.022	0.905					
Hrs student volunteering									-0.027	0.076	0.727					
<b>Organizational Behavior</b>																
<i>Revenues</i>																
Price of attendance													0.134	0.206	0.514	
Instit. tuition discount rate													-0.003	0.004	0.418	
Tuit & fees as pct. of core reven.													-0.003	0.003	0.399	
<i>Expenditures</i>																
Core expend./per FTE													-0.020	0.143	0.890	
Share of faculty full-time													-0.006	0.002	0.006 **	-0.14
Pct. stud. services share of exp.													-0.015	0.008	0.066	
Pct. share acad. & inst. support													0.007	0.005	0.124	
FT exec./admin. staff per 100 FTE													0.039	0.068	0.568	
Threshold	-0.240	0.322	0.457		-0.339	0.326	0.299		-0.170	0.337	0.614		-0.160	0.330	0.627	
Variance Component	0.173	0.053	0.001 **		0.157	0.051	0.002 **		0.122	0.048	0.010 *		0.098	0.047	0.039 *	
			Diff. to prev.				Diff. to prev.				Diff. to prev.				Diff. to prev.	
Loglikelihood	-3367.87	281.02			-3349.96	17.92			-3128.14	221.82			-3057.53	70.61		
AIC	6883.74	-498.04			6859.91	-23.83			6434.27	-425.64			6291.05	-143.22		
BIC	7384.63	-281.45			7371.41	-13.22			7031.13	-340.28			6879.47	-151.66		
Explained Variance at Level-2 <sup>2</sup>	0.80				0.82				0.86				0.89			
Increase Expl. Variance at Level-2 after Level-1 inserted	-				0.09				0.30				0.43			

\* p<.05, \*\* p<.01, \*\*\* p<.001

Note 1: Results for Models 1-2 and t-estimates are omitted to improve readability and are reported in Appendix B.

Note 2: Based on calculation using unconditional model variance component; 0.881, p<.001

Notes: Reference groups are displayed in parentheses.

Analysis of BPS:04/09. Sample includes N=6,561 students, and n=651 institutions. Student and institutional-level data weighted by disaggregated WTA000 weight.



examining persistence and degree completion did not incorporate students' age (Oseguera & Rhee, 2009; Titus, 2006b, 2006c). However, it confirms recent findings by DeAngelo et al. (2011) examining a nationally representative dataset, and DesJardins and McCall (2010) who found higher attrition risk for older students.

Gender is also found to be a significant predictor of degree attainment across all models, with women being more likely to graduate. The effect is notably reduced when college experience and financial aid variables are entered (model 3), however, the effect remains relatively stable with only marginal decline in magnitude across the models thereafter. Controlling for student- and institutional-level predictors, women have a 5.03% higher chance ( $p < .01$ ) to graduate within six years than men. This confirms general findings in the literature about the success of women in postsecondary education (Astin & Oseguera, 2005a; Pascarella & Terenzini, 2005) and shows that women not only access higher education in greater numbers, they also have higher chances of obtaining a baccalaureate degree.

In regard to race/ethnicity, two measures have been found significant, however, only in the early stages of the estimation (model 2). Before college experience and financial aid measures are entered, Latino/a students and Other race/ethnicity are found less likely to graduate, with their chances lowered by 7.77% ( $p < .05$ ) and 6.85% ( $p < .05$ ), respectively. Once pre-college, transition, and college attendance characteristics and experiences are accounted for, a student's racial/ethnic background does not seem to influence the likelihood of degree attainment. Although not the primary interest in this study, this is a very interesting finding, as previous research that specifically examined six-year degree completion found minority students to be significantly less likely to obtain a degree (DeAngelo et al., 2011; Titus, 2006b). However, these

studies did not incorporate disaggregated financial aid measures and first-year GPA, which might account for this differential finding.

Parental educational level and having a sibling in college are similar in this regard, as their effect is only statistically significant before college measures are accounted for. Results in model 2 show that, students whose parents hold an Associate's degree or have only some college background are 4.49% ( $p < .05$ ) less likely to graduate within six years. In contrast, having a brother or sister attending college while enrolled increases one's chances by 5.57% ( $p < .01$ ). However, when controlling for college attendance and institutional characteristics, effects subside to statistical insignificance as shown in models 3 through 6. Parental education and having at least one sibling in college were conceptualized as social capital measures (Bourdieu, 1986), and were found influential in previous studies (Dika & Singh, 2002). However, the BPS data did not allow incorporation of more detailed measures of peer, friends, and family support associated with increased higher education success. Examining social capital effects with more nuanced measures might result in different findings.

It has been hypothesized that parental family status exerts an influence on student success in higher education. Results reported in Table 4.3 show that, when compared to married parents, students coming from single parent households are significantly less likely to graduate from college within six years. Examining effects in model 2, single parent students are almost eleven percent (-10.96%,  $p < .05$ ) less likely to graduate. Students with parents that are either divorced, live in separation, or are widowed also have a lower chance to obtain a bachelor's degree (-4.62%,  $p < .05$ ). However, when accounting for college experiences and other factors, only single parent status remains a significant, negative predictor of degree attainment. Interestingly, the magnitude of the effect increases in models 3, 4, and 5, generally indicating a suppressor

effect<sup>14</sup>. Examining pair-wise correlations shows (see Appendix A for correlation matrix) that coming from a single-parent household is positively correlated with receiving certain need-based aid. Specifically, single parent status is positively associated with federal need-based grants ( $r=.205, p<.01$ ), state need-based grants ( $r=.125, p<.01$ ), and federal subsidized loans ( $r=.105, p<.01$ ), all of which possess a negative correlation with the outcome measure. Similar oppositional relationships are also found for institutional-level variables, such as institutions with a high share of part-time students ( $r=.069, p<.01$ ) or a high share of students on campus receiving federal grants ( $r=.154, p<.01$ ), which helps to explain the increase in the effect in models 4 and 5. In the final model, estimates show that students with a single parent are significantly less likely to obtain a degree. When compared to peers whose parents are married, they have about 14% (-13.97,  $p<.05$ ) lower chances to graduate with a bachelor's degree, even after controlling for family income and all other characteristics.

*Academic Preparation.* Pre-college academic preparation and high school background have been found influential on student persistence and degree completion in much of the literature (Astin, 1993; Pascarella & Terenzini, 2005), thus were included in this study. Results show, both admission test score (ACT or SAT) and high school grade point average (GPA) are positive predictors of six-year degree completion, although to varying degrees. In model 2, before college measures are included, both of these variables are significant at the  $p<.001$  level. However, once college GPA in the first year – a measure strongly associated with previous academic achievement – is accounted for (model 3), their effect decreases notably, from 4.26%

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<sup>14</sup> In general, with more variables entered into an analysis, the effect size of a particular measure is expected to decrease (marginally). An increase in the effect of a particular variable can be caused by a suppressor effect, which can occur when two predictor variables have opposite relationships with the dependent variable, but a positive relationship with one another. To interpret suppressor effects, pair-wise correlation estimates have to be examined. The correlation matrix is reported in Appendix A.

( $p < .001$ ) to 1.48% ( $p < .05$ ) for admission test scores and 7.13% ( $p < .001$ ) to 4.81% ( $p < .001$ ) for high school GPA. When institutional characteristics are included in the model (model 4), the test score measure turns not significant, indicating that results from admissions tests are no longer predictive of student degree attainment when accounting for institutional context. High school GPA, in contrast, remains significant at the  $p < .001$  level across all models. Final estimates show that for every one unit increase in high school GPA, students are 4.70% ( $p < .001$ ) more likely to graduate. This generally shows the importance of the K-12 system and confirms that prior academic achievement and adequate preparation at the high school level is highly predictive of success in postsecondary education. However, it also shows that admissions test scores are less predictive of degree completion, once institutional characteristics have been accounted for.

The only other measure in the academic preparation block showing initial statistical significance is a variable, capturing whether students had 4 years of Mathematics in high school (model 2). I have inserted this measure as it is one of the minimum standards for adequate college preparation set forth by the Department of Education (National Commission on Excellence in Education, 1983). However, once college experiences and financial aid are controlled for, this variable shows no significant association with the outcome.

*Financial/ Economic Factors.* The last variable block in the pre-college phase focuses primarily on family income and wealth. Family income has also been found influential on student persistence and degree completion in the literature and significant results are also reported in this study. Results reported in Table 4.3 show that, after controlling for all student- and institutional-level variables, low income students are 8.64% ( $p < .05$ ) less likely to graduate with a bachelor's degree within six years. For lower-middle and upper-middle income students, no significant results were found, when compared to their high income peers.

Interestingly, when assessing only the influence of pre-college and transition measures (model 2), the three lower income groups are found to be not significant. Starting with model 3, which incorporates college experience and financial aid, measures for low income and lower-middle income become highly significant ( $p < .01$ ). The magnitude of the effect – low income students are 12.38% ( $p < .01$ ) less likely to graduate within six years – indicates a pronounced suppressor effect between multiple variables and income. For instance, low and lower-middle income students are more likely to receive need-based grants (federal and other sources). Examining correlations, low income student status shows a moderate to strong association with receiving federal grants ( $r = .680$ ,  $p < .01$ ), fair association with state need-based grants ( $r = .256$ ,  $p < .01$ ), and weak correlation with federal work-study ( $r = .096$ ,  $p < .01$ ). However, all these measures have an opposed association (negative correlation) with the outcome. In contrast, students from lower income backgrounds are less likely to receive help from their parents to pay for housing ( $r = -.284$ ,  $p < .01$ ), living expenses ( $r = -.081$ ,  $p < .01$ ), or tuition and fees ( $r = -.301$ ,  $p < .01$ ), all measures that are positively related to degree completion. Effects for lower-middle income students are generally similar, yet less pronounced. The suppressor effect may also be caused by college integration variables. For instance, coming from a low or lower-middle income family is negatively correlated with living on campus, social integration, and GPA in the first year of study. These measures, however, are positively correlated with degree completion in six years, thus help explain this effect. For low income students, effects decrease when controlling for institutional characteristics (models 4-6), with a minor suppressor effect between model 5 and 6. Examining the effect for lower-middle income students, data also shows a significant negative relationship in model 4. However, once institutional/peer climate and

organizational behavior measures are accounted for, estimations in the final model are not statistically significant.

A less examined relationship in the literature on persistence and degree completion is the impact of family wealth. Family wealth in this study is incorporated through a variable indicating whether students' parents owned investment greater than \$10,000. Interestingly, this measure shows significant, positive results across all six models. The magnitude of the effect actually increases in models 3, 4, and 5, indicating various suppressor effects, once college experience and institutional variables are accounted for. For instance, owning investments of more than \$10,000 is negatively correlated with receiving multiple types of financial aid, such as institutional ( $r = -.072, p < .01$ ) and state need-based grants ( $r = -.137, p < .01$ ) and work-study ( $r = -.064, p < .1$ ) inserted in model 3, all of which are positively correlated with degree completion. In the final model, data shows that students whose parents owned such investments are 4.30% ( $p < .05$ ) more likely to obtain a degree within six years. This confirms the hypothesized independent impact of family wealth on degree attainment that have also been reported in recent studies (Jez, 2010; F. T. Pfeffer, 2011).

Both of these results are important findings of this study. First, low income students, even after controlling for background, academic preparation and performance, financial aid, and all other factors at the individual and institutional level, are less likely to graduate when compared to their high income peers. Also, family wealth independently from income exerts a positive influence on degree attainment. Generally, these findings indicate support for social reproduction theory (Blau & Duncan, 1967; Bourdieu & Passeron, 1990; Sewell et al., 1969) and Bourdieu's (1977) conceptualization of various forms of capital, most importantly economic, social, and cultural capital. All else equal, low income students' habitus and cultural capital, which is less

likely to include the knowledge and skills necessary to successfully navigate the college environment, does appear to hinder persistence and subsequent completion of a baccalaureate degree. This notion is substantiated through the positive effect found for family wealth. Although not an indicator of the total household wealth, or net worth, the positive association indicates that higher parental social and cultural capital that is associated with more wealth is transferred intergenerationally. All else being equal, students with wealthier parents appear to have higher social and cultural capital and a habitus that improves their chances of persistence and degree completion.

### Transition from High School to Higher Education

During this phase, four variable blocks are entered into the analysis, educational goals, school choice and institutional commitment, pull factors, and economic/ financial influences.

*Educational Goals.* Educational aspirations and goals have been found influential on student outcomes such as persistence and degree completion (McDonough, 1997, 2005; Reed, 2011; Walpole, 2003, 2007), thus were incorporated in this study. Given the importance of educational aspiration, I have included four aspiration indicators and three variables that seek to assess students' overall educational goals, based on previous findings in the literature. When examining results, however, none of the included measures remain significant in the final model. Before college experience measures and financial aid variables were entered in model 3, students' aspirations directed at obtaining a Master's or doctorate degree exerted a positive, significant influence on degree completion. In model 3, only Master's degree aspirations remained significant with students being 4.16% ( $p < .05$ ) more likely to graduate. Given hypothesized influences and empirical evidence in other studies, the non-significance of educational aspirations may be caused by conjointly examining students across income groups.

Thus, disaggregating the data and running analyses separately by income groups may provide more nuanced results on the impact of students' goals and aspirations.

Previous work has also shown that students who strive to become community leaders, live close to family, or seek to attend higher education for financial reasons and economic advancement are more likely to persist or graduate (Astin & Oseguera, 2005a). Examining the results in this study, however, shows no significant relationship on the probability of degree completion.

*School Choice and Institutional Commitment.* In total, eight variables were included in this variable block seeking to capture the impact of the commitment (or lack thereof) towards attending a specific institution, as hypothesized in the literature (Hossler, Braxton, & Coopersmith, 1989; Nora, 2004; Nora et al., 2005; Tinto, 1987, 1993). Variables included measures for the process of school choice that are hypothesized to influence persistence and degree completion (students consulted a ranking, considered graduation rate in their choice), and an indicator for the number of schools they applied to. Further, measures for the reason individuals chose to attend their particular institution were incorporated, in conjunction with an indicator that showed whether they were accepted at their first choice institution, and students' initial plans of transfer.

Of the variables conceptualized and entered in this block, two measures showed consistent, significant results across all models. Data in Table 4.3 shows that students who chose a particular college because of its reputation are more likely to obtain a degree from this institution within six years. Estimates in the final model show that, controlling for other individual and institutional-level effects, students that considered college reputation are 4.27% ( $p < .05$ ) more likely to graduate. Choosing an institution because of its reputation is a measure



sought to capture effects of cultural capital in the college-choice process. I hypothesized that students who chose a college or university particularly for its reputation possess higher cultural capital, as highly reputable (and often selective) institutions are assumed to better serve the elite in society (Bourdieu, 1977; Bourdieu & Passeron, 1990; Karabel, 2005). Given the consistently positive association with degree completion, after accounting for other student-level and institutional-level characteristics, this is another indicator for the positive impact of cultural capital on student success.

Results for initial transfer plans, particularly the magnitude of the effect, are astounding and generally confirm the negative influence on degree attainment that has been previously found in the literature (DeAngelo et al., 2011; Oseguera & Rhee, 2009). Effects fluctuate minimally across the models, and show that students who entered a college or university already with the intention to transfer are 26.50% ( $p < .001$ ) less likely to graduate within six years. Using t-estimates to assess the strength of the effect (see Appendix B), this is the second most influential predictor of six-year degree attainment with  $t = -10.739$  ( $p < .001$ ). This underscores the importance of the institutional selection and college choice process for students, and may have far-reaching consequences for campus administrators and policy makers seeking to improve persistence and degree completion from a campus perspective. Although, the measure used in this study does not provide any information on the reason students held transfer intentions or what their particular alternative plans were (transfer to another 4-year institution, transfer to a 2-year or other institution, or leave higher education entirely), the finding in this study underscores the importance of measuring students' initial goals and commitments.

*Pull Factors and Economic/Financial Influences.* Two measures were included into the model that sought to capture influences leading to student departure, based primarily on Bean's

(1980) and Nora's (2004) conceptualization of pull factors. Of the two, only one measure showed initial significant results – whether parents expected students to work while enrolled in college. However, the effect is confined to model 2, before college experiences and financial aid variables are included in the analysis, and results show that students are 6.65% ( $p < .001$ ) less likely to graduate, before college experiences and aid measures are accounted for.

Based on St. John's et al. (1996) financial nexus theory, I also incorporated a variable that measured whether students chose the institution they attended for financial reasons or affordability in general. As conceptualized in the nexus theory, financial aspects – tuition and fees, cost of attendance, financial aid – are weighed during the college choice process and proponents of the theory point towards the importance of congruence or fit to foster persistence and degree completion, and inter-temporal linkages of economic factors. Other studies have confirmed such a relationship (Paulsen & St. John, 1997, 2002b; St. John et al., 2005). However, results in this study show no significant impact for this measure across all models. Although the measure used may not fully capture the economic considerations students weigh in their college choice, results in this study do not provide support for the assumptions of the financial nexus theory.

#### College Attendance Phase

Based on the conceptual framework guiding this study, three variable blocks were simultaneously inserted at this phase (model 3) – measures seeking to capture students' academic and social experiences, pull factors, and financial aid measures. However, in this section of the results chapter, I will focus only on non-financial aspects. Out of eleven non-financial measures examined, five were found statistically significant in the final model.

*Academic and Social Experiences.* Students' academic and social experiences during college are key elements in theories on college impact, persistence, and degree completion drawn upon for this study. Based on early conceptualizations (Bean, 1980, 1983; Tinto, 1976, 1983) and empirical studies that have been conducted over the past decades, this study incorporated eleven measures for the social and academic integration dimension. In particular, I sought to estimate the effects from students' living arrangements, formal academic interactions, social integration and volunteering, major, and academic performance in the first year.

Consistently, students' living arrangements have been found to be influential on multiple measures of student success (Adelman, 1999, 2006; Astin, 1993; Tinto, 1993). Examining the effect on six-year degree completion in this study, results show that living on campus is also one of the strongest predictors in this analysis. Effects are consistent across all models, and students who live on campus, opposed to off-campus housing, are 16.49% ( $p < .001$ ) more likely to graduate with a bachelor's degree. This is the second largest effect for a dichotomous predictor in the analysis (the first, being intentions to transfer). This finding highlights the immensely important role that living on-campus plays in integrating students into collegiate life. It also indicates that institutions which are primarily attended by commuting students and cannot provide on-campus housing opportunities, have to consider alternative ways to improve student integration and, subsequently, persistence and degree completion.

Aspects of students' academic integration were examined through a composite academic integration index, derived from multiple survey items, and measures on study behavior in the first year. However, none of the four predictors hypothesized to influence student degree attainment showed significant results in the estimation. This finding is in accordance with

reviews in the literature that found little to no support for the impact of academic integration on student outcomes (Braxton & Lee, 2005; Braxton et al., 1997).

Aspects of students' social integration into campus and college life were also examined through a composite measure and the time students spent volunteering during their first year in college. Results show that, in contrast to academic integration, social integration positively predicts degree attainment. Results are relatively stable across the models (marginally increasing), and estimations in the final model show that for every 1/10<sup>th</sup> increase in the integration index, students are 0.62% ( $p < .01$ ) more likely to graduate within six years. This finding is consistent with the literature (Braxton & Lee, 2005; Braxton et al., 1997; Pascarella & Terenzini, 2005) and underscores the importance of considering factors such as peer interaction, informal faculty interaction, and validation. It also has possible implications for campus administrators who should consider more comprehensive approaches to integrate students into the campus environment and general aspects of campus and peer climate.

Student volunteering, also hypothesized to positively influence the outcome measure (Astin, 1993, 1999), failed to produce significant results in all models examined. However, the measure used from the BPS dataset did not specify whether volunteering was confined to campus activities. Thus, a more nuanced examination may produce different results.

In regard to students' chosen academic discipline, this study examined the effect of a dichotomous measure indicating whether students had declared a major in their first year, based on previous work (Titus, 2004; 2006c). I also examined a work-related measure that captures whether the work that students pursued (on or off campus) was related to their chosen academic major. However, both predictors consistently failed to produce significant results, generally

indicating that first-year major choice (or lack thereof) does not seem to influence one's chances to complete a degree within six years.

Academic performance, often expressed through students' grade point average, is another key measure in student persistence and degree attainment. Frequently, it is also conceived as a measure for academic integration into college (Tinto, 1993). Although limited to a single institution, previous research on the causal effects of various forms of financial aid also found college GPA highly predictive of student persistence and interrelated with financial aid (Herzog, 2008), thus first year college GPA was incorporated into this study. Results in Table 4.3 underscore the importance of this positive predictor of degree attainment and show that, in the final model, for every one-tenth increase in college GPA, students are 2.17% ( $p < .001$ ) more likely to graduate. Thus, for a full digit increase in GPA (measured on a 4-point scale), students are 21.70% more likely to obtain a bachelor's degree within six years. Based on the t-statistic (see Appendix B), college GPA in the first year is the strongest predictor of degree completion. This finding substantiates the importance of academic performance during the first year – a time students get acquainted with their new environment – for long-term college success. Assessing one's own potential to succeed and, subsequently, the weighing of the likelihood to obtain a bachelor's degree at the institution attended appears to be the single most influential determinant of overall degree attainment. Thus, supporting students in this evaluation process may provide an avenue for institutions to increase persistence and completion rates.

Taking remedial courses has also been found to be influential when examining student success in conjunction with financial aid (Herzog, 2008). However, results in this study show no significant relationship on students' probability of degree completion.

*Pull Factors.* Two pull factors were considered to be influential for students while in college – time spent working and distance the college is away from home. Results show a consistent, negative impact for students working more than 20 hours (which excludes work-study hours, as these are considered financial aid). Consistent with findings in the literature (Cuccaro-Alamin & Choy, 1998; Titus, 2006b), students that spent more than 20 hours dedicated to work are significantly less likely to graduate. With a minor suppressor effect in model 6, final results show that students who worked this many hours while enrolled full-time in college are 10.20% ( $p < .01$ ) less likely to obtain a bachelor's degree, compared to students who did not work. Although fewer work hours also show a negative association in the estimated parameters, results were not significant. These results show the detrimental effects of having the obligation, or desire, to work more than 20 hours a week and underscore the importance of having enough time to dedicate to one's education and collegiate life.

Another interesting finding is the result for distance from home. Also a consistently negative predictor, results show that for every percent increase in the distance between the college attended and a student's home, individuals are 2.50% ( $p < .001$ ) less likely to obtain a degree. Although the focus of this study is whether students graduated from their initial institution of enrollment, and results do not reveal whether students transferred to another institution and graduated within the same timeframe, this is an important finding, particularly from an institutional perspective. Further research is needed to determine specific effects and possible causes. For instance, students that move farther away from home to attend college could generally be more mobile, thus more likely to transfer and graduate from another institution. This finding would be less problematic from a systemic perspective, but it would have implications for campus administrators seeking to improve persistence and degree completion. Alternatively,

these students might have more difficulty integrating into college, as they may be torn between the college and home environment, thus make them less likely to remain enrolled until graduation.

#### Synopsis – Influential Predictors at the Student-Level

Table 4.4 displays a summary of significant student-level (level 1) predictors of six-year degree completion. Results are sorted by absolute t-values to emphasize the strength of the predictors. As discussed in the previous section, students' GPA in the first year of college attendance is the strongest predictor of degree attainment, underscoring the importance of academic performance in individuals' decisions to stay in or leave college. Results show, for every full GPA unit-increase, students are 21.70% more likely to graduate with a bachelor's degree within six years ( $t=13.744$ ). Initial plan to transfer is the largest negative predictor of student degree attainment, lowering one's likelihood to obtain a degree by 26.50% ( $t= -10.739$ ). Living on campus and previous academic performance, as measured through high school GPA, are found to positively predict degree completion, increasing students' chances by 16.49% ( $t=7.066$ ) and 4.70% ( $t=4.331$ ), respectively.

Examining results by their respective t-values shows that distance from home is a strong negative predictor for the outcome measure, lowering students' chances of degree completion by 2.50% ( $t= -3.683$ ) for every one percent increase in distance between home and college attended. Age, as measured by an indicator whether students are 19 years and older, also negatively influences degree completion and reduces individual likelihood by -5.63% ( $t= -3.353$ ). The seventh largest predictor by effect size is the degree to which students are socially integrated into campus life ( $t=3.263$ ), an important measure with potential policy implication. Other significant variables found influential in predicting degree attainment, sorted by strength are: 20 or more

**Table 4.4:** Summary Significant Student-Level Predictors of Degree Completion, by Strength (t-Values)

Variable	C	SE	t	p	d-P
GPA in first year (1/10)	0.091	0.007	13.744	0.000 ***	2.17
Plan to transfer	-1.086	0.101	-10.739	0.000 ***	-26.50
Live on campus	0.678	0.096	7.066	0.000 ***	16.49
High school GPA	0.200	0.046	4.331	0.000 ***	4.70
Distance institution from home (log)	-0.103	0.028	-3.683	0.000 ***	-2.50
Age: 19 years or older	-0.233	0.069	-3.353	0.001 **	-5.63
Social integration index	0.026	0.008	3.263	0.001 **	0.62
20+ hours working (excl. work-study)	-0.418	0.136	-3.073	0.002 **	-10.20
Gender: Female	0.209	0.077	2.698	0.007 **	5.03
Parents own investment >\$10,000	0.180	0.076	2.378	0.017 *	4.30
Low income (<\$32,000)	-0.362	0.158	-2.288	0.022 *	-8.64
Chose institution b/c of reputation	0.177	0.078	2.284	0.022 *	4.27
Single parent	-0.567	0.249	-2.279	0.023 *	-13.97

Note: Results reported from final model (model 6) and exclude financial aid predictors. Values sorted by absolute t-value.

hours working ( $t = -3.073$ ), being female ( $t = 2.698$ ), parental wealth in form of investments greater than \$10,000 ( $t = 2.378$ ), low income family background ( $t = -2.288$ ), students' choice of an institution due to reputation ( $t = 2.284$ ), and coming from a single parent household ( $t = -2.279$ ).

### *Hypothesis II: Institutional Influence on Degree Attainment*

The second hypothesis addressed the following research questions: To what extent does institutional context influence student degree attainment? What structural-demographic characteristics impact the average students' likelihood of degree completion, after student-level effects have been accounted for? How do institutional normative context, particularly institutional and peer climate, affect the outcome measure? Does organizational behavior, specifically institutional revenue and expenditure patterns, affect students' chances of bachelor's degree attainment within six years? At the institutional level, 26 predictors have been tested in



the empirical model. Final estimates show that five predictors remained significant in the final model.

### Structural-Demographic Characteristics

Based on previous research, four main institutional characteristics were tested in this variable block: institutional control, selectivity, HBCU, and HSI status. Results in Table 4.3 show that attending a private institution does not influence the average likelihood of degree attainment. Although positive effects for private institutions have been documented in the literature on four-year degree attainment, less influence has been documented on six-year rates (Oseguera & Rhee, 2009; Titus, 2004, 2006b). Similarly, this study does not find private institutions to have a significant influence on students' average likelihood of degree completion.

Institutional selectivity, in contrast, is found to significantly impact student degree attainment. Estimates in model 4 show, individuals attending high selectivity institutions are 6.89% ( $p < .01$ ) more likely to graduate within six years, whereas their peers enrolled in low selectivity colleges and universities have almost 13 percent ( $-12.86$ ,  $p < .001$ ) lower chances to obtain a degree. However, once institutional and peer climate measures are included in model 5, high selectivity no longer remains statistically significant. Examining correlations, high selectivity status is moderately and negatively associated with the share of part-time students ( $r = -.296$ ;  $p < .001$ ), share of students receiving federal grants ( $r = -.318$ ;  $p < .001$ ), and average student transfer inclination ( $r = -.289$ ;  $p < .000$ ), all of which are also negatively associated with the outcome measure. Further, high selectivity is positively correlated with average student income ( $.259$ ;  $p < .000$ ), which is also positively associated with degree completion. Once these measures have been accounted for in the model, high selectivity status no longer remains significant. Low selectivity status, in contrast, shows statistical significance across all models. Although the effect

is also notably reduced in model 5, students that attend a low selectivity college or university are 7.41% ( $p < .05$ ) less likely to obtain a bachelor's degree within six years. Generally, this confirms scholarly work that finds selectivity (in general) influential on students' likelihood of degree completion (Oseguera & Rhee, 2009; Titus, 2004). Results reported in this study, however, paint a more nuanced picture of institutional influence. When compared to moderately selective institutions, high selectivity colleges and universities do not increase chances to graduate, but low selectivity institutions significantly lower students' chances of degree attainment.

Remaining measures in the structural-demographic variable block did not produce significant results in the analysis. Thus, students attending institutions that are classified as other selectivity (open admission and for-profit colleges), Historically Black Colleges and Universities, and Hispanic Serving Institutions have no higher or lower chance of degree completion, after controlling for student-level and institutional-level characteristics.

#### Institutional and Peer Climate

In model 5, twelve measures seeking to capture the effects of institutional and peer climate are incorporated, of which three measures were found significant. Interestingly, the share of minority students attending a particular institution exerts the only positive impact on the average likelihood of degree attainment. Results in the final model show, for every one percent increase in the share of minority students on campus, average chances of degree completion increase by .14% ( $p < .05$ ). This finding confirms the positive influence a more diverse learning environment can have on student success (Laden, Milem, & Crownson, 2000; Rhee, 2008; Titus, 2006b). In light of the continued discussion on the benefits of diversity on student learning and outcomes (Chang, 1999; Hurtado et al., 2003; S. Hurtado, J. Milem, A. Clayton-Pedersen, & W. Allen, 1999a) and renewed discussion on affirmative action policies in higher education (Allen,

2005; Allen & Solorzano, 2000), this provides further evidence on the overall benefits of more inclusive college and university environments.

Assessing the effects of remaining variables entered in this block, results show that both the share of students that are enrolled part-time and the share of students receiving federal need-based grants on campus negatively impact student degree attainment. Results remain significant in the final model, showing that for every percent increase in the share of part-time students on campus, the average likelihood of degree completion decreases by .26% ( $p < .01$ ). The effect for the share of students receiving federal grants on campus is even larger, as with every one percent increase in the share of recipients the average probability to obtain a bachelor's degree decreases by .41% ( $p < .001$ ). Although not necessarily surprising conceptually, these results are interesting. After controlling for financial measures at the student level, such as family income and wealth, and financial aid, the higher the share of students receiving federal grant aid, the lower the average likelihood of degree completion. This indicates that the lower aggregated social and cultural capital that results from increased low income student attendance creates a contextualized negative influence on degree attainment, in addition to student-level characteristics. Similarly, increased part-time student attendance appears to negatively influence campus and peer climate, so that average chances of degree completion for students attending such a college or university are adversely affected. It could be argued that these effects might be influenced by the financial strength of an institution. However, negative effects remain significant even after revenue and expenditure measures are incorporated in the final model.

Institutional size has been found influential on student success in previous research (Berger & Milem, 2000; Blau, 1994) and I hypothesized a positive association with the outcome

measure. However, results show no significant difference for this variable. Also, the share of students receiving state/local grants, institutional grants, or loans is not statistically significant.

Based on Berger and Milem's (2000) conceptualization and subsequent work (Oseguera & Rhee, 2009; Titus, 2004, 2006b), I included "human aggregates" (aggregated student-level measures) in the model that were assumed to impact the outcome measure. Specifically, I hypothesized that aggregated income, academic and social integration, and hours spent volunteering exert a positive influence on students' degree attainment. Aggregate transfer inclination has been assumed to influence degree completion negatively, based on Oseguera and Rhee's (2009) study. However, none of the aggregated peer climate variables show significant results in the model. This indicates that, once campus structural diversity and the share of part-time and low-income students are accounted for, student aggregates do not significantly influence students' average likelihood of degree completion.

#### Organizational Behavior

The last variable block at the institutional level examines the influence of institutional prioritization in revenue generation and expenditures, based on resource dependency theory and previous conceptualization in the literature (Titus, 2004, 2006c). Previous studies have found that the share of revenues generated from tuition and fees, positively influences persistence. In this study, I examined the effect of the share of tuition and fees in core revenues. Additionally, I hypothesized that price of attendance and institutional discount rate, two measures under direct control of the institution to impact revenue streams, influence the likelihood of degree attainment. Results in Table 4.3 show, however, that none of the revenue measures are statistically significant. This contradicts findings in Titus (2006c) who found a strong positive effect on 4-year persistence.

In regard to aspects of institutional expenditures, five measures for various institutional strategies have been included in the study. Also based on Titus's (2006c) work on persistence, I included a measure capturing the amount institutions spent on core expenditures per full-time equivalent student. I also included measures intended to examine whether institutional priorities on teaching (share of full-time faculty), student services, academic support, and administration influence student degree attainment. For all but one of these measures I hypothesized a positive association with the outcome. Assuming limited resources, I predicted a negative influence for institutional focus on administrative functions. However, of the five measures included in this variable block, only one produced significant results.

Surprisingly, after controlling for all other student-level and institutional-level characteristics, the share of faculty that is full-time is found to negatively influence students' average likelihood of degree completion. Results show that for every percent increase in the share of faculty that is full-time, the likelihood of obtaining a bachelor's degree decreases by .14% ( $p < .01$ ). Although not large in effect size, the results are statistically significant and somewhat counterintuitive, particularly in light of documented negative effects of increased contingent faculty (Baldwin & Chronister, 2001; Benjamin, 2002). Thus, more research needs to examine the particular effects and potential causes of increased part-time and full-time faculty on student persistence and degree completion.

#### Overall Model Fit

Several fit statistics can be used to assess overall model fit. In the bottom section, Table 4.3 displays estimates for the loglikelihood, AIC, and BIC statistics. Generally, as variable blocks are sequentially entered, a good model fit is indicated by increasing values for the loglikelihood and declining estimates for AIC and BIC. Examining the loglikelihood, values

increase from -3779.25 in model 1 (see Appendix B) to -3057.53 in the final model, with largest reductions witnessed when college experience and financial aid variables are entered (model 3; increase = 281.02), and after accounting for college normative context and climate (model 5; increase = 212.82). Overall, AIC and BIC values confirm an increase in model fit upon entering additional variable block, as indicated by consistent reductions in their estimated values across the models.

Good model fit is also indicated through the variance component estimation. Values decline from .201 ( $p < .001$ ) in model 2 to .098 ( $p < .05$ ), showing that the remaining variance after all student-level and institutional-level variables have been entered is only significant at the .05 significance level.

Utilizing the intra-class correlation formula introduced in Chapter 4 and variance estimations for the unconditional model (no predictors at the student or institutional level), ICC is calculated at .211 (variance component 0.881;  $p < .001$ ). This means, 21.1% of the variance in student degree completion is between schools. Assessing variance components estimated for the six models, results show that the overall variance explained consistently increases across the models. Compared to the unconditional model, the final model explains about 88.9% of the variance at level 2, an excellent model fit. Using the conditional intra-class correlation and variance component after all student variables have been accounted for in model 3, variance explained at the institutional level increases from 9.2% in model 4, to 29.5% when institutional and peer measures are entered in model 5, and 43.3% when revenue and expenditure patterns are incorporated in the final model.

## Propensity Score Matched, HGLM Results on Financial Aid Impact

This section presents estimation results on the effects of financial aid on six-year degree attainment, using a propensity score, multilevel analysis that incorporates adjustments for complex survey designs. In the following section, the quality of the propensity scoring algorithm in balancing the dataset will be assessed before estimation results on financial aid measures will be presented.

### *Propensity Score Estimation Results*

In the propensity score estimation, two separate analyses were carried out using logistic regressions. Results from these analyses and obtained probabilities were used to create the estimation weights (ATE and ATT) used in the main HGLM analyses.

The estimation and evaluation of the quality of the propensity score involved multiple steps. For the estimation STATA's *pscore* command was used, which employs a highly rigorous variable balance test within estimated strata and removes outlying cases. After the final model was fit for the estimation, the *ptest* procedure was carried to test for variable imbalance before and after reweighting the dataset. Results are presented in Table 4.6 and show a significant reduction in variable bias for all three estimations, indicated by the reduction in mean and median biases. During the estimation, cases too far outside the common support area were removed to improve balance in the data<sup>15</sup>. The common support area for treated and non-treated cases was also inspected visually (see Figures C1-C3, Appendix C).

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<sup>15</sup> During the estimation, cases that contained missing values were listwise deleted, resulting in N=6,430 cases used for the propensity score estimations. After *pscore* estimations, balance tests, and common support area analyses, N=6,419 cases remained in the grants-only treatment (8 strata), N=6,395 in the grants and loans treatment (7 strata), and N=6,332 cases in the treatment containing grants, loans, and work-study (6 strata).

**Table 4.5:** Comparison of Conditional Variable Means Before and After Adjusting with Propensity Score Weights (Summary)

	(1) Grants only								(2) Grants & Loans (ATE, PS Weight)				(3) Grants, Loans, FWS (ATE, PS Weight)			
	Regular Weight (WTA000)				Rewighted (ATE, PS Weight)				Not Treated	Treated	T	p	Not Treated	Treated	T	p
	Not Treated	Treated	T	p	Not Treated	Treated	T	p								
Age: 19 years or older	.34	.34	.35	.726	.34	.32	1.12	.263	.34	.32	1.42	.156	.34	.35	-1.25	.212
Gender: Female	.55	.59	-3.02	.003 **	.56	.55	1.06	.287	.56	.57	-.38	.702	.56	.55	.90	.366
Caucasian (Ref.)	.71	.68	2.61	.009 **	.72	.71	.72	.474	.71	.71	.05	.961	.71	.72	-.76	.447
African American	.10	.06	5.01	.000 ***	.08	.09	-.87	.386	.08	.09	-.09	.927	.09	.08	.46	.643
Latino/a or Hispanic	.09	.14	-6.23	.000 ***	.09	.09	.48	.633	.09	.09	.24	.813	.09	.09	.43	.667
Asian	.05	.08	-3.72	.000 ***	.06	.06	-.43	.668	.06	.06	-.39	.694	.06	.06	-.10	.924
Other Race/Ethnicity	.05	.05	.70	.483	.05	.06	-.50	.617	.05	.05	.13	.898	.05	.05	.52	.605
English is primary language	.91	.86	6.95	.000 ***	.91	.91	-.01	.993	.91	.90	.79	.431	.91	.91	-.54	.592
Low income	.19	.23	-2.94	.003 **	.19	.19	-.23	.815	.19	.19	-.32	.751	.19	.19	.24	.811
Lower-middle income	.25	.21	3.59	.000 ***	.24	.23	.91	.363	.24	.24	-.15	.879	.24	.24	.06	.956
Upper-middle income	.27	.22	4.01	.000 ***	.26	.26	.21	.832	.26	.27	-.63	.526	.26	.26	-.24	.809
High income	.29	.35	-4.56	.000 ***	.31	.32	-.83	.407	.31	.30	1.02	.309	.31	.31	-.03	.980
Parents own investment >\$10,000	.30	.36	-4.91	.000 ***	.32	.32	-.50	.619	.32	.32	.03	.979	.32	.34	-1.77	.077
<i>Parental Education</i>																
High school or less	.20	.17	2.63	.008 **	.18	.18	.17	.862	.18	.19	-.60	.550	.18	.18	.45	.653
Associate degree or some college	.24	.18	4.63	.000 ***	.22	.21	.73	.463	.22	.22	.02	.986	.22	.22	.11	.914
Bachelor's degree	.28	.31	-2.17	.030 *	.29	.28	1.40	.163	.29	.29	.20	.839	.29	.28	1.07	.284
Master's degree or higher	.28	.34	-4.32	.000 ***	.31	.33	-2.15	.032 *	.30	.30	.29	.771	.30	.32	-1.52	.129
<i>Parent Family Status</i>																
Married	.74	.79	-4.34	.000 ***	.75	.75	-.03	.979	.75	.76	-.19	.847	.75	.74	.77	.440
Single parent	.04	.04	1.07	.286	.04	.03	1.55	.120	.04	.04	.44	.658	.04	.04	.88	.379
Divorced/separated/widowed	.22	.17	4.10	.000 ***	.21	.21	-.68	.499	.21	.21	.00	.997	.21	.22	-1.23	.220
Sibling in college	.30	.31	-.53	.595	.31	.32	-.85	.393	.31	.30	1.11	.267	.31	.32	-1.21	.225
Admission test scores (ACT or SAT)	10.61	11.19	-10.76	.000 ***	10.76	10.74	.41	.681	10.75	10.76	-.08	.939	10.76	10.81	-1.20	.231
High school GPA	4.16	4.44	-10.04	.000 ***	4.26	4.22	1.37	.171	4.26	4.26	.07	.947	4.26	4.26	-.12	.901
Private high school attended	.15	.15	-.06	.956	.15	.17	-1.38	.169	.15	.15	.18	.860	.15	.13	1.98	.050
4 Years of English in high school	.85	.88	-2.40	.016 *	.86	.86	.37	.708	.86	.87	-.08	.934	.86	.88	-1.81	.071
4 Years of Math in high school	.77	.82	-4.63	.000 ***	.79	.79	-.27	.788	.79	.79	.07	.944	.79	.77	1.83	.067
<i>Importance</i>																
Be a community leader	.47	.47	-.48	.628	.47	.47	.16	.873	.47	.48	-.46	.646	.47	.48	-.57	.569
Be financially well off	.74	.70	3.10	.002 **	.73	.72	.43	.668	.73	.73	-.18	.856	.73	.71	1.55	.120
Live close to relatives	.41	.42	-.79	.430	.41	.38	1.98	.052	.41	.40	.58	.565	.41	.41	.21	.830
<i>Degree Aspirations</i>																
Bachelor's degree aspiration	.24	.21	2.05	.041 *	.23	.24	-.71	.479	.23	.22	.51	.607	.23	.20	2.58	.010 *
Master's degree aspiration	.49	.46	1.83	.067	.48	.48	.47	.641	.48	.49	-.38	.701	.48	.52	-2.87	.004 **
Doctorate aspiration	.19	.22	-2.83	.005 **	.20	.19	.55	.583	.20	.20	-.15	.883	.20	.21	-.99	.321
Professional degree aspiration	.08	.10	-2.30	.022 *	.09	.09	-.52	.601	.09	.09	.12	.902	.09	.07	2.42	.016 *
Plan to transfer	.14	.11	2.74	.006 **	.13	.14	-.41	.679	.13	.13	-.24	.814	.13	.13	.56	.572
Live on campus	.71	.61	7.28	.000 ***	.70	.70	-.40	.691	.70	.71	-.67	.504	.70	.72	-.76	.451

\* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

Note: Variables reported are used in the estimation of propensity scores. Interaction terms are omitted.



**Table 4.6: Bias Reduction Analyses for Propensity Score Estimation, by Aid Package**

Summary Statistics Bias Analysis for Logistic Regression - Grants in Aid Package (Treatment 1)

Before Matching					After Matching				
Percentiles	Smallest	Largest			Percentiles	Smallest	Largest		
1%	0.281	0.281			1%	0.042	0.042		
5%	0.301	0.301			5%	0.169	0.169		
10%	1.116	0.906	Obs	31	10%	0.253	0.188	Obs	31
25%	3.904	1.116	Sum of Wgt.	31	25%	1.077	0.253	Sum of Wgt.	31
50%	7.494		Mean	9.233	50%	2.122		Mean	2.213
			Std. Dev.	7.338				Std. Dev.	1.614
75%	14.137	16.808			75%	3.146	4.722		
90%	16.808	20.749	Variance	53.844	90%	4.722	4.828	Variance	2.606
95%	24.586	24.586	Skewness	1.123	95%	4.863	4.863	Skewness	0.837
99%	31.094	31.094	Kurtosis	4.020	99%	6.786	6.786	Kurtosis	3.461
Sample		Pseudo R2	LR chi2	p>chi2	Mean Bias		Median Bias		
Raw Data		0.053	372.85	0.000	9.2		7.5		
Matched Data		0.041	78.3	0.000	2.2		2.1		

Summary Statistics Bias Analysis for Logistic Regression - Grants and Loans in Aid Package (Treatment 2)

Before Matching					After Matching				
Percentiles	Smallest	Largest			Percentiles	Smallest	Largest		
1%	0.234	0.234			1%	0.035	0.035		
5%	0.262	0.262			5%	0.141	0.141		
10%	0.950	0.382	Obs	31	10%	0.291	0.259	Obs	31
25%	2.097	0.950	Sum of Wgt.	31	25%	0.733	0.291	Sum of Wgt.	31
50%	7.766		Mean	9.795	50%	2.289		Mean	2.454
			Std. Dev.	8.890				Std. Dev.	1.940
75%	15.535	23.446			75%	3.344	5.077		
90%	23.446	23.875	Variance	79.030	90%	5.077	5.703	Variance	3.763
95%	26.708	26.708	Skewness	0.755	95%	6.769	6.769	Skewness	0.794
99%	30.707	30.707	Kurtosis	2.451	99%	7.161	7.161	Kurtosis	2.932
Sample		Pseudo R2	LR chi2	p>chi2	Mean Bias		Median Bias		
Raw Data		0.045	295.85	0.000	9.8		7.8		
Matched Data		0.047	70.7	0.000	2.5		2.3		

Summary Statistics Bias Analysis for Logistic Regression - Grants, Loans, and Work-Study in Aid Package (Treatment 3)

Before Matching					After Matching				
Percentiles	Smallest	Largest			Percentiles	Smallest	Largest		
1%	0.239	0.239			1%	0.046	0.046		
5%	0.972	0.972			5%	0.127	0.127		
10%	1.413	1.312	Obs	31	10%	0.241	0.132	Obs	31
25%	2.008	1.413	Sum of Wgt.	31	25%	0.731	0.241	Sum of Wgt.	31
50%	7.433		Mean	9.688	50%	1.588		Mean	2.044
			Std. Dev.	9.710				Std. Dev.	1.658
75%	14.549	20.040			75%	3.476	4.648		
90%	20.040	27.414	Variance	94.292	90%	4.648	4.761	Variance	2.748
95%	28.272	28.272	Skewness	1.363	95%	5.238	5.238	Skewness	0.636
99%	39.976	39.976	Kurtosis	4.440	99%	5.338	5.338	Kurtosis	2.148
Sample		Pseudo R2	LR chi2	p>chi2	Mean Bias		Median Bias		
Raw Data		0.091	479.5	0.000	9.7		7.4		
Matched Data		0.054	43.49	0.053	2.0		1.6		

After creating final propensity score weights, a series of t-tests was carried out to compare conditional variable means before and after adjustment. For this, variable means were compared for all covariates in each of the three financial aid package estimations. Detailed results for t-tests between raw and propensity-score-reweighted data are presented in detail in Appendix C (see Tables C1-3, Appendix C). Table 4.5 provides a summary of these assessments.

Table 4.5 shows that in the original (WTA000-weighted) data, 27 out of 35 conditional variables displayed significant differences. After reweighting the data with the ATE weight for the grants-only financial aid package (treatment 1), imbalance was significantly reduced, as only one variable (parents hold a master's degree) showed a significant difference between students who received this form of aid and students who did not. Estimation bias reduction was even better for students that received grants and loans (treatment 2). Comparing conditional variable means before and after adjustment shows excellent balance within the data, as no variable was significantly different when using the ATE weight. Only in the propensity score estimation for students that received grants, loans, and work-study (treatment 3), three variables (students' degree aspirations) displayed slight imbalances after reweighting. However, overall bias was significantly reduced in all three estimations and balance reached 96.2% of the conditional variables used in the model.

In addition to the balance test for the reweighted data, summary statistics for bias estimations before and after the propensity score estimation are presented in Table 4.6.

### *Hypothesis III: Financial Aid Impact on Degree Attainment*

The third hypothesis addressed the following research questions: To what degree does financial aid affect student degree completion? Do effects vary for different financial aid tools, such as grant aid, subsidized and unsubsidized loans, and federal work-study? Does financial aid

differentially impact students from lower income backgrounds when compared to their high income peers?

Tables 4.7 through 4.9 list the estimated influence of various forms of financial aid on six-year degree attainment. The tables display effects for students receiving different aid packages – grants only, grants and loans, and grants, loans, and work-study – and provide estimation results for all students and by income groups. Parameter estimates are presented in a way that decomposes the treatment effect so that potential selection bias associated with the receipt of aid can be assessed. For this, results are presented in the ‘unmatched’ column for HGLM estimations without matching students on the propensity of aid support. The second main column in Table 4.7 through 4.9 displays estimates for the average treatment effect (ATE), which controls for selection bias via propensity score estimation and reweighting techniques. In the third main column, parameters for the average treatment effect for the treated (ATT) are shown, a counterfactual frequently used to gauge the effects of educational policies.

ATE and ATT<sup>16</sup> parameters are estimated using a survey-adjusted HGLM estimation model. The model includes controls for student and institutional level characteristics, shown in the final model (Model 6) in Table 4.3. In addition to pre-treatment measures that have been used in the estimation of the propensity scores, the estimation incorporates all transition and college experience variables, as well as institutional structural-demographic, context/climate, and organizational behavior measures. In the following results are discussed by the type of financial aid treatment (aid package) that students received.

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<sup>16</sup> ATT is only estimated for all-student analyses for the three aid treatments in this study. Due to insufficient sample size in the HGLM when examining ATT by income group, particularly for the low and lower-middle income groups, only ATE results are reported.

Overall, results presented and discussed in the following section show that financial aid does have an impact on student degree attainment. Selection bias is reduced, when comparing ATE with unmatched estimation results. As hypothesized, disaggregating aid reveals remarkable differences in aid effect by income groups. For instance, for low income students, need-based grants from all sources (federal, state, and institutional) are found to positively influence degree completion. However, for low income students that received loans in their aid package, unsubsidized (Stafford) loans significantly reduce chances to obtain a degree. For lower-middle and upper-middle income students, institutional grant aid (both need-based and merit-based) is mostly found to increase the likelihood of degree attainment. In contrast, none of the financial aid measures included in this analysis significantly impact college completion for high income students.

#### Grants-only Financial Aid Package (Treatment 1)

Results in Table 4.7 for the average treatment effect suggest that, for all students receiving a grant-only aid package, institutional need-based aid and merit aid increase the likelihood of degree completion, whereas other forms of financial aid are not found to be significant. For every \$1,000 increase in this form of aid, a students' chance of degree attainment increases by 0.67% ( $p < .05$ ) for need-based and almost one percent (0.93%,  $p < .01$ ) for merit aid. Comparing ATE results to parameter estimations in the unmatched sample, results for institutional aid are overestimated for need-based grants and underestimated for merit aid. Also, the parameter estimate for federal need-based grants, such as PELL, SEOG are only marginally not significant in the unmatched estimation, revealing further estimation bias. The ATT is often assessed to examine efficacy of educational policies, thus is also estimated in this study. Reviewing results in Table 4.7, however, shows that none of the financial aid measures for

**Table 4.7: HGLM Parameter Estimates Financial Aid, Grants in Aid Package (Treatment 1)**

All Students	Unmatched N=6430				Average Treatment Effect (ATE) N=6019				Avg. Treatm. Effect f. Treated (ATT) <sup>1</sup> N=6030			
	C	SE	p	d-P	C	SE	p	d-P	C	SE	p	d-P
	Fed. need-based grants (\$1,000)	0.067	0.035	0.053	1.60	0.055	0.038	0.150		0.197	0.146	0.179
State need-based grants (\$1,000)	-0.012	0.036	0.747		0.006	0.040	0.872		-0.106	0.146	0.471	
Instit. need-based grants (\$1,000)	0.032	0.010	0.002 **	0.77	0.028	0.013	0.027 *	0.67	0.004	0.079	0.962	
State merit grants (\$1,000)	0.017	0.042	0.684		0.018	0.055	0.745		0.006	0.144	0.964	
Instit. merit grants (\$1,000)	0.024	0.012	0.042 *	0.58	0.039	0.013	0.002 **	0.93	0.056	0.046	0.222	
Outside grants (\$1,000)	0.045	0.024	0.066		0.042	0.029	0.154		0.067	0.066	0.306	
Help from parents - housing	-0.141	0.098	0.149		-0.167	0.115	0.147		0.421	0.358	0.240	
Help from parents - living exp.	0.085	0.078	0.278		0.115	0.086	0.179		-0.354	0.315	0.261	
Help from parents - tuition & fees	0.101	0.099	0.306		0.015	0.110	0.893		0.083	0.360	0.818	
Unmet need (\$1,000)	0.015	0.008	0.050	0.36	0.011	0.009	0.219		-0.019	0.032	0.541	

Low Income (<\$32,000)	Unmatched N=1056				Average Treatment Effect (ATE) N=1056			
	C	SE	p	d-P	C	SE	p	d-P
	Fed. need-based grants (\$1,000)	0.117	0.052	0.025 *	2.78	0.119	0.058	0.041 *
State need-based grants (\$1,000)	0.091	0.045	0.042 *	2.17	0.101	0.048	0.033 *	2.40
Instit. need-based grants (\$1,000)	0.074	0.023	0.001 **	1.77	0.068	0.025	0.006 **	1.62
State merit grants (\$1,000)	0.074	0.091	0.420		0.036	0.102	0.723	
Instit. merit grants (\$1,000)	0.009	0.034	0.790		0.005	0.037	0.884	
Outside grants (\$1,000)	0.003	0.045	0.954		-0.003	0.048	0.947	
Help from parents - housing	0.138	0.224	0.537		-0.093	0.231	0.687	
Help from parents - living exp.	0.234	0.171	0.172		0.244	0.181	0.178	
Help from parents - tuition & fees	0.083	0.204	0.684		0.116	0.230	0.614	
Unmet need (\$1,000)	0.026	0.012	0.034 *	0.62	0.023	0.014	0.109	

Lower-Middle Income (\$32,000-\$59,999)	Unmatched N=1375				Average Treatment Effect (ATE) N=1373			
	C	SE	p	d-P	C	SE	p	d-P
	Fed. need-based grants (\$1,000)	-0.037	0.056	0.506		-0.074	0.062	0.227
State need-based grants (\$1,000)	-0.042	0.053	0.425		-0.018	0.057	0.752	
Instit. need-based grants (\$1,000)	0.071	0.022	0.001 **	1.69	0.080	0.024	0.001 **	1.91
State merit grants (\$1,000)	0.008	0.079	0.917		-0.036	0.081	0.660	
Instit. merit grants (\$1,000)	0.049	0.027	0.068		0.046	0.030	0.123	
Outside grants (\$1,000)	0.048	0.058	0.407		0.038	0.063	0.544	
Help from parents - housing	-0.370	0.216	0.087		-0.207	0.229	0.365	
Help from parents - living exp.	0.008	0.168	0.962		-0.049	0.178	0.784	
Help from parents - tuition & fees	0.175	0.170	0.303		0.060	0.172	0.729	
Unmet need (\$1,000)	0.023	0.015	0.123		0.016	0.017	0.328	

Upper-Middle Income (\$60,000-\$91,999)	Unmatched N=1603				Average Treatment Effect (ATE) N=1598			
	C	SE	p	d-P	C	SE	p	d-P
	Fed. need-based grants (\$1,000)	-0.043	0.150	0.773		0.016	0.163	0.924
State need-based grants (\$1,000)	0.036	0.071	0.608		0.004	0.070	0.959	
Instit. need-based grants (\$1,000)	0.036	0.018	0.049 *	0.86	0.047	0.021	0.026 *	1.12
State merit grants (\$1,000)	0.080	0.061	0.192		0.116	0.083	0.161	
Instit. merit grants (\$1,000)	0.058	0.023	0.013 *	1.39	0.071	0.026	0.006 **	1.69
Outside grants (\$1,000)	0.113	0.059	0.056	2.68	0.095	0.069	0.171	
Help from parents - housing	-0.094	0.186	0.614		-0.230	0.219	0.295	
Help from parents - living exp.	0.103	0.139	0.461		0.200	0.167	0.230	
Help from parents - tuition & fees	0.167	0.180	0.352		0.081	0.210	0.700	
Unmet need (\$1,000)	0.018	0.015	0.230		0.017	0.017	0.308	

High Income (>\$92,000)	Unmatched				Average Treatment Effect (ATE)			
	N=1996				N=1995			
	C	SE	p	d-P	C	SE	p	d-P
Fed. need-based grants (\$1,000)	-0.188	0.393	0.633		-0.176	0.464	0.705	
State need-based grants (\$1,000)	-0.079	0.075	0.288		-0.031	0.084	0.718	
Instit. need-based grants (\$1,000)	-0.019	0.019	0.313		-0.022	0.020	0.280	
State merit grants (\$1,000)	-0.058	0.074	0.434		-0.062	0.085	0.467	
Instit. merit grants (\$1,000)	0.003	0.017	0.876		0.007	0.019	0.693	
Outside grants (\$1,000)	0.027	0.035	0.441		0.037	0.036	0.313	
Help from parents - housing	-0.315	0.179	0.078		-0.264	0.204	0.197	
Help from parents - living exp.	0.022	0.152	0.886		-0.018	0.169	0.916	
Help from parents - tuition & fees	0.104	0.205	0.613		0.026	0.226	0.908	
Unmet need (\$1,000)	0.039	0.017	0.026 *	0.93	0.026	0.018	0.151	

\* p<.05, \*\* p<.01, \*\*\* p<.001

Note 1: ATT only reported for all-student estimation. ATT not reported by income groups, due to insufficient sample size for HGLM convergence.

Note: Parameters estimated using student-level and institutional-level covariates (see Model 6- Final Model).

students actually receiving grants-only financial aid, was significant, making it somewhat difficult to gauge the true effect on degree attainment when all students are included in the estimation.

To assess the influence of financial aid on degree completion for students from different income backgrounds, I ran separate estimations by family income group. Results show significant positive results for low income students. For students with limited financial means to attend higher education, receiving need-based aid that does not have to be repaid substantially increases their chances to obtain a bachelor's degree within six years. For every \$1,000 dollar increase in aid received in federal grants, individuals are 2.82% (p<.05) more likely to graduate. For every \$1,000 they receive additionally in state and institutional need-based aid, their probability of degree attainment increases by 2.40% (p<.05) and 1.62% (p<.01), respectively. This confirms the positive impact of grant aid for low income students presented in Singell (2004). None of the other financial aid elements showed significant results for low income students that received grants only in their aid package, underscoring the importance of need-based grant aid to increase these students' chances of college completion.

For lower-middle income students, only one variable was found statistically significant in the estimation. Results show that for every \$1,000 increase in institutional need-based grant aid, chances of degree completion for these students increase by 1.91% ( $p < .01$ ), a higher value than for their low income peers. However, none of the other financial aid measures displayed significance. Although lower-middle income students on average receive more merit aid, particularly when compared to their low income peers (see Table 4.2 earlier in this chapter), this form of aid does not influence six-year degree attainment, nor do other forms of aid received. When comparing effects for this student group to those coming from low and upper-middle income backgrounds, this could indicate that these students are insufficiently covered in regard to financial aid as they do not show as much need as their low income peers, yet may not have sufficient financial strength to cover higher education costs themselves.

As was the case with both previous student groups, a significant positive effect for institutional need-based grants is also found for upper-middle income students. Being smaller in magnitude, for every \$1,000 increase, their chances to graduate rise by 1.12% ( $p < .05$ ). A larger effect is found for these students through institutional merit grants, which increase the likelihood of degree attainment by 1.69% ( $p < .01$ ) for every \$1,000 in additional support. Although these students, on average receive higher amounts in state merit aid and outside grants (from employers or private sources), these forms of aid do not show a significant influence on the outcome measure.

For high income students that received only grant aid, none of the included measures were found to be statistically significant. Although not necessarily surprising per se, these results show that the decision whether to persist and graduate for highly affluent students is not influenced by financial aspects and the aid they receive, regardless of form. Results presented

here, however, contradict recent findings in the literature (Herzog, 2008) that also used advanced statistical techniques and found that grant aid was only effective in the persistence for high income students and not influential for their lower income peers.

#### Grants and Loans Financial Aid Package (Treatment 2)

To extend the analysis to students who borrowed money to finance their higher education – an increasing share of the student population – the impact of aid is estimated for freshmen that received grants and loans in their financial aid package. Parameter estimates are presented in Table 4.8. Similar to the estimation on students receiving only grants, results in the ATE show that for all students institutional need-based and merit grants exert a positive influence on degree completion. For every \$1,000 increase in these forms of aid, students' chances to graduate increase by 0.81 ( $p < .05$ ) and 0.89 ( $p < .01$ ), respectively. Although Stafford unsubsidized loans and other (private) loans show the hypothesized negative association with degree completion, none of the loan measures are significant in the ATE estimation. However, when assessing the impact of aid for those who were actually treated (ATT), results in Table 4.8 show that unsubsidized Stafford loans are only marginally not significant ( $p = .051$ ) for those who received such aid. Given this near-significance result, students who received an additional \$1,000 in loans, are 6.25% ( $p = .051$ ) less likely to graduate within six years. ATT results also confirm the positive effect for institutional merit aid, although effect for those students that actually received aid is much higher than the average treatment effect (2.38%,  $p < .05$ ). A surprising finding is the effect of state merit grant aid for those students who received this form of support. When examining students from all income groups simultaneously, individuals that received \$1,000 in additional state merit grants were 14.64% ( $p < .01$ ) more likely to graduate with a bachelor's degree.



**Table 4.8: HGLM Parameter Estimates Financial Aid, Grants and Loans in Aid Package (Treatment 2)**

All Students	Unmatched N=6430				Average Treatment Effect (ATE) N=5996				Avg. Treatm. Effect f. Treated (ATT) <sup>†</sup> N=6030			
	C	SE	p	d-P	C	SE	p	d-P	C	SE	p	d-P
	Fed. need-based grants (\$1,000)	0.063	0.035	0.072		0.063	0.039	0.105		-0.013	0.146	0.931
State need-based grants (\$1,000)	-0.013	0.036	0.713		-0.028	0.042	0.507		-0.023	0.094	0.810	
Instit. need-based grants (\$1,000)	0.031	0.011	0.003 **	0.74	0.034	0.014	0.014 *	0.81	0.085	0.056	0.133	
State merit grants (\$1,000)	0.016	0.042	0.699		0.063	0.051	0.219		0.672	0.232	0.004 **	14.64
Instit. merit grants (\$1,000)	0.024	0.012	0.037 *	0.58	0.037	0.014	0.007 **	0.89	0.100	0.046	0.031 *	2.38
Outside grants (\$1,000)	0.044	0.025	0.070		0.036	0.024	0.138		-0.014	0.088	0.874	
Federal subsid. loans (\$1,000)	0.011	0.025	0.668		0.019	0.031	0.535		-0.037	0.128	0.775	
Stafford unsubsid. loans (\$1,000)	-0.062	0.032	0.049 *	-1.50	-0.066	0.037	0.080		-0.255	0.131	0.051	-6.25
State loans (\$1,000)	0.031	0.071	0.665		0.113	0.095	0.232		0.110	0.236	0.643	
Private loans (\$1,000)	-0.010	0.013	0.442		-0.023	0.016	0.148		-0.076	0.044	0.082	
Help from parents - housing	-0.150	0.097	0.124		-0.152	0.113	0.177		-0.044	0.348	0.900	
Help from parents - living exp.	0.089	0.078	0.257		0.168	0.094	0.074		0.261	0.304	0.390	
Help from parents - tuition & fees	0.090	0.099	0.363		0.121	0.113	0.287		0.259	0.408	0.526	
Unmet need (\$1,000)	0.013	0.008	0.081		0.012	0.009	0.191		0.001	0.050	0.981	

Low Income (<\$32,000)	Unmatched N=1056				Average Treatment Effect (ATE) N=1056			
	C	SE	p	d-P	C	SE	p	d-P
	Fed. need-based grants (\$1,000)	0.108	0.054	0.046 *	2.57	0.106	0.056	0.059
State need-based grants (\$1,000)	0.088	0.044	0.047 *	2.10	0.109	0.046	0.018 *	2.59
Instit. need-based grants (\$1,000)	0.066	0.023	0.004 **	1.58	0.055	0.025	0.027 *	1.31
State merit grants (\$1,000)	0.067	0.091	0.462		0.095	0.098	0.334	
Instit. merit grants (\$1,000)	0.006	0.034	0.872		-0.008	0.035	0.813	
Outside grants (\$1,000)	0.005	0.047	0.914		0.003	0.049	0.953	
Federal subsid. loans (\$1,000)	0.065	0.051	0.197		0.076	0.053	0.151	
Stafford unsubsid. loans (\$1,000)	-0.221	0.071	0.002 **	-5.41	-0.231	0.077	0.003 **	-5.66
State loans (\$1,000)	0.434	0.262	0.098		0.462	0.259	0.074	
Private loans (\$1,000)	0.059	0.055	0.281		0.053	0.065	0.415	
Help from parents - housing	0.120	0.221	0.588		0.123	0.228	0.589	
Help from parents - living exp.	0.236	0.174	0.175		0.244	0.183	0.184	
Help from parents - tuition & fees	0.118	0.200	0.555		0.202	0.207	0.329	
Unmet need (\$1,000)	0.028	0.013	0.027 *	0.62	0.028	0.014	0.050	0.67

Lower-Middle Income (\$32,000-\$59,999)	Unmatched N=1375				Average Treatment Effect (ATE) N=1373			
	C	SE	p	d-P	C	SE	p	d-P
	Fed. need-based grants (\$1,000)	-0.041	0.057	0.470		-0.061	0.064	0.338
State need-based grants (\$1,000)	-0.045	0.053	0.398		-0.072	0.058	0.216	
Instit. need-based grants (\$1,000)	0.072	0.023	0.001 **	1.72	0.074	0.024	0.002 **	1.77
State merit grants (\$1,000)	0.008	0.079	0.924		0.035	0.095	0.715	
Instit. merit grants (\$1,000)	0.049	0.027	0.064		0.066	0.029	0.023 *	1.58
Outside grants (\$1,000)	0.046	0.060	0.444		0.054	0.062	0.377	
Federal subsid. loans (\$1,000)	0.007	0.049	0.879		0.006	0.055	0.914	
Stafford unsubsid. loans (\$1,000)	-0.039	0.070	0.570		-0.060	0.075	0.420	
State loans (\$1,000)	0.100	0.170	0.555		0.150	0.178	0.401	
Private loans (\$1,000)	-0.026	0.035	0.452		-0.029	0.038	0.451	
Help from parents - housing	-0.375	0.216	0.082		-0.360	0.228	0.114	
Help from parents - living exp.	0.014	0.168	0.931		-0.001	0.192	0.994	
Help from parents - tuition & fees	0.156	0.170	0.357		0.187	0.185	0.312	
Unmet need (\$1,000)	0.022	0.015	0.158		0.018	0.017	0.289	

Upper-Middle Income (\$60,000-\$91,999)	Unmatched N=1603				Average Treatment Effect (ATE) N=1598			
	C	SE	p	d-P	C	SE	p	d-P
	Fed. need-based grants (\$1,000)	-0.049	0.151	0.744		-0.105	0.185	0.569
State need-based grants (\$1,000)	0.042	0.072	0.564		0.108	0.087	0.214	
Instit. need-based grants (\$1,000)	0.037	0.020	0.070		0.076	0.025	0.002 **	1.81
State merit grants (\$1,000)	0.080	0.062	0.199		0.149	0.079	0.059	3.52
Instit. merit grants (\$1,000)	0.059	0.024	0.013 *	1.41	0.078	0.029	0.007 **	1.86
Outside grants (\$1,000)	0.115	0.060	0.055	2.73	0.077	0.065	0.241	
Federal subsid. loans (\$1,000)	-0.011	0.050	0.826		-0.055	0.061	0.369	
Stafford unsubsid. loans (\$1,000)	-0.026	0.064	0.683		-0.056	0.074	0.443	
State loans (\$1,000)	-0.085	0.094	0.365		-0.092	0.119	0.437	
Private loans (\$1,000)	0.010	0.025	0.705		-0.002	0.030	0.942	
Help from parents - housing	-0.094	0.189	0.619		-0.123	0.213	0.564	
Help from parents - living exp.	0.106	0.141	0.452		0.163	0.171	0.341	
Help from parents - tuition & fees	0.159	0.178	0.374		0.044	0.212	0.835	
Unmet need (\$1,000)	0.017	0.016	0.271		0.032	0.018	0.073	

High Income (>\$92,000)	Unmatched N=1996				Average Treatment Effect (ATE) N=1974			
	C	SE	p	d-P	C	SE	p	d-P
	Fed. need-based grants (\$1,000)	-0.203	0.380	0.593		-0.068	0.404	0.865
State need-based grants (\$1,000)	-0.090	0.074	0.225		-0.146	0.086	0.088	
Instit. need-based grants (\$1,000)	-0.030	0.021	0.156		-0.027	0.026	0.312	
State merit grants (\$1,000)	-0.060	0.075	0.423		0.008	0.106	0.942	
Instit. merit grants (\$1,000)	0.003	0.017	0.847		0.003	0.025	0.904	
Outside grants (\$1,000)	0.030	0.035	0.401		0.022	0.048	0.657	
Federal subsid. loans (\$1,000)	0.083	0.070	0.240		0.096	0.089	0.278	
Stafford unsubsid. loans (\$1,000)	-0.071	0.051	0.162		-0.044	0.066	0.501	
State loans (\$1,000)	0.043	0.169	0.798		0.224	0.174	0.196	
Private loans (\$1,000)	-0.022	0.023	0.343		-0.041	0.022	0.065	
Help from parents - housing	-0.311	0.181	0.086		-0.197	0.216	0.362	
Help from parents - living exp.	0.018	0.151	0.904		0.096	0.192	0.616	
Help from parents - tuition & fees	0.090	0.207	0.664		0.050	0.258	0.846	
Unmet need (\$1,000)	0.037	0.017	0.033 *	0.89	0.041	0.022	0.068	

\* p<.05, \*\* p<.01, \*\*\* p<.001

Note 1: ATT only reported for all-student estimation. ATT not reported by income groups, due to insufficient sample size for HGLM convergence.

Note: Parameters estimated using student-level and institutional-level covariates (see Model 6- Final Model).

Low income students, similarly to the grants-only estimation, appear to receive the highest benefits from need-based grant aid. Effect sizes are comparable to the previous estimation, with students who receive an additional \$1,000 in state and institutional need-based grants being 2.59% (p<.01) and 1.31% (p<.05), respectively, more likely to graduate. Although marginally not significant in the ATE estimation for low income students, federal grant aid increases students' chances to complete college by 2.52% (p=.059). The only other significant aid measure found influential for students from low income backgrounds is unsubsidized Stafford loans. Results in Table 4.8 reveal a comparatively large, negative association with the outcome measure, as hypothesized for this form of aid. For every \$1,000 in additional money

borrowed in unsubsidized loans, low income students are 5.66% ( $p < .01$ ) less likely to graduate within six years. Even more important, this negative association for unsubsidized loans (and loans in general) is only found among low income students receiving this form of aid. As hypothesized, the high costs associated with this form of financial assistance and the relatively low value when compared to other forms of aid, particularly grants and subsidized loans, has the most detrimental effect on the least affluent students. To illustrate the magnitude of this effect: The positive effect that would result from increasing a low income student's aid package by \$1,000 in federal, state, and institutional grant aid each (total of \$3,000) would be undone through the negative effect of taking out an additional \$1,134 in unsubsidized Stafford loans.

Effects for lower- and upper-middle income students that received both grants and loans are also similar to the previous estimation. However, for students receiving such an aid package, both forms of institutional grant aid are found to positively influence degree completion by 1.77% ( $p < .01$ ) and 1.58% ( $p < .05$ ), respectively. Interestingly, effect sizes are larger for upper-middle income students, as for every \$1,000 increase in institutional need and merit grant aid, their chances to graduate rise by 1.81% ( $p < .01$ ) and 1.86% ( $p < .01$ ), respectively. Results for these students further show that state merit grants are only marginally not significant and reveal a large, positive association with the outcome measure. Assuming practical significance, a \$1,000 increase in state merit aid would increase chances to graduate by 3.52% ( $p = .059$ ).

As was the case in the previous estimation, none of the financial aid measures significantly influence degree attainment for most affluent students. Even though these students receive on average the highest amount of institutional merit grants and notable amounts of federal subsidized loans and other aid classified as need-based assistance, factors other than economic or financial ones impact their likelihood to obtain a degree within six years.

### Grants, Loans, and Work-Study Aid Package (Treatment 3)

To estimate the potential influence of the federal work-study program, I estimated a third model that uses a matching algorithm for students receiving grants, loans, and work-study in their aid package. However, given the relatively small number of students in the dataset that received this form of aid (11.3%) and the above average total financial amounts for students receiving this treatment (see Table 4.2), results should be interpreted with caution.

Estimations of the ATE in Table 4.9 show that for all students, again, institutional need-based aid increases chances of degree completion (0.70%,  $p < .05$ ). Institutional merit-based aid, which was found to be significant in the previous two estimations, was not found to be influential for these students. The only other financial aid measure that shows close-to-significant results in the ATE are state merit grants, increasing the likelihood of degree attainment by 2.28% ( $p = .061$ ). However, ATT results that provide an estimate for the effect for students who actually received this treatment reveal a remarkable positive effect. Similar to the effect for all students receiving grants and loans in their aid package, estimations show that for every \$1,000 in state merit aid that students actually received, their chances to graduate increased by 21.72% ( $p < .05$ ). Given the effect size, however, more research is needed to verify this effect.

Assessing effects by income for students receiving grants, loans, and work-study, similar patterns are revealed when compared to the previous two estimations. Although lower in effect size, for low income students, institutional and state need-based grants positively impact bachelor's degree completion and increase their likelihood by 1.88% ( $p < .01$ ) and 2.24% ( $p = .053$ ), respectively. However, for students receiving this form of aid package, federal need-based grants were no longer significant. All other forms of aid, but one, are found not to significantly influence attainment, including federal work-study. However, just as in the previous

**Table 4.9:** HGLM Parameter Estimates Financial Aid, Grants, Loans, and FWS in Aid Pkg. (Treatment 3)

All Students	Unmatched N=6430				Average Treatment Effect (ATE) N=5938				Avg. Treatm. Effect f. Treated (ATT) <sup>1</sup> N=6030			
	C	SE	p	d-P	C	SE	p	d-P	C	SE	p	d-P
	Fed. need-based grants (\$1,000)	0.060	0.035	0.086		0.062	0.043	0.144		-0.273	0.158	0.084
State need-based grants (\$1,000)	-0.013	0.036	0.712		-0.028	0.043	0.518		0.149	0.125	0.234	
Instit. need-based grants (\$1,000)	0.033	0.011	0.002 **	0.79	0.029	0.015	0.046 *	0.70	0.099	0.067	0.140	
State merit grants (\$1,000)	0.014	0.041	0.730		0.096	0.051	0.061	2.28	1.087	0.467	0.020 *	21.72
Instit. merit grants (\$1,000)	0.026	0.012	0.028 *	0.62	0.010	0.017	0.573		0.083	0.110	0.451	
Outside grants (\$1,000)	0.044	0.025	0.075		0.025	0.037	0.489		-0.100	0.196	0.613	
Federal subsid. loans (\$1,000)	0.011	0.025	0.654		0.006	0.036	0.877		-0.177	0.154	0.253	
Stafford unsubsid. loans (\$1,000)	-0.065	0.032	0.041 *	-1.57	-0.051	0.044	0.245		0.235	0.168	0.161	
State loans (\$1,000)	0.032	0.070	0.651		0.047	0.075	0.531		0.338	0.267	0.205	
Private loans (\$1,000)	-0.010	0.014	0.459		-0.011	0.018	0.542		0.065	0.081	0.424	
Federal work-study (\$1,000)	0.015	0.050	0.756		-0.012	0.068	0.854		-0.004	0.369	0.991	
Help from parents - housing	-0.143	0.097	0.138		-0.206	0.131	0.116		0.104	0.593	0.860	
Help from parents - living exp.	0.082	0.078	0.290		0.131	0.111	0.238		0.259	0.407	0.524	
Help from parents - tuition & fees	0.091	0.100	0.362		0.209	0.123	0.091		1.182	0.646	0.067	
Unmet need (\$1,000)	0.014	0.008	0.062		0.010	0.010	0.319		0.005	0.071	0.947	

Low Income (<\$32,000)	Unmatched N=1056				Average Treatment Effect (ATE) N=1056			
	C	SE	p	d-P	C	SE	p	d-P
	Fed. need-based grants (\$1,000)	0.100	0.053	0.060	2.38	0.087	0.059	0.144
State need-based grants (\$1,000)	0.085	0.044	0.053	2.03	0.094	0.049	0.053	2.24
Instit. need-based grants (\$1,000)	0.064	0.023	0.005 **	1.53	0.079	0.026	0.003 **	1.88
State merit grants (\$1,000)	0.069	0.090	0.443		0.143	0.100	0.154	
Instit. merit grants (\$1,000)	0.003	0.034	0.926		0.002	0.038	0.963	
Outside grants (\$1,000)	0.005	0.047	0.917		0.047	0.055	0.389	
Federal subsid. loans (\$1,000)	0.058	0.051	0.258		0.072	0.061	0.238	
Stafford unsubsid. loans (\$1,000)	-0.223	0.071	0.002 **	-5.46	-0.210	0.080	0.009 **	-5.14
State loans (\$1,000)	0.427	0.264	0.105		0.427	0.290	0.142	
Private loans (\$1,000)	0.060	0.054	0.272		0.086	0.060	0.152	
Federal work-study (\$1,000)	0.132	0.094	0.161		0.108	0.104	0.301	
Help from parents - housing	0.116	0.221	0.601		0.196	0.236	0.408	
Help from parents - living exp.	0.245	0.173	0.157		0.062	0.193	0.748	
Help from parents - tuition & fees	0.115	0.198	0.562		0.147	0.212	0.489	
Unmet need (\$1,000)	0.030	0.013	0.019 *	0.67	0.041	0.014	0.004 **	0.98

Lower-Middle Income (\$32,000-\$59,999)	Unmatched N=1375				Average Treatment Effect (ATE) N=1373			
	C	SE	p	d-P	C	SE	p	d-P
	Fed. need-based grants (\$1,000)	-0.042	0.058	0.472		-0.004	0.064	0.944
State need-based grants (\$1,000)	-0.045	0.053	0.398		-0.051	0.059	0.381	
Instit. need-based grants (\$1,000)	0.072	0.023	0.002 **	1.72	0.087	0.025	0.001 **	2.07
State merit grants (\$1,000)	0.007	0.079	0.925		0.006	0.091	0.946	
Instit. merit grants (\$1,000)	0.049	0.027	0.067		0.057	0.031	0.060	1.36
Outside grants (\$1,000)	0.046	0.060	0.442		0.015	0.065	0.814	
Federal subsid. loans (\$1,000)	0.007	0.049	0.883		-0.035	0.053	0.516	
Stafford unsubsid. loans (\$1,000)	-0.040	0.070	0.570		0.052	0.071	0.463	
State loans (\$1,000)	0.099	0.171	0.561		0.097	0.252	0.700	
Private loans (\$1,000)	-0.026	0.035	0.450		-0.019	0.035	0.589	
Federal work-study (\$1,000)	0.005	0.096	0.960		-0.006	0.112	0.954	
Help from parents - housing	-0.375	0.216	0.082		-0.036	0.081	0.660	
Help from parents - living exp.	0.014	0.168	0.931		-0.032	0.189	0.864	
Help from parents - tuition & fees	0.156	0.170	0.359		0.347	0.205	0.091	
Unmet need (\$1,000)	0.022	0.015	0.157		0.035	0.018	0.050 *	0.84

Upper-Middle Income (\$60,000-\$91,999)	Unmatched				Average Treatment Effect (ATE)			
	N=1603				N=1598			
	C	SE	p	d-P	C	SE	p	d-P
Fed. need-based grants (\$1,000)	-0.033	0.153	0.830		-0.195	0.186	0.296	
State need-based grants (\$1,000)	0.042	0.072	0.558		0.028	0.076	0.717	
Instit. need-based grants (\$1,000)	0.040	0.021	0.061		0.028	0.025	0.278	
State merit grants (\$1,000)	0.083	0.062	0.180		0.116	0.075	0.122	
Instit. merit grants (\$1,000)	0.061	0.023	0.009 **	1.46	0.053	0.028	0.059	1.27
Outside grants (\$1,000)	0.114	0.060	0.057		0.145	0.066	0.028 *	3.43
Federal subsid. loans (\$1,000)	-0.004	0.051	0.931		0.048	0.063	0.447	
Stafford unsubsid. loans (\$1,000)	-0.027	0.064	0.674		-0.055	0.080	0.490	
State loans (\$1,000)	-0.087	0.094	0.359		-0.047	0.105	0.658	
Private loans (\$1,000)	0.010	0.025	0.695		0.024	0.027	0.370	
Federal work-study (\$1,000)	-0.059	0.098	0.551		-0.219	0.133	0.099	
Help from parents - housing	-0.093	0.189	0.622		-0.011	0.209	0.957	
Help from parents - living exp.	0.104	0.141	0.459		0.071	0.167	0.671	
Help from parents - tuition & fees	0.165	0.180	0.360		0.233	0.196	0.233	
Unmet need (\$1,000)	0.017	0.016	0.266		0.016	0.017	0.325	

High Income (>\$92,000)	Unmatched				Average Treatment Effect (ATE)			
	N=1996				N=1905			
	C	SE	p	d-P	C	SE	p	d-P
Fed. need-based grants (\$1,000)	-0.198	0.379	0.601		-0.231	0.385	0.548	
State need-based grants (\$1,000)	-0.090	0.074	0.222		-0.180	0.091	0.048 *	-4.39
Instit. need-based grants (\$1,000)	-0.031	0.021	0.138		-0.037	0.024	0.132	
State merit grants (\$1,000)	-0.060	0.075	0.420		-0.007	0.092	0.938	
Instit. merit grants (\$1,000)	0.003	0.018	0.856		0.001	0.024	0.960	
Outside grants (\$1,000)	0.030	0.035	0.397		0.032	0.040	0.430	
Federal subsid. loans (\$1,000)	0.079	0.072	0.272		0.120	0.085	0.158	
Stafford unsubsid. loans (\$1,000)	-0.071	0.051	0.163		-0.051	0.066	0.440	
State loans (\$1,000)	0.042	0.170	0.804		-0.039	0.183	0.830	
Private loans (\$1,000)	-0.022	0.023	0.339		-0.020	0.034	0.542	
Federal work-study (\$1,000)	0.027	0.096	0.780		0.132	0.149	0.378	
Help from parents - housing	-0.313	0.181	0.084		-0.080	0.235	0.733	
Help from parents - living exp.	0.020	0.152	0.895		0.083	0.189	0.662	
Help from parents - tuition & fees	0.089	0.207	0.666		0.181	0.248	0.466	
Unmet need (\$1,000)	0.037	0.017	0.032 *	0.89	0.037	0.021	0.083	

\* p<.05, \*\* p<.01, \*\*\* p<.001

Note 1: ATT only reported for all-student estimation. ATT not reported by income groups, due to insufficient sample size for HGLM convergence.

Note: Parameters estimated using student-level and institutional-level covariates (see Model 6- Final Model).

estimation, unsubsidized Stafford loans show a substantial reduction in the likelihood of degree completion, as a \$1,000 increase in the amount borrowed decreases one's chances by 5.14% (p<.01). Again, this negative impact is only found for least affluent students, which emphasizes the adverse effects resulting from unsubsidized loans for this student group.

Lower-middle income students' chances of degree completion are found to be influenced most by institutional sources of financial aid, a consistent finding in this study across the three different treatment estimations. Although marginally not significant for merit grant aid,

institutional need-based and merit grants increase the probability of degree attainment by 2.07% ( $p < .01$ ) and 1.36% ( $p = .060$ ), respectively. For their upper-middle income students, institutional merit grants generally remain a positive predictor, although marginally not significant at the .05 level. For every \$1,000 increase in this form of aid, students have a 1.27% ( $p = .059$ ) chance of graduating within six years. Interestingly, outside grants seem to exert a positive effect – the only significant result for this particular form of aid – with a 3.43% ( $p < .05$ ) increased graduation chance for every \$1,000 additional amount provided.

As was the case for their low income peers, aid received under the federal work-study program does not appear to influence degree completion. This confirms findings in a very recent study (Scott-Clayton, 2011) that estimated work-study effects and also found no significant improvements in academic outcomes for low income students.

Similarly to the previous estimations, for high income students, financial assistance does not increase their chances of degree completion. Across the three estimations performed for the aid treatments under study, only one variable showed significant results for high income students. Results in Table 4.9 show that receipt of state need-based grant aid is negatively associated with degree completion, a 4.39% ( $p < .05$ ) decline for every \$1,000 received. This is a somewhat counterintuitive finding and may be an artifact of the small sample size of this estimation.

## CHAPTER 5: DISCUSSION AND CONCLUSION

Educational attainment is important both at the individual and societal level. For the individual, obtaining a baccalaureate degree increasingly becomes a necessity for personal advancement and upward mobility. Among other things, bachelor's degree holders have access to a much broader job market and enjoy significantly higher lifetime earnings when compared to individuals with associate's degrees or less. At the same time, educational attainment is a pivotal element for economic advancement, and the U.S. economy relies on higher education institutions to provide the college graduates and knowledge workers needed to remain competitive in the global marketplace. And yet, America lost ground and educational attainment continuously declined over the past decades. Today, the U.S. ranks only 15<sup>th</sup> among major industrialized nations in college completion rates (OECD, 2011).

To reclaim America's spot at the top and increase overall educational attainment for sustained economic growth, the Obama Administration launched the American Graduation Initiative in 2009 which seeks to add five million graduates by the year 2020. The initiative focuses on various aspects: strengthen the role of community colleges, provide better data for students and their parents to choose the right college, promote online learning, and provide funds to increase college access and completion (The White House, 2009). Complementing the initiative are efforts seeking to reform parts of the federal financial aid system and provide additional resources. Already, the federal government has reformed the student loan system and established itself as the primary lender, and funding for the Pell program practically doubled since President Obama took office, reaching \$30.3 billion in 2009-10 (College Board, 2011b; The White House, 2012).



With these changes, the federal investment in form of financial assistance reached \$169 billion in 2010-11, an increase of 164% (inflation-adjusted) over the past decade alone. The total amount in financial aid from all sources – federal, state, institutional, and private – reached \$235 billion in the same year (College Board, 2011b). And yet, despite this massive investment, relatively little is known on the specific impact of various forms of financial aid on student degree completion.

Most research has focused on individual persistence decisions and student departure and less on the specific elements, experiences, and processes that affect degree attainment. Even fewer scholars focus on the crucial intersection of degree completion and financial aid, and how specific aid components may impact students' chances to graduate differentially across income and socioeconomic groups (Chen, 2008; Goldrick-Rab et al., 2009; Hossler et al., 2009; St. John et al., 2000). Existing studies are also limited, as they frequently use aggregated measures of financial aid and rarely address – at least in the higher education literature – endogeneity bias when estimating aid effect (Alon, 2005; Cellini, 2008; Dowd, 2008). Going beyond influences of financial assistance, only in recent years and spurred by the proliferation of multilevel statistical techniques have scholars begun to focus on the influences on degree attainment resulting from the institutional context, peer climates, and organizational behavior (Oseguera & Rhee, 2009; Rhee, 2008; Titus, 2004, 2006b, 2006c).

### Study Synopsis

With this study, I seek to contribute to overcoming limitations in the literature and examine the effects of financial aid in conjunction with students' college experiences and the institutional context on six-year degree attainment. Particularly, I study the specific effects of various forms of financial aid, such as need-based and merit grants, subsidized and unsubsidized

loans, and federal work-study, and how these differentially impact students from various income backgrounds. I also examine what factors and experiences during students' pre-college, transition, and college attendance phases affect degree completion at the individual level and how institutional structural-demographic characteristics, institutional and peer climate, and organizational behavior impact student success.

For this, I draw from multiple theories pertaining to student persistence and degree completion (Becker, 1980; Berger & Milem, 2000; Bourdieu, 1977, 1986; J. Pfeffer & Salancik, 2003; St. John et al., 1996) and theoretical/empirical models that have been applied in the field of higher education (Bean, 1980, 1982; Nora, 2004; Nora & Cabrera, 1996; Tinto, 1987, 1993). In support of recent calls for more interdisciplinary perspectives in the study of persistence and degree attainment (Chen, 2008; Goldrick-Rab et al., 2009; St. John et al., 2000), I use a multitheoretical conceptual framework that seeks to account for student-level and institutional-level influences. To minimize endogeneity bias in the estimation of financial aid effects, I apply a propensity score matching technique in combination with a multilevel (HGLM) model. To my knowledge, this is the first study using such a combined approach to examine degree attainment and financial aid effects nationally.

Student-level data is drawn from the latest version of the Beginning Postsecondary Students survey (BPS:04/09), a longitudinal database containing a nationally representative sample of undergraduates who entered higher education in 2003-04. The BPS contains information on a variety of aspects, such as students' background characteristics, high school experiences and preparation, detailed financial aid and income data, educational goals, and social and academic experiences in college. Institutional-level data is drawn from the Integrated Postsecondary Education Data System (IPEDS) and the Delta Cost Project which contain

information on a variety of institutional characteristics, such as size, student characteristics, faculty and staff, costs, and institutional finances (both revenues and expenditures). Data filters were applied to restrict the analyses to students that enrolled full-time in bachelor's granting degree programs at 4-year institutions; international students and student athletes were excluded. The final sample in this study encompasses N=6,561 students attending n=651 4-year colleges and universities in the U.S.

## Major Findings

Three primary research questions guided this study, which will be used to present major findings in the following section. First, characteristics and experiences influencing six-year baccalaureate degree completion on the student level (level-1) will be discussed. Second, I will present institutional level (level-2) results to show the impact of students' environment – the college or university attended – on their chances to obtain a degree. Third, I will discuss effects of various financial aid components on degree attainment.

### *Student-Level Influences on Degree Attainment*

The first research question addresses the influence of student-level characteristics and experiences on baccalaureate degree completion. Specifically, the research questions reads: What background characteristics, pre-college and college experiences, and pull factors impact six-year degree completion for dependent, full-time students at 4-year institutions, after controlling for financial aid received? In the analysis, measures were grouped and entered according to the three phases in the conceptual model; pre-college phase, transition, and college attendance phase.

One of the salient findings of this study is the support for notions of social reproduction theory (Blau & Duncan, 1967; Bourdieu, 1977, 1986; Sewell et al., 1969) and the impact of

social and cultural capital. When compared to their high income peers, students from the lowest income backgrounds are 8.64% less likely to graduate within six years with a bachelor's degree. This difference in the probability of degree attainment is even more compelling, as the estimation controls for such important influences as student high school experience and performance, educational aspirations and goals, college experiences, and academic performance in the first year attending higher education. Estimations show that lower-middle income students are also less likely to graduate within six years, when compared to their high income peers. However, results are only significant before institutional and peer climate measures are entered (in model 5, see results chapter).

At the same time, wealth is found a consistent, positive predictor of degree completion. Although the measure used in this study does not represent entire family wealth, which is often found difficult to assess, results in the final model show that students whose parents own investments larger than \$10,000 are 4.30% more likely to graduate within six years – even after controlling for family income. This finding certainly necessitates further inquiry. However, it confirms recent results in the literature that find wealth to exert an independent influences on student success, beyond traditional measures of income (Jez, 2010; F. T. Pfeffer, 2011).

Scholars that found similar negative effects for low income students on persistence and degree completion provide various explanations, and frequently cite lower academic preparation as a contributing factor (Adelman, 1999, 2006). For economists, lower preparation can result in higher psychological costs, which refers to the strain and frustration from having to sit through lectures and reading hard-to-comprehend materials, and is hypothesized to contribute to student attrition (Goldrick-Rab et al., 2009). However, this study explicitly controls for multiple measures of academic preparation at the high school level, and includes two measures of

academic performance in the first year of college. Although these measures cannot assess students' true level of strain and frustration, or psychological costs, they allow comparing effects on degree completion for students with similar characteristics. And, results show that even after controlling for all student-level and institutional-level characteristics – including academic measures – low income students are significantly less likely to obtain a baccalaureate degree.

An alternative explanation draws from Bourdieu's concept of habitus and its crucial role for higher education access and success (Bourdieu, 1986; Bourdieu & Passeron, 1990; McDonough, 1997, 2005; Walpole, 2003). For low income students, he hypothesized that their habitus is less likely to include the knowledge and skills necessary to successfully navigate the college environment. Also, these students may experience a disconnect between their own low-SES habitus and the perceived middle to high-SES habitus of the college environment. This disconnect can increase the difficulty for these students to adjust to the college or university attended and, subsequently, lower their chances to persist and graduate. This notion is supported by the effects of income and wealth found in this study. The positive effect uncovered for students choosing to attend a particular college due to its reputation, a measure also conceptualized to capture parental and student cultural capital, further supports this conceptualization. Consistent throughout the estimation, results show that students who were influenced by an institution's reputation in their choice are 4.27% more likely to graduate within six years.

Beyond these findings, ten variables have been found significant at the student level. Mostly confirming previous research (Astin & Oseguera, 2005a; W. G. Bowen, Chingos, & McPherson, 2009; Pascarella & Terenzini, 2005), results in this study show that women are 5.03% more likely to graduate with a bachelor's degree than men. In regard to race/ethnicity,

none of the variables display significance in the final model. Thus, once pre-college, transition, and college experience measures are accounted for, a student's race/ethnicity does not influence the likelihood of degree completion. Also confirming findings in the literature (Adelman, 2006; DeAngelo et al., 2011; DesJardins & McCall, 2010), older students have a lower chance of degree attainment. Results in this study show that students 19 years and older are 5.63% less likely to obtain a bachelor's degree within six years. Students from single parents also face significant obstacles, as their likelihood to complete a baccalaureate degree is almost 14% (-13.97%) lower when compared to students whose parents are married.

Traditionally, academic performance has been one of the strongest predictors of student persistence and degree completion (Adelman, 1999, 2006; Astin, 1993; W. G. Bowen et al., 2009; Pascarella & Terenzini, 2005). This study also finds measures for academic preparation in high school and academic performance in college highly significant. In fact, first-year college GPA is the strongest predictor of six-year degree attainment, measured by t-value. For every one-tenth increase in a student's GPA, his or her chances to complete a degree increase by 2.17%. Not surprisingly, once college GPA is entered into the analysis, the effect of prior academic performance, measured through high school GPA, is reduced. However, high school GPA remains significant throughout the estimation and results show that students' chances to obtain a degree increase by 4.70% for every unit-increase in high school academic performance.

Interestingly, admission test scores, a measure frequently found highly predictive of student success and that is also found significant in models 1-3, turns insignificant once structural-demographic characteristics (level-2) are entered into the model. This confirms findings in the literature (Astin & Oseguera, 2005a; W. G. Bowen et al., 2009; Oseguera, 2005),

arguing that admission test scores (SAT and ACT) are less predictive for long-term student success, once other student-level and institutional-level predictors are accounted for.

Degree aspirations, also hypothesized to be influential on degree attainment are not found significant in this study. This is certainly surprising, as previous research points towards the importance of educational aspirations on various measures of student success (MacLeod, 1995; McDonough, 1999, 2005; Walpole, 2003). Furthermore, none of the measures of educational goals and reasons to attend higher education – beyond choosing an institution due to its reputation, as reported above – are found to predict six-year degree attainment. Only students' initial transfer plans show highly significant results. In fact, the intention to transfer is the second strongest predictor of degree completion in this study. Individuals who hold such plans already in the first year of enrollment are 26.50% less likely to obtain a degree. The magnitude of this effect is certainly striking; however, results generally confirm the negative influence on degree attainment found in the literature (DeAngelo et al., 2011; Oseguera & Rhee, 2009). Although this study does not reveal whether students pursued other routes in higher education and graduated from another 4-year institution within the same time period, reverse-transferred, or left higher education entirely, this finding underscores the importance of college choice for students and measuring initial student attitudes and plans for college administrators.

Based on the financial nexus theory (Paulsen & St. John, 2002b; St. John et al., 2005; St. John et al., 1996), I hypothesized that a student's choice of institution for financial reasons and a perceived congruence regarding costs associated with attending a particular college influences degree attainment. Although the measure used in this study may not fully capture the economic considerations students weigh in their college choice, thus may not fully represent the

hypothesized relationship, results in this study do not provide support for the assumptions of the nexus theory.

The model tested in this study incorporated various measures for students' college experiences, such as living arrangements, academic and social integration, student involvement, and pull factors. Confirming the immensely important role of students' living arrangements in student success, this study finds that students who live on campus are 16.49% more likely to graduate within six years. Using t-values, this is the third most influential predictor of degree attainment, thus underscores the crucial role of integrating students into the campus environment (Astin, 1993). However, it also indicates that institutions that are primarily commuter colleges or institutions that simply cannot provide on-campus housing need to consider alternative ways to improve student integration and, subsequently, student degree completion.

Based on theoretical and empirical models on student persistence (Bean, 1982; Nora, 2004; Tinto, 1993) I incorporated and tested constructs for academic and social integration. None of the academic integration measures were found significant. However, social integration displays a significant, positive influence on degree attainment. For every one-tenth increase in the social integration measure, students are .62% more likely to graduate, or every full unit increase raises students' chances to graduate by 6.2%. Generally confirming results in the literature (Braxton & Lee, 2005; Braxton et al., 1997), this finding is particularly important for campus administrators as it points towards the immensely important role of better integrating students into the college environment, and considering aspects of student-faculty interaction, mentoring experiences, and campus and peer climate.

The last variable block in the college attendance phase included pull factors that are hypothesized to be detrimental for student degree attainment. Results show that, when compared



to students that do not work, students spending more than 20 hours per week working are 10.20% less likely to graduate. Working fewer hours also displays a negative association, however, results are not significant. These results confirm findings in the literature about the detrimental effects of having the obligation, or desire, to work more than 20 hours a week (Cuccaro-Alamin & Choy, 1998; Titus, 2006b) and underscore the importance of dedicating (or having the opportunity to dedicate) sufficient time to one's education and collegiate life.

Distance from home is also found to significantly reduce students' chances of degree attainment within six years from the institution of initial enrollment. Although students may choose to transfer to another 4-year institution and graduate within the same time period simply to be closer to home, this study finds that for every one-percent increase in distance, students are 2.50% less likely to graduate. More research is needed to explore possible causes and explanations, as this result could be indicative, for instance, of higher student mobility in the positive case or students having more difficulties integrating into college life when moving farther away.

#### *Institutional-Level Influences on Degree Attainment*

The second research question guiding this study focuses on influences resulting from the institutional context and reads: Accounting for individual-level characteristics, which institutional-level factors influence students' likelihood of degree attainment? In the conceptual model, institutional influences were grouped into three main sectors – *structural-demographic, institutional and peer climate, and organizational behavior* – based on theoretical models and empirical finding in the literature (Berger & Milem, 2000; Oseguera & Rhee, 2009; J. Pfeffer & Salancik, 2003; Titus, 2004, 2006b, 2006c).

It was hypothesized that *structural-demographic* characteristics would have a strong influence on six-year degree attainment, as some of the variables included have emerged as significant in previous studies (Astin & Oseguera, 2005a; Oseguera & Rhee, 2009; Titus, 2004, 2006b). However, results reported in this study only partially confirm hypothesized relationships. Institutional control (private) is not found influential on student degree completion, although positive effects of attending a private institution have been documented in the literature. This provides support, however, for recent findings showing that attending a private college or university may be beneficial for degree completion within four years, but may not affect the likelihood to graduate within six years (DeAngelo et al., 2011; Oseguera & Rhee, 2009; Titus, 2006b). Thus, students attending a public institution are not more or less likely to graduate with a baccalaureate degree within six years when compared to their peers attending a private college or university.

Institutional selectivity, in contrast, is found to significantly impact student degree attainment. In the final model, students attending high selectivity institutions – initially hypothesized to support degree attainment – are not significantly more likely to graduate when compared to students attending moderately selective institutions. However, students at low selectivity colleges and universities are 7.41% less likely to graduate within six years. Generally, this confirms findings in the literature where selectivity emerged as influential on degree attainment (Astin & Oseguera, 2005b; Titus, 2004, 2006b), yet paints a more nuanced picture. The findings in this study show that students attending highly selective institutions are no more or less likely to graduate within this timeframe, when compared to their peers enrolled in moderately selective institutions. Attending a low selectivity college or university, in contrast, is detrimental to one's chances to obtain a bachelor's degree within six years. This finding may

have implications for policy and campus administrators. It shows that simply becoming more selective in the admission process for already moderately selective institutions does not produce more graduates, as these colleges and universities are not significantly different in their impact in degree attainment compared to their highly selective counterparts. However, providing additional resources and tackling the obstacles for students enrolled in low selectivity and open admission institutions may prove effective to raise overall degree attainment rates.

Of the twelve measures on *institutional and peer climate* included, three showed significant results in the final model. Surprisingly, institutional size which has been found influential on persistence and degree attainment in previous research (Berger & Milem, 2000; Titus, 2004) did not produce significant results in this study.

With the measures incorporated in this sector, I sought to capture contextual influences that are less tangible, yet are hypothesized to be highly influential on student persistence and degree completion (Berger & Milem, 2000; Hurtado, 2001; Hurtado et al., 1998, 1999b; Oseguera & Rhee, 2009). For this, I included institutional climate measures and student aggregates of selected student-level measures. Interestingly, the measure for student diversity on campus (share of minority students) is found to positively impact six-year degree attainment. Results show, that for every one percent increase in student diversity, chances to graduate increase by .14%. This finding generally aligns with previous research affirming that cohort diversity and supportive campus climates influence student persistence (Laden et al., 2000; Rhee, 2008; Titus, 2006b). However, when incorporated as institutional characteristic, the majority of previous work found either no or negative effects for this measure (Oseguera & Rhee, 2009). Only most recently, Arellano (2011) reported a similar positive effect on six-year Latino/a degree attainment in a national study. The positive effects of student diversity on degree

attainment found in this study provide further proof of the benefits of diverse learning environments for student success, elaborated elsewhere in the literature (Chang, 1999; Hurtado et al., 2003; Hurtado et al., 1999b).

Of the remaining climate measures included, two were found to significantly predict degree attainment. Both, the share of students attending part-time and the share of students receiving federal need-based grants significantly reduce students' chances to graduate within six years by .26% and .41%, respectively. Particularly the negative effect for the share of students receiving federal aid – a proxy for the average income of students on campus – is very interesting. In addition to the detrimental effects for low income students reported in the previous section, the importance of finances and economic factors also arises at the institutional level. As colleges and universities have been characterized as primary socializing organization for adults in society (Feldman & Newcomb, 1993), attending an institution with more low income students, which may also lack the habitus to succeed in higher education, appears to have a contextual, detrimental effect on student development and their chances to obtain a baccalaureate degree. Thus, coming from a low income background and attending a college with a higher share of low income students, significantly reduces one's chances to graduate. This further highlights the pivotal impact of economic factors, both at the student and institutional level.

Measures for *organizational behavior* were inserted last into the model. Drawing from theoretical models in the literature and resource dependency theory (J. Pfeffer & Salancik, 2003; Titus, 2004), I hypothesized that institutional revenue and expenditure patterns affect student degree attainment. Of the three measures tested for institutional revenue generation, none were found to significantly predict degree completion. This is somewhat surprising, as Titus (2006c)

found a strong positive effect for the share of revenues generated from tuition and fees, a measure also included in this study.

On the expenditure side, I hypothesized that institutional prioritization, such as a focus on teaching and learning, academic support, spending on student services, research, and administration would exert an influence on degree attainment at the individual level<sup>17</sup>. Surprisingly, of the five measures tested in this block, only the share of faculty that is full-time was found significant. Core expenditures per FTE student, a measure found to impact degree attainment in a previous multilevel analysis (Titus, 2006c), and variables assessing institutional spending on student services, academic support, and spending on administrative functions did not produce significant results in the estimation. The effect of the share of full-time faculty, which is found to reduce students' chances to graduate within six years by .14%, is certainly interesting and counterintuitive. Particularly in light of documented negative effects of contingent faculty on student learning and general outcomes (Baldwin & Chronister, 2001; Benjamin, 2002), this finding warrants further research to assess the impact of part-time and full-time faculty on student persistence and degree completion.

The fact that only one of the revenue and expenditure measures displayed significant results is somewhat surprising. However, previous studies on degree attainment mostly conceptualized less complex empirical models at the institutional level. For instance, Titus (2006c) incorporated only structural-demographic measures before testing the influence of institutional revenues and expenditures. In this study, I incorporated multiple measures for institutional and peer climate and organizational behavior in addition to structural-demographic

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<sup>17</sup> Due to issues with multicollinearity and missing values in the data, not all initially hypothesized relationships could be tested, which affected measures both at the revenue and expenditure side.

variables. Thus, after controlling for institutional structural measures, campus diversity, and the share of students part-time and receiving federal aid, institutional revenue and expenditure patterns may not have added unique predictive power to the model, resulting in the reported non-significance (except for full-time faculty).

### *Financial Aid Effects*

The third research question addresses the influence of various forms of financial aid on student degree attainment. Specifically, it asks: What is the influence of various forms of financial aid, particularly need-based and merit grants, subsidized and unsubsidized loans, and federal work-study, on six-year degree completion? Do effects vary by income group? Similarly to the previous two research questions, salient findings will be discussed in the following section.

This study pursued a different approach, when compared to most scholarly work on persistence and degree completion, in that I used disaggregated financial aid measures and specific amounts received. For instance, I inserted three different measures for need-based grant aid (federal, state, and institutional), three measures for merit or outside grants, I distinguished between subsidized and unsubsidized federal loans, loans from other sources, federal work-study, and financial help from parents. Overall, results show that this approach seems relevant and allows for more nuanced examination of the effects of financial factors on student success. For instance, results show that even within the same aid category (need-based grants), one of three measures (in this case institutional grants) is found significant. However, when aggregated measures of the same category were inserted in the analysis<sup>18</sup> many were found not significant in predicting degree attainment. Also, when examining students from all income backgrounds

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<sup>18</sup> Results for analyses with aggregated measures are not reported here, but are available from the author upon request.

simultaneously, only few aid measures were found significant with comparatively small effects. However, examining financial aid impact by income group reveals stark differences in the type and effect size for multiple aid components, which underscores the need for more disaggregated analyses in the estimation of factors that impact student degree completion.

Assessing results for *all students* (using the average treatment effect, ATE), this study finds that only institutional need-based and merit grants positively influence students' chances to obtain a bachelor's degree. In this estimation, none of the other aid elements – federal and state grants, loans, and work-study – displayed significance. Comparing results across the three aid treatments (grants only; grants and loans; grants, loans, and work-study), I find that an additional \$1,000 in need-based institutional grants increase chances to complete a degree between .67% and .81%. An additional \$1,000 in institutional merit grants is found to raise a student's probability to graduate between .89% and .93%, which would indicate that, overall, institutional merit grants are slightly more effective to support degree attainment. However, when disaggregating aid effects by income group, results show a more nuanced picture.

Examining results for *low income* students shows that need-based grants from all sources increase chances to complete a degree within six years and that unsubsidized (federal) loans exert a strong negative influence on degree attainment. Although not significant for all measures in the third treatment estimation (grants, loans, and work-study), results in this study show that federal grant aid increases the chances for low income students to graduate between 2.52% and 2.82% for every \$1,000 in additional aid, the largest positive factor. Effects for state need-based grants are only slightly smaller, increasing the likelihood to graduate between 2.24% and 2.59%. For an additional \$1,000 in institutional need-based grants, results show that students have a 1.31% to 1.88% higher chance to obtain a baccalaureate degree. Merit grant aid from state or

institutional sources and other/outside grants are not found significant in the estimation. Federal work-study is also not found to significantly predict degree attainment, thus refutes the hypothesized relationship. However, this finding confirms results reported in a recent study which also showed not impact of the federal work-study program on student success (Scott-Clayton, 2011).

The results show that for students coming from the lowest income backgrounds, need-based grants do have a large impact on their chances to graduate. In particular, federal and state need-based grants are found most influential, with the former showing even slightly larger positive effects. These results and effect sizes confirm findings for grant aid found in the literature (Alon, 2007; Singell Jr, 2004), although these studies did not use such differentiated measures. However, it contradicts recent findings that showed no impact of grant aid on persistence rates for low income students (Herzog, 2008).

The second important finding for low income students is the result for unsubsidized loans. Results confirm the hypothesized negative influence on degree completion, as students who receive an additional \$1,000 in unsubsidized (Stafford) loans are 5.14% to 5.66% less likely to graduate within six years – the largest negative factor for all aid estimations. As elaborated in the results chapter, a \$3,000 increase in grant aid (with \$1,000 each coming from federal, state, and institutional sources) will be undone by only taking out \$1,134 in additional unsubsidized loans. Subsidized federal and loans from other sources are not found significant in the analyses.

The large detrimental effect of unsubsidized loans for low income students is even more relevant, as it is found only for this income group. As interest rates for these loans are identical for all students (since the federal government is the creditor and interest rates are fixed), identical amounts borrowed seem to have differential effects depending on students' family income



background. Liquidity constraints on the part of low income students may cause this effect and would also help explain the strong positive influence found for need-based grants, as these directly reduce the costs students pay to attend college. Also, these results provide evidence for different rates of price elasticity among students from various income backgrounds, with poorer students generally more sensitive to price changes and more affected by higher costs of borrowing. Certainly, more research is needed to explore the reason *why* this may be the case, and explore possible ways to reduce the detrimental effects reported in this study.

Results for *lower-middle and upper-middle income* students show a different picture. For these students, only institutional grant aid (need-based and merit) is found significant in the estimations. All other forms of assistance – grants, loans, and work-study – do not show significant results. For lower-middle income students, every additional \$1,000 in institutional need-based grant aid increases a student's chance to graduate between 1.77% and 2.07%. These rates are 1.36% to 1.58% for every \$1,000 increase in institutional merit grants. For their upper-middle peers, effects for institutional need-based grants are somewhat smaller and range between 1.12% and 1.81%. For every \$1,000 in additional merit grants from institutional sources, upper-middle income students' chances to obtain a bachelor's degree increase between 1.27% and 1.86%. Overall, the effects for both these groups are comparable; only institutional need-based grants are found to have a marginally larger, positive effect on lower-middle income students, as one would expect.

The results for middle income students are surprising in that only institutional aid is found influential on degree attainment. Although state merit grants are only marginally not significant for the upper-middle income group and students receiving grants and loans in their aid package, this certainly underscores the importance institutions play in the allocation and

distribution of financial aid. This finding could be interpreted as aid from federal and state sources being irrelevant for students' success. However, an alternative explanation could be that when financial aid packages are allocated at the institution, federal and state sources are used to fill most basic financial need and institutional resources are then used for students at the margin and where targeted support could make the difference between persisting and graduating, or dropping out. Certainly, more research is needed on this aspect, but the results in this study clearly speak to the importance of institutional grant support for student success.

Somewhat surprising are the results for high income students reported in chapter 4, particularly in light of recent research findings (Herzog, 2008). None of the included financial aid measures showed positive influences on degree attainment. However, for high income students receiving grants, loans, and work-study, results show that for every \$1,000 in additional state need-based grants their chances to graduate are lowered by 4.39%, certainly a surprising finding. These results substantiate the notion that high income students are most likely to graduate from college, regardless of financial aid, due to their already high availability of economic, social, and cultural capital. Given that these students receive federal and state financial support, albeit in small amounts (see Table 4.2), the question arises whether this aid could not be used more efficiently with their lower income peers.

To summarize, this study, using a quasi-experimental estimation technique to reduce endogeneity, finds financial aid to significantly impact six-year degree completion. For low income students, receiving need-based grants from all sources increases their chances to graduate, whereas unsubsidized loans exert a large negative impact on their chances to complete college. For middle income students, only institutional need-based and merit grants are found to positively influence baccalaureate degree attainment, whereas for their high income peers none

of the tested financial aid measures made a difference. The large positive effects found for the all-student estimation and state merit grants (average treatment effect for the treated, ATT), warrants further examination. However, due to sample size the ATT could not be estimated by income group.

### Implications for Policy and Practice

The results of this study have implications for educational policy at various levels and institutional practice. These implications will be discussed in the following two sections. First, I will focus on financial aid aspects and related policy, and second, I will discuss the implications of this study in fostering overall degree attainment.

#### *Financial Aid Policy Implication*

The impact of financial aid has been a major focus of this study and the results reported have implications for policy at the federal and state level, and institutional practices. Overall, this study shows that financial assistance influences six-year degree attainment for all but high income students. Particularly for low income students, need-based grants significantly increase their chances to graduate, whereas unsubsidized loans severely lower their likelihood to obtain a baccalaureate degree. For middle income students, institutional need-based and merit grants are found to exert a positive influence in student degree completion.

In reviewing the findings in this study, a number of policy recommendations can be deducted. First, one of the most evident is that the investment in form of need-based grant aid should be strengthened at the federal and state level. Given the positive effects reported for need-based grants, policy makers at the federal level should consider providing federal Pell and SEOG programs with additional resources, even beyond increases witnessed in most recent years. State

policy makers contemplating further cuts to higher education and aid programs should weigh the long-term effects on the state's economy when reducing funding for crucial need-based aid programs. Given the persistent gap in overall attainment rates by income groups and the strong positive effects reported for low income students in this study, policy makers should further consider expanding eligibility criteria to provide more need-based grants to students coming from lower-middle income backgrounds.

Second, federal policy makers should keep interest rates for subsidized loans low and shift to a targeted use of unsubsidized loans. In light of tremendous federal debt and increased spending on federal financial aid when assessing total expenditures, the discussion to raise interest rates on subsidized loans may be comprehensible. However, proposals to increase interest rates for subsidized Stafford loans close to the level of unsubsidized loans may prove not only most detrimental for lowest income students, but also more costly for the tax payer. As this study has shown, the negative effects of unsubsidized loans outweigh the positive impact of federal grant aid, roughly by a ratio of 2.25:1. Thus, for every \$2.25 spent additionally in federal grant assistance, positive effects on degree attainment for low income students are undone by borrowing just \$1 in unsubsidized loans. And with a higher risk of dropping out of college and not finishing a degree, the default risk on federal loans increases dramatically (Podgursky, Ehlert, Monroe, Watson, & Wittstruck, 2002). This is not to say that this form of aid does not have its use. Rather, federal aid policy should consider a targeted approach in the use of unsubsidized loans. Low income students, for instance, should receive only subsidized loans in addition to grant aid. Their high income peers, however, and potentially upper-middle income students should receive proportionately larger amounts of unsubsidized loans, as results in this study have shown no detrimental effects for these students. Such a targeted approach could

contribute to increasing overall degree attainment rates, while being potentially cost neutral to the tax payer.

Third, federal and state aid programs should focus on students with the highest financial need. Examining financial assistance for students from various income groups reveals that, even though in smaller amounts, high income and upper-middle income students receive need-based grant aid and unsubsidized loans. However, this support is not found to affect the likelihood of degree attainment for these students. Policy makers at the federal and state level should reconsider these practices and potentially reallocate resources to programs proven to be more effective in increasing overall degree completion.

Fourth, the institutional role in allocating and distributing aid to students should be strengthened. The positive influence of institutional grant aid on degree attainment for middle income students, while federal and state aid did not display significant effects, is a somewhat surprising finding of this study. More research is needed on the intersection of institutional aid, student success, and income. However, the direct contact of financial aid officers with students at the institution may increase their capacity to provide targeted financial aid packages for students at the margin, using federal and state aid sources in the process. If this were the case, providing institutions and financial aid officers with more leeway in using various aid sources and creating targeted aid packages depending on specific student circumstance and need, may prove beneficial to raise overall degree attainment. However, further research may also reveal that federal and state aid sources, particularly in light of dramatically increased costs of higher education, are simply insufficient for middle income students to impact persistence and degree completion.

### *Fostering Degree Attainment*

Beyond financial aid, this study examined multiple influences on degree attainment at the student and institutional level, with implications for policy and practice.

Using nationally representative data, descriptive statistics confirm a persistent attainment gap: low income students have dramatically lower chances to graduate with a baccalaureate degree when compared to their higher income peers. Specifically, high income students have a 52.6% higher six-year graduation rate than students from the lowest income backgrounds. Statistical analyses in this study further show that despite all financial aid and controlling for students' academic performance, pre-college and college experiences, and institutional factors, low income students are still significantly less likely to obtain a baccalaureate degree. This highlights the urgency to address persistent attainment gaps, particularly in light of national initiatives to raise educational attainment. In order to reach the goal of adding five million graduates by the year 2020, policy makers and administrators need to concentrate their efforts on tools that support unleashing the full potential of American society. To increase access and ultimately success not only for low income students, administrators at the postsecondary and secondary institutions need to collaborate to ensure better transition of students within the educational pipeline. To better assist those who are already attending 4-year institutions – the focus group of this study – campus administrators should a) collect more information on proven risk factors and b) subsequently use the data to design targeted student programming. Based on the results of this study, data on students' work responsibilities, family status, living arrangements, distance from home, and initial transfer inclination can be crucial to provide assistance and possibly prevent student attrition.

Such information can also be used to improve students' social integration, another factor found to support degree attainment in this study. This is particularly promising for campuses and administrators that already focus on aspects of campus and student climate, student-faculty interaction, mentoring, and other experiences intended to foster student integration. Others should follow suit.

Academic performance has long been found one of the most important predictors of student success. Affirming this relationship, this study finds first-year college GPA to be the strongest predictor of six-year degree attainment. Given the apparent pivotal role of academic performance and the process in which students assess their own academic capabilities in the first year of higher education attendance, multiple policies can be implemented to assist students. For instance, faculty teaching students in their first year and counseling staff should be made aware of the important connection between GPA and long-term student success. Furthermore, restrictions on first-year course load should be implemented/enforced and curricula designed to ease the transition from secondary to postsecondary education.

Results for institutional-level factors potentially have broader implications. First, data in this study confirms findings in the literature of the benefits of diverse learning environments. Results show that having a more diverse student population on campus may not only increase student learning, it also raises students' chances to obtain a baccalaureate degree. This information should be strongly considered in the continued discussion on affirmative action policies at the federal, state, and campus level.

Second, the findings in this study indicate that we should consider refocusing the public and scholarly discourse on the institutional impact on degree attainment. Data shows that students attending public institutions are no more or less likely to obtain a baccalaureate degree

within six years than students at private colleges or universities. Also, students attending moderately selective institutions do not have significantly different chances of degree completion, when compared to their peers attending highly selective colleges. Thus, the focus should be on how to assist low selectivity or open admission institutions to increase their overall attainment rates. For this, it is crucial not to apply a deficit perspective, as research has shown institutional performance is mostly driven by the students admitted and attending the institution (Astin & Oseguera, 2005a; DeAngelo et al., 2011). Rather, these institutions should be perceived as a resource, an opportunity and stepping stone for students into higher education. If this nation would be able to provide incentives for the best teaching faculty to serve at these colleges and provide additional resources to overcome existing performance barriers, the goal of becoming once more the number one country in degree attainment by the year 2020 is more than accomplishable.

### Future Research

In conceptualizing educational attainment as a complex phenomenon, this study drew from multiple theories and theoretical and empirical models to examine factors influencing six-year baccalaureate degree completion. The multitheoretical perspective applied allowed to identify various influential measures at the student and institutional level. Thus, this study affirms recent calls in the literature (Chen, 2008; Goldrick-Rab et al., 2009; St. John et al., 2000) to use integrated conceptual perspectives in the study of student persistence and degree completion. Beyond that, with the results reported in this study, I hope to contribute to a more integrated perspective on the influence of economic and non-economic factors on student success.



Existing scholarly work at the intersection of degree completion, financial aid, and income bears several conceptual and methodological shortcomings, some of which I sought to address in this study. Methodologically, I applied a propensity score matching, multilevel (HGLM) model to examine student-level and institutional-level influences and better account for endogeneity bias in the estimation of financial aid effects. In support of calls for more nuanced examinations of the impact of financial aid (St. John et al., 2000), I used disaggregated measures to test the effects of various sources and forms of financial aid, such as need-based and merit grants, subsidized and unsubsidized loans, and work-study. I also ran separate analyses by income groups to examine differential effects of financial aid. The results reported in this study show that not only do different forms of aid have differential effects on degree completion even within the same aid category (i.e. need-based grants), their impact also varies tremendously by income groups. Thus, the need to use more nuanced perspectives in the search for influences on student success, particularly persistence and degree completion, cannot be stressed enough.

Future research interested in the influence of financial aid on student success should also seek to model possible changes in student aid packages and incorporate a stronger longitudinal perspective, similarly to the work of DesJardins and associates (DesJardins et al., 2002). In this context, examining the potential influence of financial aid and aid packaging on time-to-degree and student learning in college are additional future research areas.

In examining only students attending 4-year institutions in a bachelor-granting degree program, this study was limited to individuals already on a successful path, as some would argue. Thus, a natural extension of this research would be to examine student-level, institutional-level, and financial aid influences on persistence and degree completion for students that transferred to another institution – an increasing part of the student population. Also, most students in the U.S.

start their postsecondary education at 2-year colleges. Following the path of these students to degree completion, whether at a 2-year or 4-year institution, and examine beneficial and detrimental factors is another promising research area, particular in light of the limited amount of scholarly work on student mobility (Arellano, Guillermo-Wann, Hurtado, & Colin, 2010).

Given the prominent influence of institutional aid found in this study, more research is needed at the college and university level. For this, scholarly work should focus on institutional policies, practices, and processes that contribute to the benefits of institutional need-based and merit-based grants for middle income students. In particular, campus financial aid policies might be a contributing factor worth further examination. Also, focusing on campus delivery processes and information distribution and accessibility, all crucial aspects in administrating financial aid, but frequently overlooked, might provide further insights into the complex interactions of financial assistance, income, and student success.

Lastly, scholars should incorporate a broader perspective, going beyond the U.S. higher education system to compare influences on student success. As Burton Clark, a pioneer in such efforts explained, cross-national comparisons are particularly advantageous in “uncovering the unique features and unconscious assumptions that possess our vision when we study only a single country, generally our own.” (Clark, 1983). Thus, examining higher education systems, elements, and processes in countries other than the U.S. may prove beneficial in rethinking and redesigning American higher education for sustained benefits at the individual and societal level.

## APPENDICES

APPENDIX A – DESCRIPTIVE STATISTICS AND CORRELATION MATRIX

**Table A-1: Descriptive Statistics**

Variable	Min	Max	Mean	S.D.
<i>Financial Aid Packages</i>				
Grants only financial aid pkg.	0	1	.25	.43
Grants and loans in financial aid pkg.	0	1	.21	.41
Grants, loans, and work-study in fin. aid pkg.	0	1	.11	.32
<i>Dependent Variable</i>				
DV - 6-year degree completion	0	1	.60	.49
<i>Student-Level Variables</i>				
Age: 19 years or older	0	1	.34	.47
Gender: Female	0	1	.56	.50
White	0	1	.70	.46
African American	0	1	.09	.28
Latino/a or Hispanic	0	1	.10	.30
Asian	0	1	.06	.23
Other Race/Ethnicity	0	1	.05	.22
English is primary language	0	1	.90	.30
Low income (<\$32,000)	0	1	.20	.40
Lower-middle income (\$32,000-\$59,999)	0	1	.24	.43
Upper-middle income (\$60,000-\$91,999)	0	1	.25	.44
High income (>\$92,000)	0	1	.31	.46
Parents own investment >\$10,000	0	1	.31	.46
<i>Parental Education</i>				
High school or less	0	1	.19	.39
Associate degree or some college	0	1	.22	.42
Bachelor's degree	0	1	.29	.45
Master's degree or higher	0	1	.30	.46
<i>Family Status</i>				
Married	0	1	.75	.43
Single parent	0	1	.04	.20
Divorced/separated/widowed	0	1	.21	.41
Sibling in college	0	1	.31	.46
Admission test scores (ACT or SAT; 100)	4.20	16.00	10.75	1.85
Earned college credits in high school	0	1	.43	.50
High school GPA	1.00	5.00	4.23	.99
Private high school attended	0	1	.15	.36
4 years of English in high school	0	1	.86	.35
4 years of Math in high school	0	1	.78	.41
<i>Education Goals</i>				
Be a community leader	0	1	.47	.50
Be financially well off	0	1	.73	.44
Live close to relatives	0	1	.41	.49

**Table A-1: Descriptive Statistics (cont.)**

Variable	Min	Max	Mean	S.D.
<i>Degree Aspirations</i>				
Bachelor's degree aspiration	0	1	.23	.42
Master's degree aspiration	0	1	.48	.50
Doctorate aspiration	0	1	.20	.40
Professional degree aspiration	0	1	.09	.28
Plan to transfer	0	1	.13	.34
Distance institution from home (log)	0	9.42	4.22	1.64
Did not work (excl. work-study)	0	1	.54	.50
1-10 hours working (excl. work-study)	0	1	.14	.35
11-20 hours working (excl. work-study)	0	1	.17	.38
20+ hours working (excl. work-study)	0	1	.14	.35
Job related to major	0	1	.07	.25
Parents expected to get a job	0	1	.27	.45
Consulted a ranking	0	1	.47	.50
First choice school accepted	0	1	.86	.35
Considered graduation rate in choice	0	1	.54	.50
Applied to 6 or more institutions	0	1	.19	.39
Chose institution b/c of location	0	1	.77	.42
Chose institution b/c of coursework	0	1	.62	.48
Chose institution b/c of reputation	0	1	.65	.48
Chose institution for personal/family reasons	0	1	.44	.50
<i>Volunteering</i>				
No volunteering	0	1	.54	.50
1-10 hours volunteering	0	1	.32	.47
11-20 hours volunteering	0	1	.08	.27
20+ hours volunteering	0	1	.06	.23
Live on campus	0	1	.68	.46
Freq. of classes attended taught by TA	0	2	.68	.76
Freq. of large lectures attended	0	2	1.16	.78
Freq. wrote papers for courses	0	2	1.69	.50
Academic integration index	0	20	8.91	4.12
Social integration index	0	20	6.66	5.20
Major declared	0	1	.73	.44
GPA in first year	0	40	29.20	7.75
Any remedial courses taken	0	1	.16	.37
Unmet need (after EFC and all aid)	0	46.34	3.12	5.64
Federal need-based grants (Pell, SEOG, other)	0	8.05	.92	1.67
State need-based grants	0	10.00	.59	1.41
Institutional need-based grants	0	20.00	1.29	3.40
State non-need and merit grants	0	10.00	.22	.83
Institutional non-need and merit grants	0	21.76	1.41	3.23
Outside grants (private and employer)	0	23.50	.57	1.59

**Table A-1: Descriptive Statistics (cont.)**

Variable	Min	Max	Mean	S.D.
Federal subsidized loans (Stafford and Perkins)	0	7.50	1.13	1.59
Stafford unsubsidized loans	0	6.63	.53	1.15
State loans	0	13.20	.02	.33
Private (alternative) loans	0	31.78	.37	1.70
Federal work-study	0	6.00	.31	.76
Help from parents - pay housing	0	1	.56	.50
Help from parents - pay living expenses	0	1	.65	.48
Help from parents - pay tuition & fees	0	1	.70	.46
<b>Institutional-Level Variables</b>				
Public Institution	0	1	.64	.48
Private Institution	0	1	.36	.47
High selectivity	0	1	.29	.45
Middle selectivity	0	1	.56	.50
Low selectivity	0	1	.09	.29
Other (open admission; for-profit)	0	1	.06	.24
HBCU	0	1	.03	.16
HSI	0	1	.06	.24
Institutional size: Enrollment (log)	3.99	10.82	9.01	1.14
Pct. minority enrollment	0.07	100.00	25.41	23.23
Pct. of part-time enrollment	0.21	93.98	14.81	11.12
Pct. students receiving federal grant aid	5.00	95.00	28.52	15.76
Pct. students receiving state/local grants	0	96.00	32.81	21.19
Pct. student receiving institutional grants	0	100.00	45.94	28.04
Pct. students receiving loans	0	100.00	49.68	18.46
Income (aggregate)	7.45	13.09	10.91	.52
Transfer plans (aggregate)	0.00	100.00	13.25	12.84
Academic integration index (aggregate)	0.00	20.00	8.92	1.80
Social integration index (aggregate)	0.00	20.00	6.63	2.57
Hours student volunteering (aggregate)	0.00	5.00	1.02	.49
Price of attendance (log)	8.11	10.78	9.74	.42
Institutional tuition discount rate	6.84	10.54	8.89	.77
Tuition and fees as a pct. of core revenues	1.00	100.00	38.43	22.56
Core expenditures per FTE student (log)	8.47	13.55	9.84	.53
Share of faculty full-time	4.23	100.00	57.24	20.82
Student services share of education and related expenses	0.01	43.90	11.57	6.00
Academic and institutional support share of education and related expenses	8.99	83.09	33.86	8.80
Full-time executive/admin. staff per 100 FTE	-3.77	4.59	.15	.74

**Table A-2: Correlation Matrix**

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 6-yr Degree Attainm.	1															
2 Age: 19+ years	-0.63	1														
3 Gender: Female	0.90	-0.97	1													
4 African American (White)	-0.98	-0.39	0.17	1												
5 Latino/a or Hispanic (White)	-0.94	-0.36	0.10	-1.03	1											
6 Asian (White)	0.28	-0.29	-0.08	-0.76	-0.83	1										
7 Other Race/Ethnicity (White)	-0.42	-0.30	0.12	-0.71	-0.78	-0.58	1									
8 White (Ref.)	1.28	0.77	-0.19	-4.71	-5.17	-3.92	-3.59	1								
9 English is primary language	0.49	0.39	-0.04	0.61	-4.19	-3.30	0.09	4.04	1							
10 Parental educ: HS or less (BA)	-1.08	0.02	0.24	0.70	1.66	0.64	-0.17	-1.77	-1.78	1						
11 Parental educ: AA degree (BA)	-0.76	-0.03	0.42	0.93	0.14	-0.67	0.09	-0.36	0.36	-2.59	1					
12 Parental educ: BA degree (Ref.)	0.41	0.04	-0.10	-0.64	-0.72	-0.07	0.10	0.86	0.53	-3.09	-3.43	1				
13 Parental educ: MA or higher (BA)	1.21	-0.04	-0.49	-0.81	-0.84	0.13	-0.03	0.99	0.68	-3.14	-3.49	-4.16	1			
14 Parents: Married (Ref.)	1.39	0.05	-0.24	-2.25	-1.08	0.93	-0.16	1.70	0.31	-1.35	-0.68	0.54	1.25	1		
15 Parents: Single parent (Married)	-0.92	-0.28	0.12	0.38	0.47	-0.34	-0.20	-1.93	-0.22	0.81	0.60	-0.55	-0.70	-3.60	1	
16 Parents: Div./sep./wid. (Married)	-1.03	0.08	0.19	0.89	0.92	-0.82	0.27	-0.86	-0.23	1.05	0.43	-0.30	-0.99	-8.89	-1.07	1
17 Sibling in college	0.72	-0.36	-0.21	-0.42	-0.55	0.20	0.03	0.51	0.29	-0.64	-0.82	0.40	0.90	0.93	-0.69	-0.65
18 Admission test scores	2.81	-0.28	-0.84	-2.82	-1.62	0.61	-0.09	2.50	1.25	-2.59	-1.19	-0.74	0.74	2.54	1.75	-1.60
19 High school GPA	2.69	-0.33	-1.19	-1.45	-0.95	0.53	0.00	1.24	0.49	-1.12	-0.33	0.38	0.88	1.11	-1.23	-0.58
20 Earned college credits in HS	1.67	-0.26	0.52	-0.99	-0.26	0.75	0.08	0.36	-0.16	-1.10	-0.55	0.05	1.40	0.80	-0.51	-0.60
21 Private HS attended	0.37	0.25	-0.21	-0.35	0.24	-0.08	0.22	0.00	0.02	-0.74	-0.70	0.57	0.71	0.48	-0.30	-0.36
22 4 yrs of English in HS	0.63	0.09	0.34	-0.06	-0.63	-0.26	0.07	0.55	0.61	-0.44	0.00	0.12	0.26	0.30	-0.13	-0.26
23 4 yrs of Math in HS	1.74	-0.09	0.05	0.62	-0.70	0.72	-0.14	0.54	-0.13	-1.33	-0.38	0.55	0.94	0.94	-0.38	-0.81
24 Low income (<\$32k) (High)	-1.41	0.16	0.17	2.15	2.07	1.01	-0.04	-3.19	-2.59	2.51	0.74	-0.96	-1.87	-3.55	2.16	2.72
25 Low-mid income (\$32-\$59k) (High)	-0.48	0.04	0.38	0.17	0.09	0.00	0.13	-0.22	-0.05	0.86	0.78	-0.14	-1.30	-1.16	0.44	1.22
26 Up-mid income (\$60-\$91k) (High)	0.28	-0.16	-0.10	-0.67	-0.81	-0.48	0.03	1.17	1.01	-0.64	0.22	0.40	-0.05	1.73	-0.89	-1.40
27 High income (>\$92k) (Ref.)	1.41	-0.03	-0.40	-1.38	-1.12	-0.42	-0.14	-1.87	1.35	2.38	-1.57	0.59	2.88	2.52	-1.07	-2.47
28 Parents own investment >\$10k	0.77	0.21	-0.46	-1.42	-1.03	-0.06	0.14	1.64	1.04	-1.14	-0.78	0.28	1.42	1.54	-0.89	-1.20
29 Bachelor's degree aspiration (Ref.)	-0.95	0.10	-0.68	-0.36	-0.13	-0.35	-0.33	0.64	0.40	0.63	0.32	0.46	-1.29	0.12	-0.02	-0.11
30 Master's degree aspiration (BA)	0.01	0.11	0.25	-0.02	-0.11	-0.28	-0.02	0.23	0.31	-0.03	-0.02	0.07	-0.02	0.11	-0.04	-0.09
31 Doctorate aspiration (BA)	0.62	-0.09	0.18	0.49	0.32	0.06	0.09	-0.59	-0.48	-0.38	-0.11	-0.42	0.84	-0.44	0.18	0.38
32 Prof. degree aspiration (BA)	0.53	-0.22	0.31	-0.12	-0.08	0.92	0.40	-0.54	-0.48	-0.35	-0.28	-0.21	0.77	0.25	-0.15	-0.19
33 Goal: Be a community leader	-0.17	0.44	-0.51	0.95	0.22	-0.31	0.07	-0.60	0.21	0.30	-0.24	-0.24	0.20	-0.19	0.31	0.05
34 Goal: Be financially well off	-0.81	0.05	-0.76	1.31	0.65	0.74	0.12	-1.67	-0.60	0.82	0.25	-0.30	-0.63	-0.62	0.73	0.30
35 Goal: Live close to relatives	-0.15	0.00	0.79	-0.32	0.42	0.57	0.21	-0.47	-0.63	0.60	0.39	-0.13	-0.74	0.49	0.04	-0.54
36 Consulted a ranking	1.10	-0.29	0.09	-0.11	-0.27	0.33	0.10	0.04	0.21	-1.02	-0.70	0.00	1.51	0.54	-0.22	-0.46
37 Considered grad. rate	0.86	-0.07	0.11	-0.47	-0.44	-0.41	-0.13	0.85	0.43	-0.67	-0.16	0.00	0.72	0.54	-0.64	-0.26
38 Applied to 6+ institutions	0.64	-0.41	0.15	0.43	-0.08	0.94	0.08	-0.73	-0.11	-0.60	-0.72	-0.10	1.27	0.15	0.07	-0.19
39 Chose instit. b/c of coursework	0.73	-0.17	-0.13	-0.33	-0.25	-0.36	-0.01	0.55	0.48	-0.44	-0.23	0.11	0.48	0.03	-0.24	0.08
40 Chose instit. b/c of reputation	1.38	0.04	-0.10	-0.68	-0.32	-0.15	-0.31	0.85	0.33	-0.66	-0.48	0.12	0.88	0.81	-0.52	-0.60
41 Chose instit. b/c of location	0.25	0.26	0.32	-0.38	-0.19	-0.12	-0.02	0.43	0.12	-0.18	0.02	-0.10	0.24	0.00	0.11	-0.05
42 1st choice school accepted	-0.25	0.65	0.34	-0.20	-0.05	-1.02	-0.17	0.76	0.41	0.28	0.20	0.22	-0.64	0.14	-0.02	-0.14
43 Plan to transfer	-1.95	0.09	0.15	0.52	-0.17	0.60	0.28	-0.65	-0.19	0.34	0.16	0.15	0.59	-0.38	0.17	0.32
44 Chose instit. for pers./family reas.	0.10	0.01	0.48	-0.30	-0.25	0.34	0.10	0.13	0.08	-0.17	-0.25	0.06	0.31	0.24	-0.42	-0.05
45 Parents expected to get a job	-0.92	0.05	0.22	-0.61	0.12	-0.46	-0.12	0.59	0.01	0.81	0.46	-0.19	-0.92	-0.46	-0.13	0.55
46 Chose inst. for financial reason	0.49	-0.04	0.12	-0.45	-0.16	0.02	-0.10	0.43	0.08	-0.15	0.14	0.09	-0.09	0.08	-0.25	0.04
47 Live on campus	2.26	-0.07	0.17	0.01	-2.20	-0.58	-0.39	1.93	2.08	-1.61	-0.62	0.51	1.44	0.64	-0.42	-0.45
48 Acad. integration index	0.87	0.02	0.61	-0.62	-0.24	-0.23	0.25	0.22	0.19	-0.39	-0.26	0.06	0.51	-0.06	-0.02	0.07
49 Freq. classes attended by TA	0.44	0.05	-0.60	-0.24	-0.18	0.48	0.40	-0.17	-0.33	-0.48	-0.30	0.10	0.58	0.25	-0.22	-0.21
50 Freq. large lectures attended	0.57	-0.28	0.00	-0.10	-0.10	0.91	0.32	-0.49	-0.40	-0.62	-0.10	0.06	0.55	0.35	-0.48	-0.14
51 Freq. wrote papers for courses	0.06	-0.41	0.92	0.37	-0.68	-0.28	0.05	0.34	0.23	-0.13	0.33	-0.22	0.03	-0.05	-0.13	0.12
52 Social integration index	1.60	-0.19	-0.30	-0.14	-0.97	-0.46	-0.07	1.00	1.05	-1.42	-0.70	0.19	1.66	0.51	-0.16	-0.46
53 No volunteering	-0.90	-0.01	-0.74	0.24	0.50	0.07	0.03	-0.53	-0.68	0.78	-0.47	-0.22	-0.88	-0.73	0.34	0.61
54 1-10 hrs volunteering (no volunt.)	0.93	-0.03	0.54	-0.70	-0.72	-0.10	-0.14	1.02	0.74	-0.82	-0.62	0.31	0.96	0.78	-0.53	-0.58
55 11-20 hrs volunteering (no volunt.)	0.17	-0.02	0.33	0.10	0.39	-0.01	0.15	-0.39	0.00	-0.13	0.03	-0.07	0.15	0.04	0.13	-0.11
56 20+ hrs volunteering (no volunt.)	-0.14	0.10	0.11	0.75	-0.09	0.04	0.02	0.43	-0.04	0.12	0.19	-0.07	-0.20	-0.06	0.18	-0.02
57 Major declared	-0.23	0.14	0.13	0.79	-0.28	-0.30	-0.12	-0.08	0.48	0.39	0.71	0.09	-1.07	-0.31	-0.01	0.34
58 Job related to major	-0.12	0.35	0.31	-0.26	-0.03	0.22	-0.31	0.22	-0.17	0.41	0.17	-0.14	-0.36	0.21	0.07	-0.26
59 GPA in first year	3.78	-0.24	1.56	-1.00	-0.84	0.35	-0.45	1.21	0.16	-1.06	-0.34	0.19	1.03	1.37	-0.78	-1.08
60 Any remedial courses taken	-0.52	-0.05	0.67	0.81	0.20	-0.11	-0.13	0.50	-0.27	0.68	0.41	-0.18	-0.77	-0.60	0.33	0.48
61 Not working (Ref.)	1.08	-0.27	-0.39	0.41	-0.09	0.39	-0.03	-0.37	-0.14	-0.72	-0.30	0.03	0.86	0.24	0.10	-0.31
62 1-10 hrs working (not working)	0.62	-0.03	0.40	-0.69	-0.47	0.02	0.05	0.70	0.36	-0.37	-0.44	0.50	0.22	0.52	-0.14	-0.38
63 11-20 hrs working (not working)	-0.53	0.05	0.14	0.11	0.11	0.04	-0.20	-0.02	-0.21	0.38	0.13	-0.06	-0.38	-0.07	-0.03	0.09
64 20+ hrs working (not working)	-1.57	0.35	0.01	-0.01	0.49	-0.54	0.22	-0.15	0.05	0.99	0.73	-0.49	-1.03	-0.78	0.23	0.72
65 Distance from home	-1.27	-0.03	0.07	-0.32	-1.32	-0.52	0.01	1.33	1.52	-1.43	-0.67	0.47	1.36	0.56	-0.35	-0.42
66 Fed. need-based grants	-1.01	-0.02	0.22	2.20	2.15	1.00	-0.01	-3.28	-2.66	2.70	0.84	-0.88	-2.21	-3.39	2.05	2.60
67 State need-based grants	-0.01	-0.28	0.22	0.90	0.74	0.94	-0.18	-1.44	-1.27	1.44	0.65	-0.51	-1.31	-1.62	1.25	1.12
68 Inst. need-based grants	0.87	0.01	0.20	0.55	-0.07	0.51	0.01	-0.56	-0.15	0.07	-0.01	-0.12	0.06	-0.51	0.34	0.38
69 State merit grants	0.40	-0.22	-0.06	0.23	-0.41	-0.03	-0.04	0.17	0.41	-0.10	-0.01	0.07	0.02	0.04	-0.19	0.05
70 Inst. merit grants	1.20	-0.13	0.41	-0.37	-0.73	-0.23	-0.33	0.98	0.56	-0.63	-0.18	0.12	0.58	0.58	-0.42	-0.41
71 Outside grants	0.93	0.15	0.43	-0.01	-0.19	-0.23	0.26	0.12	0.52	0.16	-0.18	-0.20	0.23	-0.08	0.00	0.08
72 Federal subsid. loans	-0.50	0.06	-0.07	1.43	-0.17	-0.05	0.15	-0.81	0.05	1.30	1.11	-0.63	-1.50	-1.99	1.05	1.60
73 Stafford unsubsid. loans	-0.63	-0.16	-0.18	1.49	-0.40	-0.82	-0.16	-0.15	0.93	0.01	0.57	-0.29	-0.24	-0.10	0.57	-0.17
74 State loans	-0.01	0.02	-0.09	-0.20	0.07	-0.05	0.13	0.04	0.03	-0.17	0.50	-0.10	-0.20	-0.37	-0.04	0.41
75 Private (altern.) loans	-0.16	-0.11	-0.13	0.10	-0.38	-0.01	0.01	0.20	0.34	-0.04	0.68	-0.35	-0.24	-0.03	0.00	0.03
76 Federal work-study	0.29	-0.20	0.29	0.21	0.07	0.24	-0.09	-0.26	-0.21	0.41	0.21	0.07	-0.62	-0.83	0.24	0.77
77 Help f. parents - housing	1.50	-0.29	-0.08	-0.83	-1.48	-0.54	0.02	1.76	1.82	-2.09	-1.04	0.72	2.02	1.60	-1.11	-1.20
78 Help f. parents - living expenses	0.74	-0.44	-0.22	0.35	0.00	0.09	0.18	-0.35	0.15	-0.62	-0.35	0.06	0.79	0.57	-0.31	-0.46
79 Help f. parents - tuition & fees	0.91	-0.33	-0.08	-1.19	-1.26	-0.09	0.02	1.60	1.33	-1.63	-0.85	0.71	1.46	1.76	-1.15	-1.3



**Table A-2: Correlation Matrix (cont.)**

Variable	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1 6-yr Degree Attainm.	0.72	0.281	0.269	0.167	0.037	0.063	0.174	-0.141	-0.048	0.028	0.141	0.077	-0.095	0.001	0.62	0.53
2 Age: 19+ years	-0.036	-0.028	-0.033	-0.026	0.025	0.009	-0.009	0.016	0.04	-0.016	-0.003	0.021	0.10	0.11	-0.009	-0.022
3 Gender: Female	0.021	-0.084	0.119	0.052	-0.021	0.034	0.005	0.017	0.038	-0.010	-0.040	-0.046	-0.068	0.025	0.18	0.31
4 African American (White)	-0.042	-0.282	-0.145	-0.099	-0.035	-0.006	-0.062	0.215	0.17	-0.067	-0.138	-0.142	-0.036	-0.002	0.49	-0.12
5 Latino/a or Hispanic (White)	-0.055	-0.162	-0.095	-0.026	0.024	-0.063	-0.070	0.207	0.09	-0.081	-0.112	-0.103	-0.013	-0.111	0.32	-0.08
6 Asian (White)	0.020	0.061	0.053	0.075	-0.008	-0.026	0.072	0.101	0.00	-0.048	-0.042	-0.006	-0.035	-0.028	0.06	0.92
7 Other Race/Ethnicity (White)	0.003	-0.009	0.000	0.008	0.022	0.027	-0.014	-0.001	0.013	0.003	-0.014	-0.014	-0.033	-0.002	0.09	0.40
8 White (Ref.)	0.51	0.250	0.124	0.036	0.000	0.055	0.054	-0.319	-0.022	0.117	0.077	0.164	0.064	0.223	0.059	-0.54
9 English is primary language	0.029	0.125	0.049	-0.016	0.002	0.061	-0.013	0.259	0.005	0.101	0.135	0.104	0.040	0.031	0.48	-0.48
10 Parental educ: HS or less (BA)	-0.064	-0.259	-0.112	-0.110	-0.074	-0.044	-0.133	0.251	0.086	-0.064	-0.238	-0.114	0.063	-0.003	0.38	-0.35
11 Parental educ: AA degree (BA)	-0.082	-0.119	-0.033	-0.055	-0.070	0.000	-0.038	0.074	-0.078	0.022	-0.157	-0.078	0.032	-0.002	-0.11	-0.28
12 Parental educ: BA degree (Ref.)	0.40	0.074	0.038	0.005	0.057	0.12	0.055	-0.096	-0.114	0.040	0.059	0.028	0.046	0.007	-0.42	-0.21
13 Parental educ: MA or higher (BA)	0.090	0.254	0.088	0.140	0.071	0.026	0.094	-0.187	-0.130	-0.005	0.288	0.142	-0.129	-0.002	0.84	0.77
14 Parents: Married (Ref.)	0.093	0.175	0.111	0.080	0.048	0.030	0.094	-0.355	-0.116	0.173	0.252	0.154	0.12	0.11	-0.44	0.25
15 Parents: Single parent (Married)	-0.069	-0.160	-0.123	-0.051	-0.030	-0.013	-0.038	0.216	0.04	-0.089	-0.107	-0.089	-0.002	-0.004	0.18	-0.15
16 Parents: Div./sep./wid. (Married)	-0.065	-0.108	-0.058	-0.060	-0.036	-0.026	-0.081	0.272	0.122	-0.140	-0.217	-0.120	-0.11	-0.009	0.38	-0.19
17 Sibling in college	1	0.34	0.23	-0.009	0.025	-0.016	0.030	-0.099	-0.050	0.12	0.121	0.062	0.04	-0.002	-0.11	0.13
18 Admission test scores	0.34	1	0.410	0.376	0.080	0.076	0.331	-0.266	-0.068	0.062	0.230	0.149	-0.135	-0.031	0.97	0.18
19 High school GPA	0.23	0.410	1	0.268	-0.011	0.143	0.274	-0.131	-0.057	0.071	0.100	0.039	-0.099	-0.026	0.71	0.93
20 Earned college credits in HS	-0.009	0.376	0.268	1	-0.006	0.033	0.208	-0.096	-0.038	0.15	0.104	0.058	-0.123	-0.006	0.90	0.68
21 Private HS attended	0.25	0.080	-0.011	-0.006	1	-0.006	0.46	-0.061	-0.023	-0.014	0.087	0.088	-0.027	0.008	0.03	0.22
22 4 yrs of English in HS	-0.016	0.076	0.143	0.033	-0.006	1	0.84	-0.039	0.16	-0.014	0.033	0.00	-0.008	-0.003	0.12	0.01
23 4 yrs of Math in HS	0.030	0.331	0.274	0.208	0.046	0.084	1	-0.100	-0.063	0.026	0.121	0.061	-0.097	0.005	0.50	0.67
24 Low income (<\$32k) (High)	-0.095	-0.266	-0.131	-0.096	-0.061	-0.039	-0.100	1	-0.281	-0.292	-0.129	0.020	-0.036	-0.028	-0.06	0.67
25 Low-mid income (\$32-\$59k) (High)	-0.050	-0.068	-0.057	-0.038	-0.023	0.016	0.063	-0.281	1	-0.328	-0.373	-0.094	0.038	-0.003	-0.13	-0.32
26 Up-mid income (\$60-\$91k) (High)	0.12	0.062	0.071	0.015	0.014	-0.014	0.026	-0.292	-0.328	1	-0.387	0.18	-0.002	0.15	-0.04	-0.16
27 High income (>\$92k) (Ref.)	0.121	0.230	0.100	0.04	0.087	0.033	0.121	-0.332	-0.373	-0.387	1	0.182	-0.050	0.20	-0.07	0.50
28 Parents own investment >\$10k	0.62	0.149	0.039	0.058	0.088	0.000	0.061	-0.129	-0.094	-0.108	0.182	1	-0.028	0.002	-0.05	0.45
29 Bachelor's degree aspiration (Ref.)	0.04	-0.135	-0.099	-0.123	-0.027	-0.008	-0.097	0.020	0.038	-0.002	-0.050	-0.028	1	-0.531	-0.272	-0.172
30 Master's degree aspiration (BA)	-0.002	-0.031	-0.026	-0.006	0.008	-0.003	0.005	-0.036	-0.003	0.015	0.020	0.02	-0.531	1	-0.477	-0.302
31 Doctorate aspiration (BA)	-0.011	0.097	0.071	0.090	0.003	0.12	0.050	0.028	-0.013	-0.004	-0.007	-0.005	-0.272	-0.477	1	-0.154
32 Prof. degree aspiration (BA)	0.13	0.118	0.093	0.068	0.022	0.01	0.067	-0.006	-0.032	-0.016	0.050	0.045	-0.172	-0.302	-0.154	1
33 Goal: Be a community leader	-0.004	-0.058	-0.003	0.023	0.017	-0.006	-0.012	0.034	0.002	-0.043	0.009	-0.015	-0.087	-0.003	0.76	0.29
34 Goal: Be financially well off	-0.035	-0.201	-0.064	-0.080	-0.024	-0.026	-0.040	0.089	-0.015	-0.026	-0.039	-0.003	-0.008	-0.004	-0.17	0.41
35 Goal: Live close to relatives	0.017	-0.109	0.012	-0.026	-0.014	0.003	-0.023	0.034	0.008	-0.038	-0.001	0.002	0.006	0.024	-0.43	0.09
36 Consulted a ranking	0.005	0.210	0.108	0.161	0.084	0.028	0.116	-0.059	-0.030	-0.054	0.130	0.071	-0.096	-0.016	0.72	0.71
37 Considered grad. rates	-0.016	0.096	0.082	0.055	0.053	0.026	0.045	-0.064	-0.048	0.015	0.087	0.020	-0.039	-0.009	0.55	-0.04
38 Applied to 6+ institutions	-0.012	0.135	0.067	0.079	0.09	0.002	0.089	-0.023	-0.063	-0.047	0.124	0.042	-0.072	-0.036	0.72	0.71
39 Chose inst. b/c of coursework	-0.009	0.058	0.043	0.067	0.003	0.003	0.043	-0.029	-0.035	-0.020	0.039	0.029	-0.028	0.016	0.002	0.12
40 Chose inst. b/c of reputation	0.017	0.157	0.119	0.091	0.019	0.045	0.04	-0.080	-0.036	0.016	0.087	0.069	-0.059	-0.003	0.33	0.46
41 Chose inst. b/c of location	0.025	-0.002	0.004	-0.017	-0.015	0.034	0.013	0.002	0.010	0.006	0.017	-0.009	0.018	-0.025	0.15	0.15
42 1st choice school accepted	-0.007	-0.060	0.016	-0.024	-0.012	0.019	-0.02	-0.001	0.030	-0.046	-0.031	0.04	0.33	-0.052	-0.35	0.72
43 Plan to transfer	0.10	-0.122	-0.044	-0.064	0.012	-0.016	-0.027	0.057	0.012	-0.011	-0.050	-0.009	-0.020	0.018	0.00	0.02
44 Chose inst. for pers./family reas.	0.022	0.01	-0.010	0.014	-0.001	0.004	0.017	-0.022	0.004	0.034	-0.017	0.013	-0.046	-0.031	0.00	0.13
45 Parents expected to get a job	-0.029	-0.082	-0.063	-0.053	-0.007	-0.008	-0.069	-0.004	0.080	0.038	-0.107	-0.054	-0.033	0.029	-0.36	-0.49
46 Chose inst. for financial reason	0.10	0.060	0.071	0.054	-0.034	0.029	0.041	-0.045	0.044	0.044	-0.044	-0.036	-0.031	-0.012	0.39	0.12
47 Live on campus	0.47	0.236	0.150	0.077	0.040	0.045	0.116	-0.161	-0.058	-0.028	0.166	0.073	-0.033	-0.026	0.39	0.41
48 Acad. integration index	0.16	-0.018	0.047	0.043	0.026	-0.008	0.056	-0.003	-0.026	-0.011	0.037	0.013	-0.119	-0.026	0.115	0.62
49 Freq. classes attended by TA	0.36	0.052	0.066	0.079	-0.040	0.030	0.040	-0.024	-0.040	-0.006	0.052	0.030	-0.031	-0.021	0.16	0.61
50 Freq. large lectures attended	0.027	0.101	0.128	0.136	-0.044	0.026	0.075	-0.038	-0.022	0.020	0.033	0.032	-0.036	-0.047	0.35	0.87
51 Freq. wrote papers for courses	0.18	-0.072	-0.028	-0.051	0.026	-0.005	-0.020	-0.012	0.038	-0.031	0.004	-0.002	-0.043	0.020	0.09	0.16
52 Social integration index	0.33	0.178	0.109	0.137	0.047	0.032	0.102	-0.096	-0.066	0.031	0.116	0.075	-0.123	-0.022	0.19	0.56
53 No volunteering	-0.020	-0.151	-0.129	-0.129	-0.050	-0.030	-0.096	0.077	0.031	-0.011	-0.085	-0.046	0.090	-0.001	-0.59	-0.50
54 1-10 hrs volunteering (no volunt.)	0.022	0.166	0.116	0.121	0.044	0.024	0.098	-0.082	-0.033	-0.011	0.092	0.059	-0.069	0.013	0.29	0.40
55 11-20 hrs volunteering (no volunt.)	-0.009	0.31	0.40	0.26	0.15	0.16	0.019	-0.001	-0.005	0.004	0.001	-0.003	-0.050	-0.006	0.42	0.25
56 20+ hrs volunteering (no volunt.)	0.10	-0.046	-0.003	0.002	0.002	-0.001	-0.013	0.000	0.006	-0.003	-0.002	-0.017	0.005	-0.016	0.17	-0.03
57 Major declared	-0.028	-0.106	-0.018	-0.036	-0.037	-0.029	-0.048	0.10	0.050	0.001	-0.057	-0.041	0.037	-0.016	-0.004	-0.23
58 Job related to major	-0.002	-0.060	0.005	-0.013	-0.003	0.000	0.008	-0.005	0.025	-0.005	-0.014	0.021	0.029	-0.008	-0.008	-0.17
59 GPA in first year	0.44	0.359	0.072	0.245	0.027	0.065	0.203	-0.137	-0.023	0.033	0.095	0.029	-0.139	0.022	0.00	0.72
60 Any remedial courses taken	0.17	-0.250	-0.111	-0.104	-0.022	-0.020	-0.104	0.056	0.025	0.019	-0.090	-0.039	0.022	0.014	-0.20	-0.30
61 Not working (Ref.)	0.38	0.110	0.073	0.059	0.022	0.021	0.065	0.011	-0.059	-0.039	0.082	0.026	-0.030	-0.017	0.25	0.39
62 1-10 hrs working (not working)	0.026	0.072	0.047	0.042	0.039	0.020	0.052	-0.064	0.000	0.044	0.013	0.040	-0.017	0.013	-0.007	0.12
63 11-20 hrs working (not working)	-0.033	-0.070	-0.041	-0.028	-0.027	-0.039	-0.042	0.026	0.014	0.010	-0.046	-0.033	0.013	0.021	-0.017	-0.33
64 20+ hrs working (not working)	-0.044	-0.154	-0.105	-0.096	-0.042	-0.007	-0.098	0.020	0.068	0.001	-0.081	-0.042	0.045	-0.012	-0.10	-0.31
65 Distance from home	0.49	0.223	0.136	0.105	0.037	0.042	0.090	-0.139	-0.054	-0.017	0.154	0.099	-0.039	-0.008	0.25	0.36
66 Fed. need-based grants	-0.045	-0.273	-0.119	-0.090	-0.071	-0.022	-0.113	0.680	0.22	-0.302	-0.361	-0.183	0.018	-0.045	0.42	-0.05
67 State need-based grants	-0.025	-0.103	0.002	-0.003	-0.053	-0.005	-0.019	0.256	0.123	-0.106	-0.236	-0.137	-0.014	-0.007	0.35	-0.16
68 Inst. need-based grants	0.005	0.134	0.075	0.064	0.033	0.022	0.036	0.024	0.076	-0.012	-0.080	-0.072	-0.071	-0.028	0.79	0.45
69 State merit grants	0.04	0.087	0.101	0.049	-0.021	-0.002	0.053	-0.020	-0.011	0.045	-0.016	0.003	-0.022	0.025	0.25	0.44
70 Inst. merit grants	0.001	0.225	0.141	0.096	0.040	0.030	0.077	-0								

**Table A-2: Correlation Matrix (cont.)**

Variable	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
1 6-yr Degree Attainm.	0.17	-0.081	-0.015	.110	0.086	0.064	0.073	.138	0.025	-0.025	-0.195	0.10	-0.092	0.049	0.226	0.087
2 Age: 19+ years	0.44	0.005	0.000	-0.029	-0.007	-0.041	-0.017	0.004	0.026	0.065	0.009	0.001	0.005	-0.004	-0.007	0.002
3 Gender: Female	-0.51	-0.076	0.079	0.009	0.11	0.15	-0.13	-0.10	0.032	0.034	0.15	0.048	0.022	0.12	0.17	0.061
4 African American (White)	0.95	.131	-0.032	-0.11	-0.047	0.43	-0.033	-0.068	-0.038	-0.020	0.52	-0.030	-0.061	-0.046	0.01	0.062
5 Latino/a or Hispanic (White)	0.22	0.065	0.042	-0.027	-0.044	-0.008	-0.025	-0.032	-0.019	-0.005	-0.017	-0.025	0.12	-0.16	-0.20	-0.024
6 Asian (White)	-0.31	0.074	0.057	0.033	-0.041	0.94	-0.036	-0.015	-0.012	-0.102	0.60	0.034	-0.046	0.002	-0.058	-0.025
7 Other Race/Ethnicity (White)	0.07	0.012	0.021	0.10	-0.13	0.008	-0.001	0.011	-0.002	-0.117	0.28	0.10	-0.12	-0.10	-0.039	0.025
8 White (Ref.)	-0.60	-0.167	-0.047	0.004	0.085	0.27	0.055	0.085	0.043	0.076	-0.065	0.13	0.059	0.043	0.193	-0.022
9 English is primary language	0.21	-0.060	-0.063	0.021	0.043	-0.11	0.048	0.033	0.12	0.041	-0.19	0.008	0.01	0.008	0.208	0.019
10 Parental educ. HS or less (BA)	0.30	0.082	0.060	-0.102	-0.067	-0.060	-0.044	-0.066	-0.018	0.028	0.034	-0.017	0.081	-0.15	-0.161	-0.039
11 Parental educ. AA degree (BA)	-0.24	0.025	0.039	-0.070	-0.16	-0.072	-0.023	-0.048	0.002	0.020	0.16	-0.025	0.046	-0.14	-0.062	-0.026
12 Parental educ. BA degree (Ref.)	-0.24	-0.030	-0.13	0.000	0.000	-0.10	0.11	0.12	-0.10	0.022	0.15	0.006	-0.19	0.009	0.051	0.006
13 Parental educ. MA or higher (BA)	0.20	-0.063	-0.074	0.151	0.072	0.127	0.048	0.088	0.024	-0.064	-0.059	0.031	-0.092	-0.009	0.144	0.051
14 Parents: Married (Ref.)	-0.19	-0.062	-0.049	0.054	0.054	0.15	0.003	0.081	0.000	0.14	-0.038	0.024	-0.046	0.008	0.064	-0.006
15 Parents: Single parent (Married)	0.31	0.073	0.004	-0.022	-0.064	0.07	-0.024	-0.052	0.11	-0.002	0.17	-0.042	-0.13	-0.025	-0.047	-0.002
16 Parents: Div./sep./wid. (Married)	0.05	0.030	-0.054	-0.046	-0.06	-0.19	0.008	-0.060	-0.005	-0.14	0.032	-0.005	0.055	0.004	-0.045	0.007
17 Sibling in college	-0.04	-0.035	0.017	0.005	-0.16	-0.12	-0.009	0.17	0.025	-0.007	0.10	0.022	-0.029	0.10	0.47	0.016
18 Admission test scores	-0.58	-0.201	-0.109	0.210	0.096	0.135	0.058	0.157	-0.002	-0.060	-0.122	0.001	-0.082	0.060	0.236	-0.018
19 High school GPA	-0.03	-0.064	0.12	0.108	0.082	0.067	0.043	0.119	0.004	0.16	-0.044	-0.10	-0.063	0.071	0.150	0.047
20 Earned college credits in HS	0.23	-0.080	-0.026	0.161	0.055	0.079	0.067	0.091	-0.17	-0.024	-0.064	0.14	-0.053	0.054	0.077	0.043
21 Private HS attended	0.17	-0.024	-0.014	0.084	0.053	0.109	0.003	0.19	-0.15	-0.12	0.12	-0.001	-0.007	-0.034	0.040	0.026
22 4 yrs of English in HS	-0.06	-0.026	0.03	0.028	0.026	0.02	0.003	0.045	0.034	0.19	-0.16	0.04	-0.008	0.029	0.045	-0.008
23 4 yrs of Math in HS	-0.12	-0.040	-0.023	0.116	0.045	0.089	0.043	0.084	0.13	-0.032	-0.027	0.17	-0.069	0.041	-0.16	0.056
24 Low income (<\$32k) (High)	0.34	0.089	0.034	-0.059	-0.064	-0.023	-0.029	-0.080	0.002	-0.001	0.057	-0.022	-0.004	0.045	-0.116	-0.003
25 Low-mid income (\$32-\$59k) (High)	0.02	-0.015	0.008	-0.030	-0.048	-0.063	-0.035	-0.036	-0.10	0.020	0.12	0.004	0.000	0.044	-0.058	-0.026
26 Up-mid income (\$60-\$91k) (High)	-0.43	-0.026	-0.038	-0.054	0.15	0.047	-0.020	0.010	0.030	-0.11	0.034	0.038	0.044	0.028	-0.011	
27 High income (>\$92k) (Ref.)	0.09	-0.039	-0.001	0.10	0.087	0.24	0.039	0.087	0.016	-0.046	-0.050	-0.17	-0.107	-0.044	0.166	0.037
28 Parents own investment >\$10k	-0.15	0.003	0.002	0.071	0.020	0.042	0.029	0.069	0.17	-0.031	-0.009	0.13	0.054	-0.036	0.073	0.13
29 Bachelor's degree aspiration (Ref.)	-0.87	-0.008	0.006	-0.096	-0.039	-0.072	-0.028	-0.059	-0.009	0.034	-0.020	-0.046	0.033	-0.031	-0.033	-0.119
30 Master's degree aspiration (BA)	-0.03	-0.004	0.024	-0.16	-0.009	-0.036	0.16	-0.003	0.18	0.033	0.18	0.031	0.029	-0.12	0.026	-0.026
31 Doctorate aspiration (BA)	0.76	-0.17	-0.043	0.072	0.055	0.072	0.02	0.033	-0.025	-0.052	0.000	0.000	-0.036	0.039	0.039	0.115
32 Prof. degree aspiration (BA)	0.29	0.041	0.009	0.071	-0.004	0.071	0.12	0.046	0.15	-0.035	-0.002	0.13	-0.049	0.12	0.041	0.062
33 Goal: Be a community leader	1	0.44	0.126	0.077	0.053	0.077	0.073	0.097	-0.13	0.004	-0.19	0.037	-0.025	0.009	0.061	0.179
34 Goal: Be financially well off	0.44	1	0.079	-0.030	-0.049	0.14	-0.031	-0.009	0.032	-0.17	0.036	-0.003	0.10	-0.026	-0.114	-0.024
35 Goal: Live close to relatives	0.126	0.079	1	-0.025	-0.022	-0.17	-0.004	0.024	0.062	0.025	-0.021	0.072	0.001	0.17	-0.078	0.038
36 Consulted a ranking	0.77	-0.030	-0.025	1	0.208	0.219	0.116	0.140	0.008	-0.113	-0.055	-0.027	-0.092	0.12	0.122	0.133
37 Considered grad. rate	0.53	-0.049	-0.022	0.208	1	0.115	0.136	0.175	0.028	-0.11	-0.057	0.15	-0.064	0.12	0.134	0.140
38 Applied to 6+ institutions	0.77	0.14	-0.017	0.219	0.116	1	-0.020	0.020	-0.063	-0.233	0.007	-0.036	-0.077	-0.073	0.130	0.108
39 Chose inst. b/c of coursework	0.73	-0.031	-0.004	0.116	0.136	-0.020	1	0.360	0.074	0.075	-0.116	0.000	-0.038	0.003	0.079	0.135
40 Chose inst. b/c of reputation	0.97	-0.009	0.024	0.140	0.175	0.20	0.360	1	0.119	0.074	-0.140	0.046	-0.081	0.14	0.134	0.131
41 Chose inst. b/c of location	-0.13	0.032	0.062	0.008	0.028	-0.063	0.074	0.119	1	0.049	-0.039	-0.155	0.024	0.118	-0.171	-0.020
42 1st choice school accepted	0.04	-0.017	0.025	-0.113	-0.111	-0.233	0.075	0.074	0.049	1	-0.067	0.046	0.049	0.047	-0.028	-0.002
43 Plan to transfer	-0.19	0.036	-0.021	-0.055	-0.057	0.007	-0.116	-0.140	-0.039	-0.067	1	0.005	0.066	-0.13	-0.053	-0.030
44 Chose inst. for pers./family reas.	0.37	-0.003	0.072	-0.027	0.15	-0.036	0.000	0.046	0.155	-0.046	0.005	1	0.006	0.064	-0.018	0.031
45 Parents expected to get a job	-0.25	0.10	0.001	-0.092	-0.064	-0.077	-0.038	-0.081	0.024	0.049	0.066	0.006	1	0.32	-0.203	0.088
46 Chose inst. for financial reason	0.09	-0.026	0.017	0.17	0.12	-0.073	0.003	0.14	0.119	0.047	-0.13	0.041	0.032	1	-0.052	-0.058
47 Live on campus	0.61	-0.114	-0.078	-0.122	0.134	0.130	0.079	0.134	-0.071	-0.028	-0.053	-0.13	-0.208	-0.052	1	0.177
48 Acad. integration index	0.179	-0.024	0.038	0.133	0.140	0.108	0.135	0.131	-0.020	-0.002	0.030	0.031	-0.088	-0.058	0.177	1
49 Freq. classes attended by TA	0.44	0.53	-0.001	0.032	-0.16	0.02	-0.02	0.036	0.022	-0.11	-0.18	0.002	-0.028	0.059	0.043	0.020
50 Freq. large lectures attended	-0.004	0.046	-0.004	0.061	-0.033	0.14	-0.025	0.16	0.16	-0.034	-0.007	0.029	-0.025	0.092	0.040	-0.005
51 Freq. wrote papers for courses	0.53	-0.012	0.018	0.19	0.063	0.076	0.000	-0.004	0.023	-0.021	0.024	0.002	0.026	-0.045	0.075	0.174
52 Social integration index	0.192	-0.103	-0.040	0.176	0.147	0.132	0.098	0.176	-0.032	-0.026	-0.061	0.032	-0.135	-0.036	0.067	0.378
53 No volunteering	-0.144	0.108	-0.024	-0.113	-0.095	-0.065	-0.071	-0.108	0.007	0.13	0.16	-0.047	0.027	-0.17	-0.109	-0.122
54 1-10 hrs volunteering (no volunt.)	0.83	-0.100	0.009	0.087	0.088	0.047	0.063	0.094	0.002	-0.008	-0.022	0.039	-0.040	0.026	0.109	0.126
55 11-20 hrs volunteering (no volunt.)	0.74	-0.103	0.025	0.030	0.032	0.036	0.12	0.24	-0.16	-0.005	0.000	-0.11	-0.11	0.003	0.003	0.068
56 20+ hrs volunteering (no volunt.)	0.55	-0.104	0.004	0.031	-0.009	0.002	0.12	0.14	-0.001	-0.005	0.10	0.035	0.034	-0.020	0.12	0.035
57 Major declared	-0.01	0.040	0.002	-0.051	-0.15	-0.085	0.107	-0.045	-0.007	0.063	0.043	-0.027	0.059	0.023	-0.051	-0.010
58 Job related to major	0.15	0.003	0.037	-0.12	-0.006	-0.17	0.10	-0.025	0.12	0.17	0.14	0.000	0.170	0.007	-0.076	-0.002
59 GPA in first year	-0.25	-0.104	0.034	0.086	0.062	0.15	0.061	0.102	-0.001	0.030	-0.080	0.024	-0.051	0.073	0.130	0.054
60 Any remedial courses taken	0.28	0.046	0.18	-0.048	-0.020	-0.025	-0.025	-0.112	0.11	0.004	0.059	0.043	0.037	0.17	-0.053	0.030
61 Not working (Ref.)	0.21	-0.042	-0.029	0.105	0.109	0.110	0.046	0.087	-0.024	-0.055	-0.066	0.10	-0.065	-0.038	0.246	0.069
62 1-10 hrs working (not working)	0.07	-0.046	0.006	0.022	0.11	-0.008	0.19	0.057	-0.007	0.12	0.17	0.021	0.242	0.16	0.068	0.060
63 11-20 hrs working (not working)	-0.22	0.043	0.16	-0.072	-0.088	-0.91	-0.14	-0.157	0.032	0.026	0.19	-0.003	0.32	0.045	-0.132	-0.044
64 20+ hrs working (not working)	-0.13	0.060	0.18	-0.04	-0.074	-0.05	-0.069	-0.112	-0.007	0.038	0.056	-0.033	0.345	-0.11	-0.275	-0.111
65 Distance from home	0.42	-0.098	-0.080	0.174	0.134	0.164	0.059	0.139	0.062	-0.041	-0.067	-0.077	-0.217	-0.077	-0.461	0.118
66 Fed. need-based grants	0.58	0.076	0.038	-0.035	-0.052	-0.021	-0.008	0.057	0.001	-0.004	0.053	-0.001	0.003	-0.031	-0.130	0.042
67 State need-based grants	0.11	0.16	0.033	-0.16	-0.16	0.01	-0.008	0.021	0.008	-0.005	0.13	-0.027	-0.002	-0.022	-0.021	0.044
68 Inst. need-based grants	0.12	-0.047	-0.037	0.127	0.070	0.147	0.032	0.089	-0.023	-0.037	-0.051	-0.032	-0.050	-0.077	0.138	0.104
69 State merit grants	-0.021	0.13	0.10	-0.18	-0.033	-0.59	-0.17	0.006	0.10	0.025	0.021	0.14	0.008	0.046	0.12	-0.021
70 Inst. merit grants	0.06	-0.090	-0.028	0.043	0.069	0.054	0.029	0.053	-0.029	0.032	-0.037	-0.004	-0.024	0.000		



Table A-2: Correlation Matrix (cont.)

Variable	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
1 6-yr Degree Attainm.	0.44	0.57	0.06	.160	-.090	0.93	0.17	-.014	-.023	-.012	.378	-.052	.108	.062	-.053	-.157
2 Age: 19+ years	.005	-.028	-.041	.019	-.001	-.003	-.002	0.10	0.14	0.35	-.024	-.005	-.027	-.003	0.05	0.035
3 Gender: Female	-.060	.000	.092	-.030	-.074	.054	.033	.011	0.13	.031	.156	.067	-.039	.040	.014	.001
4 African American (White)	-.024	-.010	.037	-.014	.024	-.070	.010	.075	.079	-.026	-.100	.081	.041	-.069	.011	-.001
5 Latino/a or Hispanic (White)	-.018	-.010	-.068	-.097	.050	-.072	.039	-.009	-.028	-.003	-.084	.020	-.009	-.047	.011	.049
6 Asian (White)	.048	.091	-.028	-.046	.007	-.010	-.001	0.04	-.030	.022	.035	-.011	.039	.002	-.004	-.054
7 Other Race/Ethnicity (White)	.040	.032	.005	-.007	.003	-.014	.015	.002	-.012	-.031	-.045	-.013	-.003	.005	-.020	.022
8 White (Ref.)	-.017	-.049	.034	-.100	-.053	.102	-.039	-.043	-.008	.022	.121	-.050	-.037	.070	-.002	-.015
9 English is primary language	-.033	-.040	.023	.105	-.068	.074	.000	.004	.048	-.017	.016	.027	-.014	.036	-.021	.005
10 Parental educ. HS or less (BA)	-.048	-.062	-.013	-.142	.078	-.082	-.013	.012	.039	.041	-.106	.068	-.072	-.037	.038	.095
11 Parental educ. AA degree (BA)	-.030	-.010	.033	-.070	.047	-.062	.003	.019	.071	.017	-.034	.041	-.030	-.044	-.013	.073
12 Parental educ. BA degree (Ref.)	.010	.006	-.022	.019	-.022	.031	-.007	-.007	.009	-.014	.019	-.018	.003	.050	-.006	-.048
13 Parental educ. MA or higher (BA)	.058	.055	.003	.166	-.088	.096	.015	-.020	-.107	-.036	.103	-.077	.086	.022	-.038	-.103
14 Parents: Married (Ref.)	.029	.035	-.005	.051	-.073	.078	.004	-.006	-.031	.021	.137	-.060	.024	.052	-.007	-.078
15 Parents: Single parent (Married)	-.022	-.048	-.013	-.016	.034	-.053	.013	.018	-.001	.007	-.078	.033	.010	-.034	-.003	.023
16 Parents: Div./sep./wid. (Married)	-.021	-.014	.012	-.046	.061	-.058	-.011	-.002	.034	-.026	-.108	.046	-.031	-.038	.009	.072
17 Sibling in college	.036	.027	.018	.033	-.020	.022	-.009	.010	-.028	-.002	.044	.017	.038	.026	-.033	-.044
18 Admission test scores	.052	.101	-.072	.178	-.151	.166	.031	-.046	-.106	-.060	.359	-.250	.110	.070	-.070	-.154
19 High school GPA	.066	.128	-.028	.109	-.129	.116	.040	-.003	-.018	.005	.307	-.111	.073	.047	-.041	-.105
20 Earned college credits in HS	.079	.136	-.051	.137	-.129	.121	.026	.002	-.036	-.013	.245	-.104	.059	.042	-.028	-.096
21 Private HS attended	-.040	-.044	.026	.047	-.050	.044	.015	.002	-.037	-.003	.027	-.022	.022	.039	-.027	-.042
22 4 yrs of English in HS	.030	.026	-.005	.032	-.030	.024	.016	-.001	-.029	.000	.069	-.020	.021	.020	-.039	-.007
23 4 yrs of Math in HS	.040	.075	-.020	.102	-.096	.098	.019	-.013	-.048	.008	.203	-.104	.065	.052	-.042	-.098
24 Low income (<\$32k) (High)	-.024	-.038	-.012	-.096	.077	-.082	-.001	.000	.010	-.005	-.137	.056	.011	-.064	.026	.020
25 Low-mid income (\$32-\$59k) (High)	-.040	-.022	.038	-.066	.031	-.033	-.005	.006	.050	.025	-.023	.025	-.059	.044	.014	.068
26 Up-mid income (\$60-\$91k) (High)	.006	.020	-.031	.031	-.011	.011	.004	-.003	.001	-.005	.033	.019	-.039	.000	.010	.001
27 High income (>\$92k) (Ref.)	.052	.033	.004	-.116	-.085	.092	.001	-.002	-.057	-.014	.109	-.090	.082	.013	.046	-.081
28 Parents own investment >\$10k	.030	.032	-.002	.075	-.046	.059	-.003	-.017	.041	.021	.029	-.039	.026	.040	-.033	-.042
29 Bachelor's degree aspiration (Ref.)	-.031	-.036	-.043	-.123	.090	-.069	-.050	.005	.037	.029	-.139	.022	.030	-.017	.013	.045
30 Master's degree aspiration (BA)	-.021	-.047	.020	-.022	-.001	.013	.006	-.016	-.016	-.008	.022	.014	-.017	.013	.021	-.012
31 Doctorate aspiration (BA)	.016	.035	.009	.119	-.059	.029	.042	.017	-.004	-.008	.069	-.020	.025	-.007	-.017	-.010
32 Prof. degree aspiration (BA)	.061	.087	.016	.056	-.050	.040	.025	-.003	-.023	-.017	.072	-.030	.039	.012	-.033	-.031
33 Goal: Be a community leader	.044	-.004	.053	.192	-.144	.083	.074	.055	-.001	.015	-.025	.028	.021	.007	-.022	-.013
34 Goal: Be financially well off	.053	.046	-.012	-.103	.108	-.100	-.013	-.014	.040	.003	-.104	.046	-.042	-.046	.043	.060
35 Goal: Live close to relatives	-.001	-.004	.018	-.040	-.024	.009	.025	.004	.002	.037	.034	.018	-.029	.006	.016	.018
36 Consulted a ranking	.032	.061	.019	.176	-.113	.087	.030	.031	-.051	-.012	.086	-.048	.105	.022	-.072	-.094
37 Considered grad. rate	-.016	-.033	.063	.147	-.095	.088	.032	-.009	-.015	-.006	.062	-.020	.109	.011	-.088	-.071
38 Applied to 6+ institutions	.002	.014	.076	.132	-.065	.047	.036	.002	-.085	-.017	.015	-.025	.110	-.008	-.091	-.051
39 Chose instit. b/c of coursework	-.002	-.025	.000	.098	-.071	.063	.012	.012	.107	.010	.061	-.025	.046	.019	-.014	.069
40 Chose instit. b/c of reputation	.036	.016	-.004	.176	-.108	.094	.024	.014	-.045	-.025	.102	-.012	.087	.051	-.057	-.112
41 Chose instit. b/c of location	.022	.016	.023	-.032	.007	.002	-.016	-.001	-.007	.012	-.001	.011	-.024	-.007	.032	.007
42 1st choice school accepted	-.011	-.034	-.021	-.026	.013	-.008	-.005	.005	.063	.017	.030	.004	-.055	.012	.026	.038
43 Plan to transfer	-.018	-.007	.024	-.061	.016	-.022	.000	.010	.043	.014	-.080	.059	-.066	.017	.019	.056
44 Chose instit. for pers./family reas.	.002	.029	.002	.032	-.047	.039	-.011	.035	-.027	.000	.024	.043	.010	.021	-.003	-.033
45 Parents expected to get a job	-.028	-.025	.026	-.135	.027	-.040	-.011	.034	.059	.170	-.051	.037	-.665	.242	.332	.346
46 Chose inst. for financial reason	.059	.022	-.045	-.036	-.017	.026	.003	-.020	.023	.007	.073	.017	-.038	.016	.045	-.011
47 Live on campus	.043	.040	.075	.306	-.109	.109	.003	.012	-.051	-.076	.130	-.053	.248	.068	-.132	-.275
48 Acad. integration index	.020	-.005	.174	.378	-.172	.126	.068	.035	-.010	-.002	.054	.030	.069	.060	-.044	-.111
49 Freq. classes attended by TA	.1	.437	.002	.000	-.014	.005	.008	.009	-.001	-.013	.008	.015	.037	.009	-.018	-.042
50 Freq. large lectures attended	.437	.1	.007	-.020	-.028	.012	.020	.011	-.013	-.033	.022	.013	.036	-.009	-.018	-.023
51 Freq. wrote papers for courses	.002	.007	.1	.097	-.046	.039	-.008	.030	-.037	-.003	.003	.049	-.017	.002	-.007	.030
52 Social integration index	.000	-.020	.097	.1	-.244	.195	.070	.048	-.050	-.024	.133	-.018	.135	.084	-.075	-.195
53 No volunteering	-.014	-.028	-.046	-.244	.1	-.742	-.323	-.269	.032	-.004	-.131	.023	-.022	.070	-.027	.072
54 1-10 hrs volunteering (no volunt.)	.005	.012	.039	-.195	-.742	.1	-.206	-.172	-.053	-.006	.118	-.031	.035	.062	-.037	-.072
55 11-20 hrs volunteering (no volunt.)	.008	.020	-.008	.070	-.323	-.206	.1	-.075	.013	.004	.042	.002	.000	.023	-.010	-.012
56 20+ hrs volunteering (no volunt.)	.009	.011	.030	.048	-.269	-.172	-.075	.1	.023	.016	-.005	.011	-.023	-.001	.027	.005
57 Major declared	-.001	-.013	-.037	-.050	.032	-.053	.013	.023	.1	.164	.007	.006	-.059	.001	.043	.037
58 Job related to major	-.013	-.033	-.003	-.024	-.004	-.006	.004	.016	.164	.1	.005	.026	-.295	.121	.141	.147
59 GPA in first year	.008	.022	.003	.133	-.131	.118	.042	-.005	.007	.005	.1	-.081	.063	.081	-.034	-.133
60 Any remedial courses taken	.015	.013	.049	-.018	.023	-.031	.002	.011	.006	.026	-.081	.1	-.047	.000	.022	.043
61 Not working (Ref.)	.037	.036	-.017	.135	-.022	.035	.000	-.023	-.059	-.295	.063	-.047	.1	.443	-.497	-.443
62 1-10 hrs working (not working)	.009	-.009	.002	.084	-.070	.062	.023	-.010	.001	.121	.081	.000	-.443	.1	-.187	-.167
63 11-20 hrs working (not working)	-.018	-.018	-.007	-.075	.027	-.037	-.010	.027	.043	.141	-.034	.022	-.497	-.187	-.187	-.167
64 20+ hrs working (not working)	-.042	-.023	.030	-.195	.072	-.072	-.012	.006	.037	.147	-.133	.043	-.443	-.167	-.187	-.167
65 Distance from home	.039	.029	.021	.268	-.198	.198	.003	-.009	-.048	-.077	.114	-.052	.231	.012	-.173	-.225
66 Fed. need-based grants	-.016	-.027	.018	-.071	.063	-.087	.015	.021	.021	-.014	-.100	.085	.025	-.048	.017	-.005
67 State need-based grants	-.036	-.061	.056	-.031	.022	-.045	.032	.005	.015	-.009	.012	.023	.014	-.010	.011	-.022
68 Instit. need-based grants	-.067	-.083	.059	.119	-.064	.046	.020	.020	-.119	-.026	.051	-.026	.084	.009	-.046	-.078
69 State merit grants	.038	.045	-.036	-.007	.005	.004	-.018	.002	.028	.023	.072	-.041	-.006	.007	.013	-.014
70 Instit. merit grants	-.135	-.146	.068	.133	-.099	.076	.041	.011	-.001	.000	.186	-.043	.033	.045	-.017	-.074
71 Outside grants	.023	.013	.008	.095	-.098	.072	.047	.010	-.004	-.009	.088	-.050	.014	.023	.009	-.054
72 Federal subsid. loans	-.068	-.100	.066	.009	.042	-.054	-.001	.018	.019	-.028	-.071	.034	.001	.000	-.002	.000
73 Stafford unsubsidized loans	-.006	-.046	.045	.018	-.011	-.010	.028	.011	.053	.002	-.046	.022	-.039	.010	.033	.009
74 State loans	-.031	.000	-.002	-.002	.024	-.021	-.010	.002	-.006	-.017	.005	.007	.011	-.004	-.012	.001
75 Private (altern.) loans	-.039	-.060	.019	-.010	.003	-.016	.012	.013	.027	.034	-.015	-.011	-.015	.014	-.015	.024
76 Federal work-study	-.071	-.101	.041	.078	-.028	.017	.003	.021	-.045	-.004	.046	.000	.063	.000	.031	-.057
77 Help f. parents - housing	.028	.043	.017	.207	-.095	.095	.021	-.011	-.075	-.075	.092	-.062	.210	.053	-.109	-.233
78 Help f. parents - living expenses	.037	.025	.017	.062	.013	-.020	.002	.009	-.016	-.045	.061	-.025	.156	-.019	.048	-.150
79 Help f. parents - tuition & fees	.009	-.003	.039	.099	-.042	.061	-.011	-.020	-.069	-.045	.056	-.037	.077	.024	.010	-.144
80 Unmet need (after EFC and aid)	-.018	-.002	.043</													

**Table A-2: Correlation Matrix (cont.)**

Variable	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
1 6-yr Degree Attainm.	.127	-.101	-.001	.087	.040	.120	.093	-.050	-.063	-.001	-.016	.029	.150	.074	.091	.044
2 Age: 19+ years	-.003	-.002	-.028	.001	-.022	-.013	.015	.006	-.016	.002	-.011	-.020	-.029	-.044	-.033	-.019
3 Gender: Female	.007	-.022	.022	.020	-.006	.041	.043	-.007	-.018	-.009	-.013	.029	-.008	.022	-.008	.018
4 African American (White)	-.032	.220	.090	.055	.023	-.037	-.001	.143	.149	-.020	.010	.021	-.083	.035	-.119	.028
5 Latino/a or Hispanic (White)	-.132	.215	.074	-.007	-.041	-.073	-.019	.017	-.040	-.007	-.038	.007	-.148	.000	-.126	.045
6 Asian (White)	-.052	.100	.094	.051	-.003	-.023	-.023	-.005	-.082	-.005	-.001	.024	-.054	.009	-.009	.074
7 Other Race/Ethnicity (White)	.001	-.001	-.018	.001	-.004	-.033	.026	.015	-.016	.013	-.001	-.009	.002	.018	.002	-.003
8 White (Ref.)	.133	-.328	-.144	-.069	.017	.098	.012	-.081	-.015	.004	.020	-.026	.175	-.035	.160	-.033
9 English is primary language	-.152	-.266	-.127	-.015	.041	.056	.052	.005	.093	.003	.034	-.021	.182	.015	.133	-.089
10 Parental educ: HS or less (BA)	-.143	.270	.144	-.007	-.010	-.063	.016	.130	.001	-.017	-.004	.041	-.209	-.062	-.163	.019
11 Parental educ: AA degree (BA)	-.067	.084	.065	-.001	-.001	-.018	-.018	.111	.057	.050	.068	.021	-.104	-.035	-.085	-.047
12 Parental educ: BA degree (Ref.)	.047	-.088	-.051	-.012	.007	.012	-.020	-.063	-.029	-.010	-.035	.007	.072	.006	.071	-.007
13 Parental educ: MA or higher (BA)	.136	-.221	-.131	.006	.002	.058	.023	-.150	-.024	-.020	-.024	-.062	.202	.079	.146	.034
14 Parents: Married (Ref.)	.056	-.339	-.162	-.051	.004	.058	-.008	-.199	-.010	-.037	-.003	-.083	.160	.057	.176	-.072
15 Parents: Single parent (Married)	-.035	.205	.125	.034	-.019	-.042	.000	.105	.057	-.004	.000	.024	-.101	-.031	-.115	.018
16 Parents: Div./sep./wid. (Married)	-.042	.260	.112	.038	.005	-.041	.008	.160	-.017	.041	.003	.077	-.120	-.046	-.131	.068
17 Sibling in college	.049	-.045	-.025	.005	.004	.001	-.004	.014	-.091	.010	-.017	.015	.077	.036	.058	.115
18 Admission test scores	.223	-.273	-.103	.134	.087	.225	.119	-.136	-.081	-.001	-.021	.002	.217	.050	.117	.041
19 High school GPA	.136	-.119	.002	.075	.101	.141	.108	-.070	-.063	-.013	-.027	.013	.126	.036	.053	-.017
20 Earned college credits in HS	.105	-.090	-.003	.064	.049	.096	.092	-.073	-.080	-.001	-.026	.000	.079	.024	.034	.012
21 Private HS attended	.037	-.071	-.053	.033	-.021	.040	-.020	-.033	-.040	-.012	-.014	.011	.066	.036	.105	.092
22 4 yrs of English in HS	.042	-.022	-.005	.022	-.002	.030	.045	-.003	-.009	-.002	-.008	-.026	.031	-.011	-.006	-.013
23 4 yrs of Math in HS	.090	-.113	-.019	.036	.053	.077	.045	-.060	-.013	-.001	-.001	-.016	.097	.029	.069	.018
24 Low income (<\$32k) (High)	-.139	.680	.256	.024	-.020	-.077	-.018	.205	-.023	-.012	-.020	.096	-.284	-.081	.301	.181
25 Low-mid income (\$32-\$59k) (High)	-.054	.022	.123	.076	.011	.015	.028	.218	-.071	.016	.009	.084	-.127	-.044	-.099	.079
26 Up-mid income (\$60-\$91k) (High)	.017	-.302	-.106	-.012	.045	.013	-.009	-.058	.027	.011	.033	-.018	.079	.010	.105	-.060
27 High income (>\$92k) (Ref.)	.154	-.361	-.236	-.080	-.016	.041	-.003	-.326	.061	-.015	-.022	-.145	.290	.101	.255	-.174
28 Parents own investment >\$10k	.099	-.183	-.137	-.072	.003	.002	-.016	-.187	-.090	-.019	-.024	-.064	.155	.058	.156	.067
29 Bachelor's degree aspiration (Ref.)	-.039	.018	-.014	-.071	-.022	-.059	-.042	.034	-.014	-.007	.007	-.032	-.024	-.031	-.022	-.005
30 Master's degree aspiration (BA)	-.008	-.045	-.007	-.028	-.025	-.034	-.007	-.038	.040	.002	.010	-.020	.007	.003	.051	-.020
31 Doctorate aspiration (BA)	.025	.042	.035	.079	.025	.069	.047	.022	.022	.012	-.009	.033	-.001	.000	-.043	.000
32 Prof. degree aspiration (BA)	.036	-.005	-.016	.045	.042	.051	.010	-.016	-.018	-.010	-.017	.036	.024	.041	.002	.042
33 Goal: Be a community leader	.042	.058	.011	.012	-.021	.006	.064	.037	.014	.004	.006	.024	.042	.025	.015	.008
34 Goal: Be financially well off	-.098	.076	.016	-.047	.013	-.090	-.043	.018	.037	-.002	-.011	-.011	-.089	.042	-.051	-.010
35 Goal: Live close to relatives	-.080	.038	.033	-.037	.010	-.028	-.023	-.015	-.028	.013	-.024	-.016	-.013	.076	.015	-.007
36 Consulted a ranking	.174	-.035	-.016	.127	-.018	.043	.045	-.020	-.043	-.014	-.009	-.013	.125	.054	.099	.073
37 Considered grad. rates	.134	-.052	-.016	.070	-.033	.069	.024	.000	.010	-.001	.025	.020	.114	.032	.073	.040
38 Applied to 6+ institutions	.164	-.021	.001	.147	-.059	.054	.025	.020	-.005	-.025	-.006	.029	.108	.062	.053	.017
39 Chose instt. b/c of coursework	.059	-.008	-.008	.032	-.017	.029	.064	.022	.055	.006	.044	.007	.083	.033	.068	.101
40 Chose instt. b/c of reputation	.139	-.057	.021	.089	.006	.053	.065	-.006	.005	.000	.008	.037	.130	.065	.097	.048
41 Chose instt. b/c of location	-.137	-.001	.008	-.023	.010	-.029	-.029	-.022	-.017	.009	-.010	-.004	-.033	.031	-.005	.003
42 1st choice school accepted	-.062	.004	-.005	-.037	.025	.039	.028	.003	.017	-.010	.010	.005	-.043	-.022	-.056	-.079
43 Plan to transfer	-.041	.053	.013	-.051	.021	-.037	-.036	.024	.032	.020	.023	.021	.057	-.029	-.030	-.016
44 Chose instt. for pers./family reas.	-.067	-.001	-.027	-.032	.014	-.004	-.009	-.069	-.010	-.008	-.023	-.001	.018	.048	.001	-.003
45 Parents expected to get a job	-.217	-.003	-.002	-.050	.008	-.024	-.014	.026	.042	.005	.004	-.015	-.218	-.191	-.096	-.056
46 Chose inst. for financial reason	-.077	-.031	-.022	-.077	.046	.000	.019	-.095	-.021	.001	-.073	-.065	-.041	.016	.037	-.141
47 Live on campus	.461	-.130	-.021	.138	.012	.125	.104	.089	.062	.019	.024	.122	.478	.072	.203	.019
48 Acad. integration index	.118	.042	.044	.104	-.021	.090	.083	.069	.030	.019	.029	.077	.079	.047	.042	.049
49 Freq. classes attended by TA	.039	-.016	-.036	-.067	.038	-.135	.023	-.068	-.006	-.031	-.039	-.071	.028	.037	.009	-.018
50 Freq. large lectures attended	.029	-.027	-.061	-.083	.045	-.146	.013	-.100	-.046	-.000	-.060	-.101	.043	.025	-.003	-.002
51 Freq. wrote papers for courses	.021	.018	.056	.059	-.036	.068	.008	.066	.045	-.002	.019	.041	.017	.017	.039	.043
52 Social integration index	.269	-.071	-.031	.119	-.007	.133	.095	.009	.018	-.002	-.010	.078	.207	.062	.099	.056
53 No volunteering	-.108	.063	.022	-.064	.005	-.099	-.098	.042	-.011	.024	.003	-.028	-.095	.013	-.042	-.006
54 1-10 hrs volunteering (no volunt.)	.118	-.087	-.045	.046	.004	.076	.072	-.054	-.010	.021	-.016	.017	.095	-.020	.016	.017
55 11-20 hrs volunteering (no volunt.)	.003	.015	.032	.020	-.018	.041	.047	-.001	.028	-.010	.012	.003	.021	.002	-.011	-.003
56 20+ hrs volunteering (no volunt.)	-.009	.021	.005	.020	.002	.011	.010	.018	.011	.002	.013	.021	-.011	.009	-.020	-.018
57 Major declared	-.048	.021	.015	-.119	.028	-.001	-.004	.019	.053	-.006	.027	-.045	-.075	-.016	.069	-.068
58 Job related to major	-.077	-.014	-.009	-.026	.023	.000	-.009	.028	.002	-.017	.034	-.004	.075	-.045	-.045	-.014
59 GPA in first year	-.114	-.900	.012	.051	.072	.169	.089	-.021	-.046	-.015	.046	.092	.017	.061	.064	.018
60 Any remedial courses taken	-.052	.085	.023	-.026	-.041	-.043	-.050	.034	.022	.007	-.011	.000	.062	-.025	-.037	.003
61 Not working (Ref.)	.281	.025	.014	.084	.005	.033	.014	.001	-.039	.011	-.015	.063	.210	.156	.077	.070
62 1-10 hrs working (not working)	.012	-.048	-.010	.009	.007	.045	.023	.000	.010	-.004	.014	.000	.053	-.019	.024	-.011
63 11-20 hrs working (not working)	-.173	.017	.011	-.046	.013	-.017	.009	-.002	.033	-.012	-.015	-.031	-.109	-.048	.010	-.040
64 20+ hrs working (not working)	-.225	-.005	-.022	-.078	-.014	-.074	-.054	.000	.009	.001	.024	-.057	-.233	-.150	-.144	-.046
65 Distance from home	.1	-.106	-.094	.133	-.033	.034	.067	.053	.033	-.002	.023	.102	.355	.070	.123	.067
66 Fed. need-based grants	-.106	.1	.350	.125	-.026	-.042	-.004	.360	-.022	.000	-.005	.186	-.302	-.077	.342	.082
67 State need-based grants	-.094	.350	.1	.123	-.040	.073	.008	.244	-.026	.020	-.005	.146	-.142	-.015	-.135	-.033
68 Inst. need-based grants	.133	.125	.123	.1	-.026	-.026	.098	.280	-.004	.021	.073	.273	.032	.021	.005	-.009
69 State merit grants	-.033	-.026	-.040	-.026	.1	.038	.009	-.077	-.010	-.013	-.039	-.017	.014	.030	-.067	-.087
70 Inst. merit grants	.034	-.042	.073	-.026	.038	.1	.115	.005	.025	-.008	.021	.096	.044	.026	-.007	-.106
71 Outside grants	.067	-.004	.008	.098	.009	.115	.1	-.036	.004	.011	-.010	.014	-.008	-.002	-.076	-.068
72 Federal subsid. loans	.053	.360	.244	.280	-.077	.005	-.036	.1	.025	.030	.143	.325	-.099	-.047	.125	-.013
73 Stafford unsubsidized loans	.033	-.022	-.026	-.004	-.010	.025	.004	.025	.1	-.005	.097	.002	.001	.023	-.036	-.146
74 State loans	-.002	.000	.020	.021	-.013	-.008	.011	.030	-.005	.1	.021	.040	-.015	-.007	-.013	-.034
75 Private (altern.) loans	.023	-.005	-.005	.073	-.039	.021	-.010	.143	.097	.021	.1	.060	-.0674	-.034	-.074	-.079
76 Federal work-study	.102	.166	.145	.273	-.017	.096	.014	.325	.002	.040	.060	.1	.1	.1	.1	.1
77 Help f. parents - housing	.355	-.302	-.142	.032	.014	.044	-.008	-.099	.001	.015	-.060	-.006	.013	.286	.518	.007
78 Help f. parents - living expenses	.070	-.077	-.015	.021	.030	.026	-.002	.047	.023	-.007	-.034	-.013	.286	.1	.206	.007
79 Help f. parents - tuition & fees	.123	-.342	-.135	.005	-.067	-.007	-.076	-.125	-.036	-.013	-.074	-.029	.518	.206	.1	.029
80 Unmet need (after EFC and aid)	.062	.082	-.033	-.009	-.087											



**Table A-2: Correlation Matrix (cont.)**

Variable	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
1 6-yr Degree Attainm.	-0.45	0.80	.191	-.031	-.130	-.136	-.063	-.104	.102	-.109	-.218	-.256	-.046	0.89	-.048	214
2 Age: 19+ years	-.009	-.001	-.076	.021	0.54	.032	-.021	-.057	-.026	-.096	.021	-.032	-.015	.022	.017	0.06
3 Gender: Female	-.014	.016	-.012	.020	-.014	-.004	.020	.024	-.001	.024	.024	.020	-.002	.022	.000	-.019
4 African American (White)	-.018	.001	-.006	-.059	.016	.112	-.497	-.018	-.069	.334	.027	.257	-.012	-.088	.103	-.187
5 Latino/a or Hispanic (White)	-.008	-.023	-.018	-.047	.029	.095	-.051	.463	.025	.379	.178	.291	.059	-.071	-.121	-.249
6 Asian (White)	.031	-.035	.139	-.089	-.043	-.025	-.040	-.007	.103	.131	-.030	-.018	-.003	-.025	.074	-.007
7 Other Race/Ethnicity (White)	.018	-.033	.003	-.027	.028	.016	-.018	-.018	.033	.051	.024	.008	-.015	-.040	.033	-.010
8 White (Ref.)	-.009	.049	-.057	.125	-.021	-.126	-.242	-.283	-.043	-.546	-.129	-.344	-.021	.132	.064	.287
9 English is primary language	-.035	.052	.055	.057	.007	-.023	.035	-.322	-.093	-.352	.135	-.218	-.069	.067	.129	.193
10 Parental educ: HS or less (BA)	.037	-.065	-.116	.030	.049	.097	.050	.085	-.047	.124	.145	.181	.041	-.040	.039	-.193
11 Parental educ: AA degree (BA)	.012	-.033	-.104	.036	.039	.072	.052	.003	-.048	.035	.073	.116	.048	-.032	.077	-.097
12 Parental educ: BA degree (Ref.)	.033	-.013	.005	.030	-.003	.068	-.039	-.004	.027	-.055	-.028	-.061	.010	-.006	-.033	.075
13 Parental educ: MA or higher (BA)	-.075	.099	.188	-.088	-.075	-.081	-.151	-.071	.057	-.084	-.163	-.201	-.089	.069	-.070	.179
14 Parents: Married (Ref.)	-.002	.029	.060	.000	-.027	-.077	-.120	-.062	.044	-.153	-.094	-.170	-.025	.059	-.040	.186
15 Parents: Single parent (Married)	-.023	.001	-.037	-.003	-.004	.080	.140	.036	-.051	.142	.069	.154	.001	-.031	.055	-.111
16 Parents: Div./sep./wid. (Married)	.014	-.032	-.045	.002	.031	.043	.059	.049	-.021	.093	.066	.106	.026	-.047	.016	-.144
17 Sibling in college	.009	.009	.017	.010	-.028	-.017	-.006	-.026	.055	-.027	-.039	-.065	-.043	-.005	-.022	.060
18 Admission test scores	-.119	.154	.409	-.198	-.170	-.171	-.198	-.171	.143	-.200	-.309	-.428	-.103	.119	-.145	.346
19 High school GPA	.007	.040	.233	-.059	-.108	-.182	-.108	-.110	.156	-.130	-.209	-.280	.012	.105	-.116	.240
20 Earned college credits in HS	-.025	.044	.252	-.145	-.073	-.083	-.068	-.062	.145	-.022	-.141	-.182	-.036	.033	-.119	.142
21 Private HS attended	-.137	.142	.067	-.055	-.001	-.010	-.046	.030	-.026	-.006	-.036	-.046	-.038	.101	.014	.072
22 4 yrs of English in HS	-.013	.027	.021	-.011	.021	-.042	-.006	-.062	.007	-.077	-.052	-.056	-.028	.060	-.008	.049
23 4 yrs of Math in HS	-.002	.021	.209	-.065	-.138	-.092	-.048	-.071	.123	-.051	-.147	-.194	.005	-.004	-.090	.150
24 Low income (<\$32k) (High)	-.009	-.025	-.068	-.028	.053	.122	.123	.173	-.067	.270	.163	.294	.020	-.061	.032	-.369
25 Low-mid income (\$32-\$59k) (High)	.003	-.014	-.100	.042	.047	.043	.010	.011	-.066	-.011	.044	.075	.020	-.003	.059	-.063
26 Up-mid income (\$60-\$91k) (High)	.056	-.040	.002	.031	-.017	-.049	-.033	-.067	.022	-.099	-.006	.069	.052	-.009	-.016	.096
27 High income (>\$92k) (Ref.)	-.047	.072	.149	-.044	-.074	-.100	-.086	-.097	.099	-.130	-.178	-.260	-.085	.058	-.066	.289
28 Parents own investment >\$10k	-.017	.038	.064	-.013	-.020	-.069	-.072	-.060	.030	-.127	-.073	-.157	-.041	.036	-.069	.133
29 Bachelor's degree aspiration (Ref.)	.041	-.067	-.141	.046	.079	.071	-.037	-.005	-.062	-.055	.082	.063	-.018	-.050	.058	-.051
30 Master's degree aspiration (BA)	.008	-.012	-.011	.019	-.018	.006	.025	-.009	-.013	-.009	.009	-.002	.008	-.027	.004	-.001
31 Doctorate aspiration (BA)	-.039	.061	.088	-.033	-.034	-.058	.012	.032	.034	.058	-.052	-.016	.016	.061	-.033	.014
32 Prof. degree aspiration (BA)	-.021	.035	.105	-.055	-.038	-.036	-.006	-.023	.067	.017	.065	-.067	-.010	.036	-.048	.058
33 Goal: Be a community leader	-.026	.030	.002	.020	-.014	-.025	.058	-.031	-.015	-.005	-.059	-.023	-.015	.030	.009	.016
34 Goal: Be financially well off	.088	-.104	-.045	-.008	.034	.060	.089	.066	.066	.127	.067	.094	.045	-.090	-.022	-.099
35 Goal: Live close to relatives	.030	-.026	-.051	.031	.023	.005	.005	.017	.005	.020	.031	.022	.007	-.011	-.009	-.033
36 Consulted a ranking	-.121	.143	.233	-.125	-.062	-.101	-.008	-.004	.040	.031	-.159	-.133	-.087	.083	-.056	.110
37 Considered grad. rate	-.134	.137	.096	-.043	-.053	-.028	-.038	-.017	-.085	-.071	-.113	-.103	-.039	.130	.057	.099
38 Applied to 6+ institutions	-.170	.174	.221	-.148	-.057	-.040	.022	-.049	-.012	.068	-.148	-.104	-.111	.089	.001	.095
39 Chose inst. b/c of coursework	-.104	.076	.059	-.075	-.009	.057	-.010	-.026	-.063	-.049	-.105	-.037	-.061	.036	.075	.039
40 Chose inst. b/c of reputation	-.151	.177	.186	-.085	-.064	-.094	-.075	-.059	-.004	-.109	-.177	-.178	-.051	.144	-.017	.154
41 Chose inst. b/c of location	.066	-.057	-.013	.023	.002	-.027	-.017	-.009	.069	-.014	.036	-.034	-.014	.039	-.039	-.003
42 1st choice school accepted	.036	-.036	-.093	.093	.007	-.004	.003	-.013	-.031	.029	.037	.030	.020	.010	-.048	.048
43 Plan to transfer	.028	-.029	-.102	.035	.055	.053	.054	.009	.048	.033	.076	.101	.039	-.030	.036	-.067
44 Chose inst. for pers./family reas.	.020	-.001	-.007	.037	-.020	-.038	.006	.005	-.019	-.021	-.013	-.009	.015	.007	-.056	-.015
45 Parents expected to get a job	.052	-.062	-.145	.068	.065	.052	-.047	.010	-.022	-.043	.138	.062	.054	-.033	.029	-.045
46 Chose inst. for financial reason	.328	-.299	-.018	.068	-.026	-.075	-.018	-.001	.175	-.034	.037	-.028	.057	-.210	-.151	.001
47 Live on campus	-.101	.168	.133	.035	-.105	-.194	.034	-.287	-.040	-.274	-.386	-.310	-.118	.182	.112	.275
48 Acad. integration index	-.179	.206	.073	-.025	.035	-.041	.040	-.053	-.123	-.028	-.128	-.057	-.048	-.190	.096	.071
49 Freq. classes attended by TA	.251	-.228	.101	-.019	-.056	-.080	-.035	.004	.388	.020	.081	-.121	-.026	-.166	-.226	.078
50 Freq. large lectures attended	.312	-.272	.141	-.019	-.081	-.125	-.023	.022	.421	.061	-.068	-.139	-.001	-.229	-.306	.081
51 Freq. wrote papers for courses	-.125	.133	-.028	.033	-.006	-.008	.035	-.065	-.123	-.041	-.018	-.028	-.003	.130	.091	.027
52 Social integration index	-.206	.248	.128	-.030	-.056	-.110	-.014	-.095	-.128	-.138	-.202	-.149	-.060	.203	.041	.141
53 No volunteering	.103	-.129	-.077	.020	.035	.062	.028	.067	.032	.105	.077	.118	.040	-.133	.002	-.101
54 1-10 hrs volunteering (no volunt.)	-.088	.113	.078	-.017	-.043	-.060	-.040	-.091	-.128	-.098	-.134	-.044	.113	-.005	.114	.000
55 11-20 hrs volunteering (no volunt.)	-.029	.037	.009	.004	.000	-.023	.006	.002	.008	.005	.011	-.016	-.001	.028	-.007	.017
56 20+ hrs volunteering (no volunt.)	-.008	.005	-.003	.012	.011	.017	.013	.036	-.022	.022	.017	.034	.005	.024	.013	-.032
57 Major declared	.091	-.096	-.150	.089	.048	.039	.085	.026	-.006	.031	.093	.143	.081	-.048	.075	-.072
58 Job related to major	.012	-.016	-.056	.013	.039	.033	-.011	-.026	-.016	-.015	.044	.027	.031	-.003	.027	-.008
59 GPA in first year	-.080	.103	.144	-.074	-.043	-.066	-.025	-.060	.037	-.066	-.120	-.150	-.022	.013	-.028	.123
60 Any remedial courses taken	.046	-.043	-.101	.046	.076	.006	.067	.044	-.022	.048	.054	.098	.017	-.025	.007	-.065
61 Not working (Ref.)	-.071	.096	.168	-.081	.056	-.079	.047	.002	.018	.040	-.173	.077	-.059	.048	-.038	.059
62 1-10 hrs working (not working)	-.028	.039	-.013	.045	-.036	-.025	-.059	-.058	-.030	-.102	-.074	-.082	-.019	.066	.033	.069
63 11-20 hrs working (not working)	.051	-.059	-.077	.044	.019	.031	-.006	-.001	.029	.013	.108	.061	.045	-.049	.017	-.043
64 20+ hrs working (not working)	.074	-.111	-.143	.024	.096	.104	-.005	.056	-.028	.032	.204	.125	.056	-.083	.028	-.106
65 Distance from home	-.137	.183	.174	-.060	-.064	-.124	-.005	-.191	-.008	-.199	-.310	-.274	-.147	.123	-.082	.222
66 Fed. need-based grants	-.057	.027	-.083	-.010	.062	.104	.118	.172	-.100	.251	.131	.311	.028	-.003	.078	-.319
67 State need-based grants	-.118	.115	-.002	-.010	.009	.013	-.026	.026	-.081	.093	.014	.108	.125	.132	.136	-.080
68 Inst. need-based grants	-.353	.366	.163	-.115	-.018	-.050	-.041	-.053	-.158	-.036	-.135	-.120	-.098	.295	.122	.104
69 State merit grants	.078	-.066	.071	-.014	-.047	-.057	-.011	-.042	.073	-.030	-.002	-.078	.377	.069	-.161	.034
70 Inst. merit grants	-.333	.357	.024	.012	-.026	-.036	-.044	-.081	-.211	-.121	-.076	-.062	.045	.418	.212	.077
71 Outside grants	-.082	.088	.078	-.049	-.018	-.023	.006	.064	-.013	-.048	-.082	-.084	-.051	.089	.011	.070
72 Federal subsid. loans	-.203	.167	-.047	-.011	.022	.084	.061	-.071	-.171	-.171	-.023	-.049	.071	-.028	.162	.274
73 Stafford unsubsidized loans	-.066	.036	-.036	-.009	-.001	.088	.100	-.046	-.104	.006	.003	.062	-.005	.010	.120	-.057
74 State loans	.002	.001	-.032	.010	.048	-.018	-.011	-.007	-.007	-.018	.001	-.020	-.001	.004	.011	.008
75 Private (altern.) loans	-.134	.089	-.052	-.001	.009	.089	-.012	-.025	-.090	-.018	-.028	.036	-.054	.071	.146	-.015
76 Federal work-study	-.205	.218	.007	.018	.016	.004	-.009	-.033	-.147	-.049	-.055	.004	.014	.203	.135	-.028
77 Help f. parents - housing	-.068	.103	.151	-.009	-.112	-.131	-.029	-.201	.023	-.201	-.283	-.289	-.070	.085	-.002	.270
78 Help f. parents - living expenses	-.015	.040	.102	-.048	-.052	-.031	.038	-.009	.039	.066	.060	-.060	-.007	.004	.038	.057
79 Help f. parents - tuition & fees	-.071	.091	.070	.017	-.070	-.085	-.047									

**Table A-2: Correlation Matrix (cont.)**

Variable	97	98	99	100	101	102	103	104	105	106	107	108
1 6-yr Degree Attainm.	-.188	.096	-.178	.047	-.190	-.113	-.063	.216	-.030	-.095	-.072	-.107
2 Age: 19+ years	.018	.017	.024	.023	-.030	-.015	.014	-.038	.040	.015	-.027	-.003
3 Gender: Female	.031	.012	-.040	.020	-.003	.028	.012	-.054	.019	.015	.042	-.021
4 African American (White)	.093	.074	-.048	.001	.009	.106	.004	-.022	.064	.061	.119	.033
5 Latino/a or Hispanic (White)	.011	-.083	-.139	.002	-.113	-.108	.024	-.018	-.101	.028	.055	-.046
6 Asian (White)	-.013	-.055	-.064	-.015	.039	-.001	-.072	.157	-.098	-.070	-.078	.034
7 Other Race/Ethnicity (White)	.019	-.009	-.051	-.009	-.015	.000	-.011	.001	.002	-.036	-.017	.020
8 White (Ref.)	-.067	.042	-.178	.010	.056	.000	.024	-.057	.072	-.002	-.053	.001
9 English is primary language	.009	.109	-.160	.033	.086	.078	.041	-.063	.103	.067	-.014	.020
10 Parental educ: HS or less (BA)	.089	-.096	-.171	-.048	-.113	-.084	-.048	-.127	-.002	.053	.082	-.068
11 Parental educ: AA degree (BA)	.077	-.044	-.073	-.020	-.076	-.043	.042	-.127	-.022	.076	.067	-.062
12 Parental educ: BA degree (Ref.)	-.049	.026	.034	-.004	-.011	-.023	-.024	.008	.011	-.041	-.056	-.001
13 Parental educ: MA or higher (BA)	-.098	.096	-.179	.063	.176	.133	-.056	.215	.011	-.073	-.075	.114
14 Parents: Married (Ref.)	-.031	.017	.087	.038	.048	.033	-.040	.074	-.021	-.029	-.089	.017
15 Parents: Single parent (Married)	.048	-.015	-.058	-.013	-.018	.008	.041	-.037	-.010	.059	.060	.012
16 Parents: Div./sep./wid. (Married)	.010	-.010	-.064	-.034	-.042	-.039	.022	-.061	.028	.002	.065	-.024
17 Sibling in college	-.004	.019	.028	.020	.033	.028	-.021	.038	.006	.016	-.043	-.003
18 Admission test scores	-.270	.121	.323	.098	.317	.187	-.118	.437	-.006	-.169	-.201	.244
19 High school GPA	-.130	.094	.191	.095	.143	.119	-.139	.245	-.043	-.144	-.163	.090
20 Earned college credits in HS	-.128	.051	.130	.071	.130	.072	-.101	.223	-.051	-.152	-.116	.080
21 Private HS attended	-.048	.063	.081	.056	.151	.094	.073	.091	.021	.017	.046	.101
22 4 yrs of English in HS	-.027	.034	.060	.025	.026	.071	-.010	.038	.021	.004	-.030	.012
23 4 yrs of Math in HS	-.083	.061	.108	.018	.136	.040	-.083	.198	-.029	-.104	-.095	.097
24 Low income (<\$32k) (High)	.102	-.065	-.135	-.020	-.111	-.053	.032	-.089	.002	.048	.110	-.041
25 Low-mid income (\$32-\$59k) (High)	.018	-.048	-.073	-.029	-.054	-.024	.042	-.087	.043	.044	.048	-.024
26 Up-mid income (\$60-\$91k) (High)	.012	.014	.041	-.005	-.037	-.019	-.031	-.034	.020	-.012	-.059	-.035
27 High income (>\$92k) (Ref.)	-.118	.087	.146	.050	.181	.084	-.037	.188	-.060	-.070	-.081	.090
28 Parents own investment >\$10k	-.056	.025	.087	.027	.075	.044	-.034	.072	-.004	-.039	-.054	.036
29 Bachelor's degree aspiration (Ref.)	.041	-.095	-.101	-.046	-.102	-.092	.033	-.135	.010	.078	.027	-.091
30 Master's degree aspiration (BA)	.041	-.012	-.017	.023	-.011	-.050	.035	-.046	.020	-.042	.020	.011
31 Doctorate aspiration (BA)	-.064	.082	.087	.051	.062	.079	-.031	.090	-.020	-.039	-.010	.056
32 Prof. degree aspiration (BA)	-.043	.048	.057	.048	.084	.114	-.068	.158	-.023	-.058	-.061	.075
33 Goal: Be a community leader	-.035	.079	.089	.054	.036	.070	-.011	.018	.025	.000	.015	.029
34 Goal: Be financially well off	.049	-.064	-.125	-.042	-.084	-.074	-.035	-.020	-.052	-.017	-.009	-.047
35 Goal: Live close to relatives	.019	-.007	-.035	.012	-.046	-.007	.000	-.064	.005	-.001	.023	-.074
36 Consulted a ranking	-.149	.118	.179	.070	.230	.122	.004	.241	-.025	-.052	-.008	.155
37 Considered grad. rate	-.094	.139	.159	.045	.176	.097	.079	.102	.035	.035	.050	.110
38 Applied to 6+ institutions	-.083	.113	.132	.037	.272	.150	.049	.205	-.039	.007	.019	.153
39 Chose instit. b/c of coursework	-.104	.075	.079	.028	.127	.018	.086	.080	.000	.039	.024	.073
40 Chose instit. b/c of reputation	-.163	.145	.233	.082	.217	.128	.033	.205	.032	-.030	-.007	.150
41 Chose instit. b/c of location	-.001	-.042	-.045	.011	-.032	-.027	-.039	.002	-.022	-.019	-.066	-.027
42 1st choice school accepted	-.003	.007	-.014	.025	-.096	-.004	-.006	-.078	.039	.011	.011	-.043
43 Plan to transfer	.370	-.052	-.094	-.029	-.088	-.036	.021	-.115	.001	.058	.042	-.047
44 Chose instit. for pers.family reas.	.033	.000	.032	.057	-.040	.013	-.057	-.014	.039	-.042	-.016	-.028
45 Parents expected to get a job	.069	-.099	-.130	-.031	-.127	-.101	.035	-.150	.004	.042	.020	-.077
46 Chose inst. for financial reason	.016	-.146	-.133	-.036	-.270	-.155	-.253	-.071	-.011	-.173	-.131	-.177
47 Live on campus	-.134	.260	.369	.071	.295	.222	-.028	.210	.073	-.017	-.041	.175
48 Acad. integration index	-.060	.442	.248	.097	.205	.210	.085	.073	.025	.047	.075	.133
49 Freq. classes attended by TA	-.056	-.080	-.040	-.010	-.114	-.072	-.254	.225	-.209	-.284	-.301	-.032
50 Freq. large lectures attended	-.052	-.102	-.065	.014	-.147	-.095	-.353	.224	-.148	-.323	-.330	-.078
51 Freq. wrote papers for courses	.013	.147	.084	.036	.128	.116	.079	-.015	.043	.100	.106	.077
52 Social integration index	-.118	.279	.489	.121	.243	.232	.035	.137	.123	.038	.038	.159
53 No volunteering	.054	-.133	-.170	-.280	-.126	-.111	-.009	-.093	-.060	.006	.004	-.090
54 1-10 hrs volunteering (no volunt.)	-.050	.121	.171	.089	.116	.101	-.007	.096	.010	.007	.078	.007
55 11-20 hrs volunteering (no volunt.)	-.011	.027	.012	.187	.031	.027	.010	.011	-.001	.001	-.013	.027
56 20+ hrs volunteering (no volunt.)	-.003	.011	.008	.198	.001	.003	.021	-.006	.010	.006	.020	.008
57 Major declared	.084	-.062	-.139	-.036	-.158	-.114	.038	-.163	-.054	.051	-.011	-.129
58 Job related to major	.044	-.030	-.063	-.014	-.047	-.044	.018	-.057	-.041	.017	.026	-.029
59 GPA in first year	-.120	.069	.138	.070	.159	.092	-.007	.170	-.017	-.025	.003	.097
60 Any remedial courses taken	.068	-.049	-.068	-.041	-.077	-.048	-.013	-.097	.032	.030	.046	-.081
61 Not working (Ref.)	-.078	.107	.164	.038	.159	.115	-.038	.178	.032	-.042	-.023	.080
62 1-10 hrs working (not working)	-.021	.044	.066	.001	.033	.031	.018	.013	.031	.028	.017	.031
63 11-20 hrs working (not working)	.049	-.065	-.092	-.003	-.094	-.059	.012	-.089	-.037	.002	-.013	.064
64 20+ hrs working (not working)	.078	-.126	-.200	-.052	-.158	-.135	.023	-.171	-.037	.031	.065	-.077
65 Distance from home	-.101	.162	.315	.071	.244	.166	-.041	.222	.096	-.050	.060	.130
66 Fed. need-based grants	.082	-.038	-.104	-.002	-.064	-.026	.087	-.086	.028	.021	.135	-.021
67 State need-based grants	-.009	.037	-.026	.005	.089	.021	.141	-.020	-.081	.079	.100	.093
68 Instt. need-based grants	-.116	.219	.258	.119	.420	.266	.160	.228	.051	.103	.113	.288
69 State merit grants	.031	-.018	.024	.002	.062	.056	-.136	.044	-.041	-.067	-.079	-.022
70 Instt. merit grants	-.043	.202	.203	.108	.295	.311	.227	.041	.024	.156	.145	.174
71 Outside grants	-.036	.115	.122	.061	.122	.112	-.001	.104	.020	-.017	-.018	.082
72 Federal subsid. loans	.010	.097	.048	.011	.180	.079	.222	-.012	.052	.161	.117	.102
73 Stafford unsubsidized loans	.023	.032	.010	.021	.032	.002	.091	-.069	.014	.110	.076	.015
74 State loans	.016	.008	.017	-.016	.004	-.019	.020	-.025	.017	.012	.024	-.027
75 Private (altern.) loans	.025	.035	-.007	.001	.112	.020	.168	-.008	-.028	.140	.142	.071
76 Federal work-study	-.024	.119	.125	.069	.185	.129	.136	.046	.055	.072	.132	.125
77 Help f. parents - housing	-.110	.161	.266	.056	.217	.145	-.033	.169	.011	-.034	-.046	.113
78 Help f. parents - living expenses	-.050	.069	.089	.031	.070	.075	-.051	.086	-.001	-.050	-.007	.054
79 Help f. parents - tuition & fees	-.077	.109	.146	.023	.179	.064	.049	.091	-.007	-.004	.011	.096
80 Unmet need (after EFC and aid)	-.081	.104	.116	.045	.308	.121	.100	.190	.042	.047	.070	.179
81 Control: Public	.090	-.406	-.408	-.181	-.739	-.467	-.701	-.142	-.146	-.444	-.440	-.446
82 Control: Private	-.095	.463	.494	.227	.732	.513	.600	.180	.186	.330	.406	.443
83 High selectivity (Mod. selectivity)	-.283	.142	.253	.080	.356	.286	-.195	.536	-.244	-.255	-.159	.255
84 Moderate selectivity (Ref.)	.116	-.029	-.046	-.010	-.259	-.151	-.004	-.304	.021	.015	.001	-.162
85 Low selectivity (Mod. selectivity)	.141	-.092	-.122	-.047	-.094	-.086	.082	-.178	.041	.119	.107	-.130
86 Other selectivity (Mod. selectivity)	.124	-.097	-.228	-.077	-.018	-.131	.277	-.160	-.048	-.291	.173	.013
87 HBCU	.132	.106	-.025	.015	-.013	.175	-.058	-.038	.202	.017	.103	-.005
88 HSI	.030	-.124	-.210	-.019	-.278	-.178	.003	-.119	-.074	.002	.136	-.121
89 Enrollment	-.111	-.283	-.269	-.040	-.227	-.278	-.482	.260	-.329	-.628	-.580	-.254
90 Pct. minority enrollment	.087	-.081	-.292	-.067	-.098	-.022	-.038	.095	-.108	-.028	.101	.003
91 Pct. of part-time enrollment	.214	-.298	-.416	-.033	-.364	-.311	.107	-.390	-.145	-.014	.168	-.139
92 Pct. receiving federal grants	.265	-.135	-.322	-.108	-.283	-.118	.207	-.359	.045	.255	.346	-.067
93 Pct. receiving state/local grants	.104	-.111	-.132	-.026	-.211	-.109	-.033	-.174	-.034	-.046	.057	-.080
94 Pct. receiving institutional grants	-.097	.435	.399	.237	.560	.562	.435	.125	.048	.287	.211	.373
95 Pct. receiving loans	.081	.214	.060	.014	.353	.216	.543	-.193	.063	.436	.307	.224
96 Income (agg.)	-.182	.176	.306	.085	.340	.171	-.029	.257	-.052	-.103	-.217	.106
97 Transfer plans (agg.)	.1	-.137	-.251	-.074	-.263	-.111	.043	-.327	.007	.148	.103	-.144
98 Acad. integration index (agg.)	-.137	.1	.566	.235	.481	.491	.195	.153	.075	.111	.181	.305
99 Social integration index (agg.)	-.251	.566	.1	.244	.497	.472	.060	.284	.249	.075	.077	.327
100 Hrs student volunteering (agg.)	-.074	.235	.244	.1	.207	.196	.045	.104	.084	-.005	.011	.136
101 Price of attendance	-.263	.481	.497	.207	.1	.515	.448	.487	.036	.226	.203	.573
102 Instt. tuition discount rate	-.111	.491	.472	.196	.515	.1	.061	.330	.093	.156	.061	.348
103 Tut & fees as pct. of core reven.	.04											

## APPENDIX B – HGLM RESULTS

**Table B-1: HGLM Model Results Predicting Six-Year Bachelor's Degree Completion (Models 1-3)**

Independent Variable	Model 1 (N=6,430)					Model 2 (N=6,430)					Model 3 (N=6,430)				
	C	SE	t	p	d-P	C	SE	t	p	d-P	C	SE	t	p	d-P
<i>Student-Level Variable (Level 1)</i>															
<i>Pre-College</i>															
<i>Demographic</i>															
Age: 19+ years	-0.173	0.067	-2.576	0.010 **	-4.18	-0.173	0.068	-2.530	0.011 *	-4.18	-0.218	0.068	-3.212	0.001 **	-5.27
Gender: Female	0.420	0.065	6.421	0.000 **	10.10	0.424	0.069	6.106	0.000 ***	10.20	0.227	0.076	2.992	0.003 **	5.46
African American (White)	-0.003	0.139	-0.021	0.983		-0.041	0.140	-0.297	0.767		-0.114	0.149	-0.769	0.442	
Latino/a or Hispanic (White)	-0.279	0.138	-2.024	0.043 *	-6.80	-0.318	0.141	-2.254	0.024 *	-7.77	-0.160	0.147	-1.089	0.276	
Asian (White)	-0.244	0.142	-1.719	0.086		-0.162	0.153	-1.059	0.290		-0.141	0.169	-0.837	0.403	
Other Race/Ethnicity (White)	-0.332	0.133	-2.497	0.013 *	-8.12	-0.281	0.136	-2.076	0.038 *	-6.85	-0.161	0.150	-1.071	0.284	
English is primary language	-0.243	0.139	-1.754	0.079		-0.227	0.137	-1.653	0.098		-0.224	0.152	-1.473	0.141	
Parental educ: HS or less (BA)	-0.073	0.093	-0.780	0.435		-0.058	0.094	-0.613	0.540		-0.031	0.102	-0.301	0.763	
Parental educ: AA degree (BA)	-0.179	0.090	-1.990	0.047 *	-4.35	-0.185	0.093	-1.996	0.046 *	-4.49	-0.170	0.099	-1.720	0.085	
Parental educ: MA or higher (BA)	0.081	0.086	0.934	0.350		0.002	0.090	0.019	0.985		-0.025	0.094	-0.265	0.791	
Parents: Single parent (Married)	-0.435	0.218	-1.995	0.046 *	-10.68	-0.446	0.221	-2.020	0.043 *	-10.96	-0.515	0.235	-2.193	0.028 *	-12.68
Parents: Div./sep./wid. (Married)	-0.208	0.085	-2.461	0.014 *	-5.03	-0.191	0.090	-2.133	0.033 *	-4.62	-0.120	0.089	-1.344	0.179	
Sibling in college	0.217	0.073	2.949	0.003 **	5.17	0.234	0.076	3.095	0.002 **	5.57	0.102	0.078	1.312	0.189	
<i>Academic Preparation</i>															
Admission test scores	0.208	0.026	8.146	0.000 ***	4.88	0.181	0.026	7.035	0.000 ***	4.26	0.062	0.028	2.235	0.025 *	1.48
High school GPA	0.316	0.042	7.532	0.000 ***	7.31	0.308	0.042	7.411	0.000 ***	7.13	0.205	0.045	4.559	0.000 ***	4.81
Earned college credits in HS	0.210	0.072	2.897	0.004 **	5.03	0.170	0.074	2.306	0.021 *	4.08	0.067	0.078	0.860	0.390	
Private HS attended	0.094	0.080	1.174	0.240		0.101	0.083	1.214	0.225		0.062	0.089	0.703	0.482	
4 yrs of English in HS	0.111	0.099	1.123	0.262		0.085	0.098	0.868	0.385		0.061	0.105	0.579	0.562	
4 yrs of Math in HS	0.211	0.076	2.767	0.006 **	5.12	0.202	0.077	2.617	0.009 **	4.90	0.148	0.081	1.832	0.067	
<i>Economic/Financial Factors</i>															
Low income (<\$32k) (High)	-0.173	0.119	-1.452	0.146		-0.167	0.121	-1.385	0.166		-0.516	0.149	-3.464	0.001 **	-12.38
Low-mid income (\$32-\$59k) (High)	-0.134	0.092	-1.446	0.148		-0.107	0.092	-1.167	0.243		-0.324	0.110	-2.942	0.003 **	-7.64
Up-mid income (\$60-\$91k) (High)	-0.130	0.087	-1.492	0.136		-0.117	0.087	-1.349	0.177		-0.179	0.094	-1.912	0.056	
Parents own investment >\$10k	0.154	0.068	2.262	0.024 *	3.68	0.143	0.071	2.002	0.045 *	3.42	0.169	0.074	2.269	0.023 *	4.03
<i>Transition</i>															
<i>Educational Goals</i>															
Master's degree aspiration (BA)						0.277	0.083	3.318	0.001 **	6.73	0.171	0.085	2.007	0.045 *	4.16
Doctorate aspiration (BA)						0.280	0.100	2.796	0.005 **	6.80	0.151	0.104	1.442	0.149	
Prof. degree aspiration (BA)						0.227	0.127	1.789	0.074		0.092	0.125	0.737	0.461	
Goal: Be a community leader						0.037	0.068	0.547	0.585		0.010	0.070	0.135	0.893	
Goal: Be financially well off						-0.047	0.077	-0.615	0.539		0.039	0.079	0.496	0.620	
Goal: Live close to relatives						-0.092	0.069	-1.332	0.183		-0.131	0.074	-1.772	0.076	
<i>School Choice &amp; Institutional Commitment</i>															
Consulted a ranking						-0.007	0.070	-0.098	0.922		-0.033	0.072	-0.460	0.645	
Considered grad. rate						0.083	0.069	1.195	0.232		0.044	0.076	0.584	0.559	
Applied to 6+ institutions						0.017	0.095	0.177	0.860		-0.018	0.099	-0.182	0.856	
Chose instit. b/c of coursework						0.075	0.067	1.132	0.258		0.025	0.069	0.359	0.720	
Chose instit. b/c of reputation						0.288	0.073	3.918	0.000 ***	6.97	0.217	0.076	2.867	0.004 **	5.24
Chose instit. b/c of location						0.089	0.076	1.174	0.241		0.110	0.081	1.350	0.177	
1st choice school accepted						-0.168	0.106	-1.587	0.112		-0.193	0.109	-1.769	0.077	
Plan to transfer						-1.096	0.089	-12.256	0.000 ***	-26.73	-1.110	0.099	-11.164	0.000 ***	-27.06
<i>Pull Factors</i>															
Chose instit. for pers./family reas.						0.001	0.067	0.019	0.984		-0.011	0.071	-0.155	0.877	
Parents expected to get a job						-0.274	0.077	-3.571	0.000 ***	-6.65	-0.001	0.102	-0.007	0.995	
<i>Economic/Financial Factors</i>															
Chose inst. for financial reason						0.082	0.066	1.247	0.212		0.097	0.072	1.344	0.179	
<i>College</i>															
<i>Academic and Social Experiences</i>															
Live on campus											0.699	0.092	7.609	0.000 ***	17.00
Acad. integration index											0.002	0.010	0.183	0.855	
Freq. classes attended by TA											0.055	0.052	1.062	0.288	
Freq. large lectures attended											0.055	0.048	1.135	0.256	
Freq. wrote papers for courses											-0.038	0.073	-0.517	0.605	
Social integration index											0.021	0.007	2.829	0.005 **	0.50
1-10 hrs volunteering (no volunt.)											-0.023	0.079	-0.294	0.769	
11-20 hrs volunteering (no volunt.)											-0.132	0.148	-0.895	0.371	
20+ hrs volunteering (no volunt.)											-0.095	0.143	-0.663	0.507	
Major declared											0.044	0.081	0.550	0.583	
Job related to major											0.119	0.143	0.836	0.403	
GPA in first year											0.089	0.006	14.467	0.000 ***	2.12
Any remedial courses taken											0.049	0.095	0.517	0.605	
<i>Pull Factors</i>															
1-10 hrs working (not working)											-0.062	0.112	-0.554	0.580	
11-20 hrs working (not working)											-0.135	0.113	-1.200	0.230	
20+ hrs working (not working)											-0.468	0.131	-3.571	0.000 ***	-11.44
Distance from home											-0.097	0.028	-3.498	0.000 ***	-2.35
<i>Economic/Financial Factors</i>															
Fed. need-based grants											0.048	0.034	1.424	0.155	
State need-based grants											0.002	0.036	0.069	0.945	





**Table B-2: HGLM Model Results Predicting Six-Year Bachelor's Degree Completion (Models 4-6)**

Independent Variable	Model 4 (N=6,430)					Model 5 (N=6,041)					Model 6 - Final (N=5,923)				
	C	SE	t	p	d-P	C	SE	t	p	d-P	C	SE	t	p	d-P
<i>Student-Level Variable (Level 1)</i>															
<i>Pre-College</i>															
<i>Demographic</i>															
Age: 19+ years	-0.204	0.068	-2.985	0.003 **	-4.93	-0.229	0.070	-3.275	0.001 **	-5.54	-0.233	0.069	-3.353	0.001 **	-5.63
Gender: Female	0.220	0.076	2.895	0.004 **	5.30	0.201	0.078	2.590	0.010 **	4.84	0.209	0.077	2.698	0.007 **	5.03
African American (White)	-0.160	0.164	-0.975	0.330		-0.180	0.165	-1.092	0.275		-0.131	0.165	-0.792	0.428	
Latino/a or Hispanic (White)	-0.120	0.152	-0.794	0.427		-0.208	0.155	-1.344	0.179		-0.223	0.155	-1.442	0.149	
Asian (White)	-0.188	0.170	-1.102	0.270		-0.282	0.180	-1.561	0.119		-0.285	0.180	-1.582	0.114	
Other Race/Ethnicity (White)	-0.168	0.151	-1.114	0.265		-0.146	0.160	-0.913	0.361		-0.146	0.161	-0.908	0.364	
English is primary language	-0.204	0.158	-1.291	0.197		-0.135	0.174	-0.775	0.438		-0.142	0.173	-0.819	0.413	
Parental educ: HS or less (BA)	-0.038	0.103	-0.370	0.711		-0.091	0.106	-0.863	0.388		-0.068	0.106	-0.644	0.520	
Parental educ: AA degree (BA)	-0.165	0.099	-1.676	0.094		-0.159	0.101	-1.569	0.117		-0.157	0.101	-1.566	0.117	
Parental educ: MA or higher (BA)	-0.030	0.094	-0.322	0.748		-0.017	0.097	-0.172	0.863		-0.015	0.097	-0.158	0.874	
Parents: Single parent (Married)	-0.544	0.239	-2.279	0.023 *	-13.40	-0.583	0.252	-2.317	0.020 *	-14.37	-0.567	0.249	-2.279	0.023 *	-13.97
Parents: Div./sep./wid. (Married)	-0.135	0.091	-1.486	0.137		-0.138	0.093	-1.485	0.137		-0.154	0.093	-1.653	0.098	
Sibling in college	0.107	0.078	1.370	0.171		0.129	0.081	1.598	0.110		0.146	0.081	1.810	0.070	
<i>Academic Preparation</i>															
Admission test scores	0.032	0.029	1.134	0.257		0.013	0.029	0.448	0.654		0.012	0.029	0.423	0.672	
High school GPA	0.194	0.045	4.264	0.000 ***	4.56	0.201	0.047	4.289	0.000 ***	4.72	0.200	0.046	4.331	0.000 ***	4.70
Earned college credits in HS	0.054	0.079	0.678	0.498		0.050	0.081	0.619	0.536		0.052	0.081	0.640	0.522	
Private HS attended	0.080	0.091	0.877	0.380		0.056	0.095	0.590	0.555		0.048	0.095	0.513	0.608	
4 yrs of English in HS	0.082	0.105	0.784	0.433		0.125	0.105	1.184	0.236		0.141	0.105	1.347	0.178	
4 yrs of Math in HS	0.114	0.081	1.399	0.162		0.081	0.084	0.969	0.333		0.085	0.083	1.018	0.309	
<i>Economic/Financial Factors</i>															
Low income (<\$32k) (High)	-0.489	0.153	-3.205	0.001 **	-11.70	-0.352	0.162	-2.170	0.030 *	-8.40	-0.362	0.158	-2.288	0.022 *	-8.64
Low-mid income (\$32-\$59k) (High)	-0.288	0.116	-2.492	0.013 *	-6.79	-0.188	0.120	-1.563	0.118		-0.168	0.119	-1.415	0.157	
Up-mid income (\$60-\$91k) (High)	-0.172	0.095	-1.820	0.069		-0.093	0.098	-0.953	0.340		-0.073	0.095	-0.769	0.442	
Parents own investment >\$10k	0.174	0.074	2.338	0.019 *	4.15	0.187	0.076	2.464	0.014 *	4.46	0.180	0.076	2.378	0.017 *	4.30
<i>Transition</i>															
<i>Educational Goals</i>															
Master's degree aspiration (BA)	0.148	0.085	1.733	0.083		0.123	0.089	1.390	0.165		0.111	0.088	1.261	0.207	
Doctorate aspiration (BA)	0.132	0.105	1.257	0.209		0.087	0.108	0.802	0.423		0.068	0.108	0.628	0.530	
Prof. degree aspiration (BA)	0.067	0.126	0.534	0.593		0.050	0.129	0.387	0.699		0.037	0.129	0.289	0.773	
Goal: Be a community leader	0.000	0.071	0.006	0.995		0.001	0.074	0.012	0.991		-0.001	0.074	-0.013	0.989	
Goal: Be financially well off	0.036	0.079	0.456	0.648		0.031	0.082	0.377	0.706		0.036	0.082	0.438	0.662	
Goal: Live close to relatives	-0.129	0.074	-1.739	0.082		-0.115	0.077	-1.492	0.136		-0.118	0.077	-1.529	0.126	
<i>School Choice &amp; Institutional Commitment</i>															
Consulted a ranking	-0.050	0.073	-0.693	0.488		-0.069	0.076	-0.903	0.367		-0.067	0.075	-0.887	0.375	
Considered grad. rate	0.039	0.076	0.517	0.605		0.040	0.078	0.513	0.608		0.039	0.078	0.500	0.617	
Applied to 6+ institutions	-0.047	0.100	-0.471	0.638		-0.049	0.105	-0.466	0.641		-0.055	0.104	-0.528	0.597	
Chose instit. b/c of coursework	0.041	0.069	0.590	0.555		0.005	0.072	0.076	0.939		0.008	0.072	0.114	0.910	
Chose instit. b/c of reputation	0.194	0.076	2.543	0.011 *	4.69	0.188	0.079	2.385	0.017 *	4.54	0.177	0.078	2.284	0.022 *	4.27
Chose instit. b/c of location	0.108	0.082	1.326	0.185		0.088	0.085	1.037	0.300		0.110	0.085	1.289	0.197	
1st choice school accepted	-0.204	0.109	-1.864	0.062		-0.212	0.114	-1.864	0.062		-0.196	0.112	-1.752	0.080	
Plan to transfer	-1.089	0.099	-10.956	0.000 ***	-26.57	-1.050	0.102	-10.250	0.000 ***	-25.66	-1.086	0.101	-10.739	0.000 ***	-26.50
<i>Pull Factors</i>															
Chose instit. for pers./family reas.	-0.008	0.072	-0.110	0.912		0.006	0.073	0.081	0.935		0.004	0.073	0.052	0.959	
Parents expected to get a job	0.015	0.102	0.147	0.883		0.016	0.106	0.151	0.880		0.036	0.106	0.336	0.737	
<i>Economic/Financial Factors</i>															
Chose inst. for financial reason	0.082	0.076	1.077	0.282		0.097	0.079	1.241	0.215		0.112	0.076	1.474	0.140	
<i>College</i>															
<i>Academic and Social Experiences</i>															
Live on campus	0.680	0.093	7.325	0.000 ***	16.54	0.680	0.097	6.998	0.000 ***	16.54	0.678	0.096	7.066	0.000 ***	16.49
Acad. integration index	0.001	0.010	0.102	0.918		0.005	0.010	0.520	0.603		0.002	0.010	0.186	0.852	
Freq. classes attended by TA	0.037	0.052	0.723	0.469		-0.025	0.055	-0.458	0.647		-0.026	0.055	-0.467	0.641	
Freq. large lectures attended	0.022	0.049	0.454	0.650		0.014	0.052	0.271	0.786		0.021	0.053	0.408	0.683	
Freq. wrote papers for courses	-0.021	0.074	-0.287	0.774		-0.086	0.076	-1.131	0.258		-0.092	0.077	-1.198	0.231	
Social integration index	0.023	0.008	3.019	0.003 **	0.55	0.024	0.008	2.843	0.004 **	0.58	0.026	0.008	3.263	0.001 **	0.62
1-10 hrs volunteering (no volunt.)	-0.018	0.079	-0.228	0.820		-0.003	0.083	-0.031	0.975		0.007	0.081	0.088	0.930	
11-20 hrs volunteering (no volunt.)	-0.129	0.149	-0.869	0.385		-0.144	0.157	-0.915	0.360		-0.129	0.152	-0.852	0.394	
20+ hrs volunteering (no volunt.)	-0.090	0.145	-0.623	0.533		-0.054	0.155	-0.351	0.726		-0.063	0.150	-0.418	0.676	
Major declared	0.063	0.081	0.771	0.440		0.142	0.084	1.689	0.091		0.141	0.083	1.689	0.091	
Job related to major	0.126	0.144	0.874	0.382		0.077	0.145	0.531	0.596		0.072	0.144	0.502	0.615	
GPA in first year	0.091	0.006	14.392	0.000 ***	2.17	0.091	0.007	13.920	0.000 ***	2.17	0.091	0.007	13.744	0.000 ***	2.17
Any remedial courses taken	0.054	0.096	0.560	0.575		0.029	0.099	0.296	0.767		0.026	0.098	0.262	0.793	
<i>Pull Factors</i>															
1-10 hrs working (not working)	-0.070	0.113	-0.623	0.533		-0.069	0.117	-0.592	0.554		-0.074	0.116	-0.632	0.528	
11-20 hrs working (not working)	-0.133	0.113	-1.178	0.239		-0.158	0.115	-1.377	0.169		-0.189	0.113	-1.662	0.097	
20+ hrs working (not working)	-0.458	0.132	-3.473	0.001 **	-11.19	-0.407	0.136	-2.995	0.003 **	-9.93	-0.418	0.136	-3.073	0.002 **	-10.20
Distance from home	-0.098	0.028	-3.551	0.000 ***	-2.38	-0.105	0.029	-3.676	0.000 ***	-2.55	-0.103	0.028	-3.683	0.000 ***	-2.50
<i>Economic/Financial Factors</i>															
Fed. need-based grants	0.053	0.034	1.564	0.118		0.059	0.035	1.681	0.093		0.060	0.035	1.719	0.086	
State need-based grants	0.000	0.037	-0.006	0.995		-0.003	0.038	-0.071	0.943		-0.013	0.036	-0.369	0.712	



## APPENDIX C – PROPENSITY SCORE ESTIMATION RESULTS

**Table C-1: Comparison of Conditional Variable Means Before and After Adjusting with Propensity Score Weights (Treatment 1)**

	Regular Weight (WTA000)						Reweighted (Propensity Score Weight)					
	Not Treated	Treated	Pct. Bias	T	p	Sig.	Not Treated	Treated	Pct. Bias	T	p	Sig.
Age: 19 years or older	.34	.34	-1.39	.35	.726		.34	.32	-3.90	1.12	.263	
Gender: Female	.55	.59	7.77	-3.02	.003	**	.56	.55	-2.34	1.06	.287	
Caucasian (Ref.)	.71	.68	-4.79	2.61	.009	**	.72	.71	-1.13	.72	.474	
African American	.10	.06	-41.91	5.01	.000	***	.08	.09	7.22	-.87	.386	
Latino/a or Hispanic	.09	.14	60.93	-6.23	.000	***	.09	.09	-3.76	.48	.633	
Asian	.05	.08	47.96	-3.72	.000	***	.06	.06	4.35	-.43	.668	
Other Race/Ethnicity	.05	.05	-8.42	.70	.483		.05	.06	5.38	-.50	.617	
English is primary language	.91	.86	-6.49	6.95	.000	***	.91	.91	.01	-.01	.993	
Low income	.19	.23	17.51	-2.94	.003	**	.19	.19	1.21	-.23	.815	
Lower-middle income	.25	.21	-17.49	3.59	.000	***	.24	.23	-4.03	.91	.363	
Upper-middle income	.27	.22	-18.73	4.01	.000	***	.26	.26	-.90	.21	.832	
High income	.29	.35	20.64	-4.56	.000	***	.31	.32	3.07	-.83	.407	
Parents own investment >\$10,000	.30	.36	21.88	-4.91	.000	***	.32	.32	1.82	-.50	.619	
<i>Parental Education</i>												
High school or less	.20	.17	-15.04	2.63	.008	**	.18	.18	-.92	.17	.862	
Associate degree or some college	.24	.18	-23.24	4.63	.000	***	.22	.21	-3.41	.73	.463	
Bachelor's degree	.28	.31	9.94	-2.17	.030	*	.29	.28	-5.39	1.40	.163	
Master's degree or higher	.28	.34	19.90	-4.32	.000	***	.31	.33	8.17	-2.15	.032	*
<i>Parent Family Status</i>												
Married	.74	.79	7.31	-4.34	.000	***	.75	.75	.04	-.03	.979	
Single parent	.04	.04	-14.13	1.07	.286		.04	.03	-18.37	1.55	.120	
Divorced/separated/widowed	.22	.17	-21.58	4.10	.000	***	.21	.21	3.31	-.68	.499	
Sibling in college	.30	.31	2.30	-.53	.595		.31	.32	3.19	-.85	.393	
Admission test scores (ACT or SAT)	10.61	11.19	5.39	-10.76	.000	***	10.76	10.74	-.18	.41	.681	
High school GPA	4.16	4.44	6.79	-10.04	.000	***	4.26	4.22	-.80	1.37	.171	
Private high school attended	.15	.15	.38	-.06	.956		.15	.17	8.23	-1.38	.169	
4 Years of English in high school	.85	.88	2.78	-2.40	.016	*	.86	.86	-.37	.37	.708	
4 Years of Math in high school	.77	.82	7.17	-4.63	.000	***	.79	.79	.35	-.27	.788	
<i>Importance</i>												
Be a community leader	.47	.47	1.48	-.48	.628		.47	.47	-.42	.16	.873	
Be financially well off	.74	.70	-5.32	3.10	.002	**	.73	.72	-.66	.43	.668	
Live close to relatives	.41	.42	2.72	-.79	.430		.41	.38	-6.12	1.98	.052	
<i>Degree Aspirations</i>												
Bachelor's degree aspiration	.24	.21	-10.38	2.05	.041	*	.23	.24	3.26	-.71	.479	
Master's degree aspiration	.49	.46	-5.35	1.83	.067		.48	.48	-1.21	.47	.641	
Doctorate aspiration	.19	.22	17.10	-2.83	.005	**	.20	.19	-2.74	.55	.583	
Professional degree aspiration	.08	.10	22.22	-2.30	.022	*	.09	.09	4.16	-.52	.601	
Plan to transfer	.14	.11	-19.12	2.74	.006	**	.13	.14	2.65	-.41	.679	
Live on campus	.71	.61	-13.62	7.28	.000	***	.70	.70	.65	-.40	.691	

\* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

Note: Variables reported are used in the estimation of propensity scores. Interaction terms are omitted.

**Table C-2: Comparison of Conditional Variable Means Before and After Adjusting with Propensity Score Weights (Treatment 2)**

	Regular Weight (WTA000)						Reweighted (Propensity Score Weight)					
	Not Treated	Treated	Pct. Bias	T	p	Sig.	Not Treated	Treated	Pct. Bias	T	p	Sig.
Age: 19 years or older	.34	.36	6.06	-1.42	.155		.34	.32	-4.96	1.42	.156	
Gender: Female	.57	.54	-4.90	1.86	.063		.56	.57	.84	-.38	.702	
Caucasian (Ref.)	.72	.65	-8.62	4.49	.000	***	.71	.71	-.08	.05	.961	
African American	.07	.15	125.22	-10.11	.000	***	.08	.09	.75	-.09	.927	
Latino/a or Hispanic	.10	.10	-1.11	.12	.901		.09	.09	-1.86	.24	.813	
Asian	.06	.04	-29.13	2.56	.011	*	.06	.06	3.98	-.39	.694	
Other Race/Ethnicity	.05	.05	-6.97	.55	.584		.05	.05	-1.36	.13	.898	
English is primary language	.90	.91	1.23	-1.23	.221		.91	.90	-.64	.79	.431	
Low income	.17	.31	85.31	-12.13	.000	***	.19	.19	1.64	-.32	.751	
Lower-middle income	.22	.30	34.22	-5.96	.000	***	.24	.24	.68	-.15	.879	
Upper-middle income	.27	.21	-20.68	4.19	.000	***	.26	.27	2.69	-.63	.526	
High income	.34	.17	-48.79	12.12	.000	***	.31	.30	-3.76	1.02	.309	
Parents own investment >\$10,000	.34	.21	-36.97	9.05	.000	***	.32	.32	-.10	.03	.979	
<i>Parental Education</i>												
High school or less	.17	.25	48.80	-7.10	.000	***	.18	.19	3.16	-.60	.550	
Associate degree or some college	.21	.28	37.26	-6.16	.000	***	.22	.22	-.08	.02	.986	
Bachelor's degree	.30	.25	-18.68	4.14	.000	***	.29	.29	-.79	.20	.839	
Master's degree or higher	.32	.22	-32.58	7.58	.000	***	.30	.30	-1.10	.29	.771	
<i>Parent Family Status</i>												
Married	.77	.66	-14.60	8.68	.000	***	.75	.76	.28	-.19	.847	
Single parent	.03	.07	115.04	-6.41	.000	***	.04	.04	-5.41	.44	.658	
Divorced/separated/widowed	.19	.27	38.43	-6.08	.000	***	.21	.21	.02	.00	.997	
Sibling in college	.32	.26	-17.28	3.96	.000	***	.31	.30	-4.11	1.11	.267	
Admission test scores (ACT or SAT)	10.85	10.40	-4.15	7.99	.000	***	10.75	10.76	.03	-.08	.939	
High school GPA	4.26	4.12	-3.23	4.60	.000	***	4.26	4.26	-.04	.07	.947	
Private high school attended	.16	.11	-29.01	4.34	.000	***	.15	.15	-1.04	.18	.860	
4 Years of English in high school	.86	.87	1.22	-1.00	.316		.86	.87	.08	-.08	.934	
4 Years of Math in high school	.79	.75	-5.15	3.25	.001	**	.79	.79	-.09	.07	.944	
<i>Importance</i>												
Be a community leader	.46	.49	5.03	-1.55	.120		.47	.48	1.22	-.46	.646	
Be financially well off	.72	.75	4.04	-2.18	.029	*	.73	.73	.28	-.18	.856	
Live close to relatives	.41	.41	1.16	-.32	.749		.41	.40	-1.72	.58	.565	
<i>Degree Aspirations</i>												
Bachelor's degree aspiration	.23	.24	4.90	-.88	.377		.23	.22	-2.34	.51	.607	
Master's degree aspiration	.48	.48	.00	.00	.999		.48	.49	.99	-.38	.701	
Doctorate aspiration	.20	.19	-1.34	.22	.825		.20	.20	.74	-.15	.883	
Professional degree aspiration	.09	.08	-9.52	1.01	.314		.09	.09	-.98	.12	.902	
Plan to transfer	.13	.14	6.64	-.85	.397		.13	.13	1.51	-.24	.814	
Live on campus	.69	.65	-6.34	3.14	.002	**	.70	.71	1.09	-.67	.504	

\* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

Note: Variables reported are used in the estimation of propensity scores. Interaction terms are omitted.

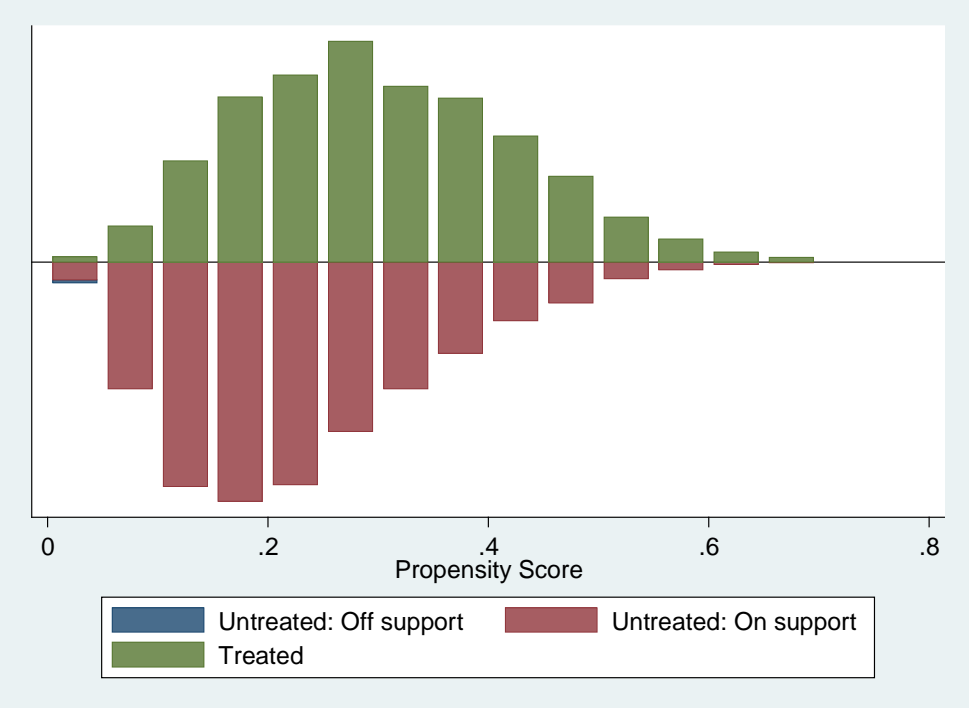
**Table C-3: Comparison of Conditional Variable Means Before and After Adjusting with Propensity Score Weights (Treatment 3)**

	Regular Weight (WTA000)						Reweighted (Propensity Score Weight)					
	Not Treated	Treated	Pct. Bias	T	p	Sig.	Not Treated	Treated	Pct. Bias	T	p	Sig.
Age: 19 years or older	.34	.34	.80	-.15	.883		.34	.35	4.39	-1.25	.212	
Gender: Female	.56	.60	7.88	-2.26	.024	*	.56	.55	-1.99	.90	.366	
Caucasian (Ref.)	.71	.65	-8.50	3.39	.001	**	.71	.72	1.19	-.76	.447	
African American	.08	.13	64.51	-4.72	.000	***	.09	.08	-3.76	.46	.643	
Latino/a or Hispanic	.10	.10	.07	-.01	.995		.09	.09	-3.37	.43	.667	
Asian	.06	.06	12.04	-.75	.451		.06	.06	.96	-.10	.924	
Other Race/Ethnicity	.05	.05	3.79	-.23	.821		.05	.05	-5.44	.52	.605	
English is primary language	.90	.90	.35	-.27	.791		.91	.91	.42	-.54	.592	
Low income	.18	.34	84.15	-9.93	.000	***	.19	.19	-1.23	.24	.811	
Lower-middle income	.23	.35	55.20	-7.51	.000	***	.24	.24	-.25	.06	.956	
Upper-middle income	.26	.20	-22.51	3.45	.001	**	.26	.26	1.02	-.24	.809	
High income	.33	.11	-66.65	12.39	.000	***	.31	.31	.09	-.03	.980	
Parents own investment >\$10,000	.32	.23	-29.97	5.38	.000	***	.32	.34	6.53	-1.77	.077	
<i>Parental Education</i>												
High school or less	.18	.27	54.08	-6.32	.000	***	.18	.18	-2.36	.45	.653	
Associate degree or some college	.22	.28	27.63	-3.68	.000	***	.22	.22	-.50	.11	.914	
Bachelor's degree	.30	.25	-16.88	2.82	.005	**	.29	.28	-4.14	1.07	.284	
Master's degree or higher	.31	.20	-34.33	5.96	.000	***	.30	.32	5.81	-1.52	.129	
<i>Parent Family Status</i>												
Married	.77	.62	-19.15	8.71	.000	***	.75	.74	-1.11	.77	.440	
Single parent	.04	.07	99.05	-4.77	.000	***	.04	.04	-10.51	.88	.379	
Divorced/separated/widowed	.20	.31	55.58	-6.92	.000	***	.21	.22	6.04	-1.23	.220	
Sibling in college	.30	.32	6.06	-1.02	.306		.31	.32	4.55	-1.21	.225	
Admission test scores (ACT or SAT)	10.77	10.63	-1.34	2.00	.046	*	10.76	10.81	.52	-1.20	.231	
High school GPA	4.22	4.26	.87	-.95	.344		4.26	4.26	.07	-.12	.901	
Private high school attended	.15	.15	-1.15	.12	.901		.15	.13	-11.37	1.98	.050	
4 Years of English in high school	.86	.83	-3.55	2.27	.023	*	.86	.88	1.74	-1.81	.071	
4 Years of Math in high school	.78	.76	-2.89	1.40	.162		.79	.77	-2.42	1.83	.067	
<i>Importance</i>												
Be a community leader	.46	.52	11.13	-2.65	.008	**	.47	.48	1.51	-.57	.569	
Be financially well off	.73	.71	-3.37	1.42	.154		.73	.71	-2.39	1.55	.120	
Live close to relatives	.41	.41	-1.15	.25	.806		.41	.41	-.64	.21	.830	
<i>Degree Aspirations</i>												
Bachelor's degree aspiration	.24	.21	-12.01	1.72	.086		.23	.20	-12.76	2.58	.010	*
Master's degree aspiration	.49	.46	-4.78	1.19	.235		.48	.52	7.40	-2.87	.004	**
Doctorate aspiration	.19	.23	20.06	-2.48	.013	*	.20	.21	5.02	-.99	.321	
Professional degree aspiration	.09	.10	14.87	-1.17	.242		.09	.07	-18.46	2.42	.016	*
Plan to transfer	.13	.15	12.41	-1.22	.222		.13	.13	-3.57	.56	.572	
Live on campus	.66	.86	29.31	-10.79	.000	***	.70	.72	2.48	-.76	.451	

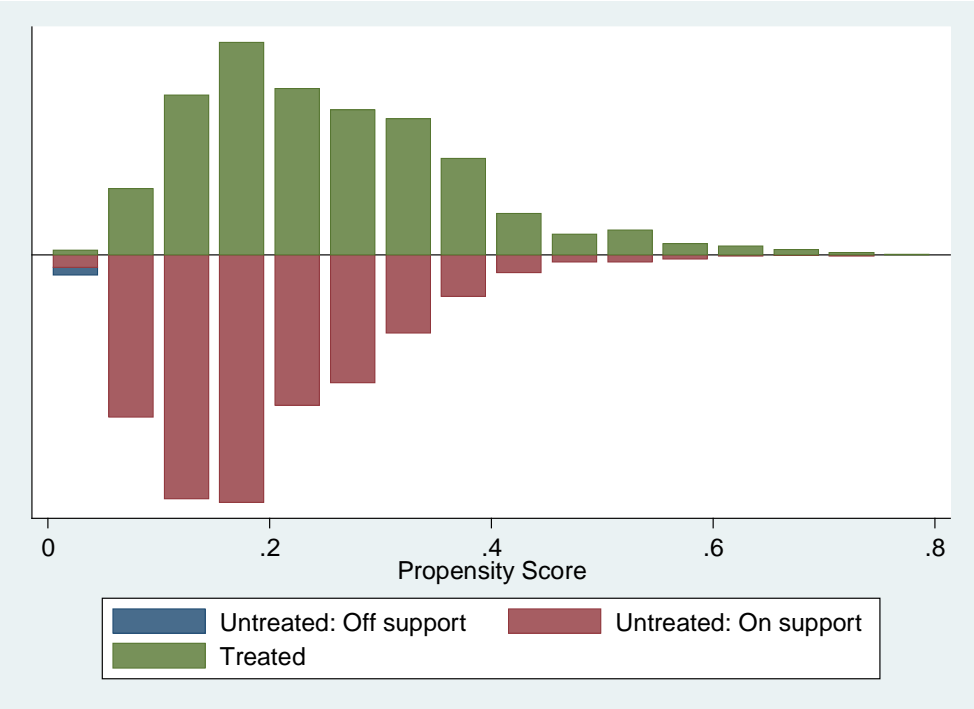
\* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

Note: Variables reported are used in the estimation of propensity scores. Interaction terms are omitted.

**Figure C-1:** Common Support Area, Propensity Score Estimation - Grants (Treatment 1)

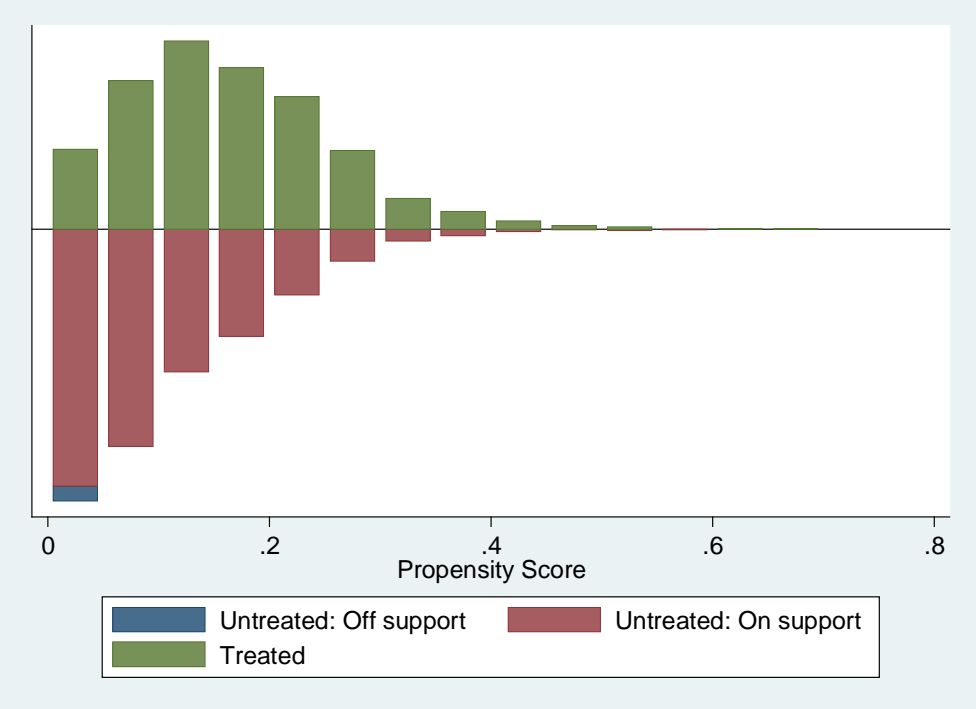


**Figure C-2:** Common Support Area, Propensity Score Estimation – Grants and Loans (Treatment 2)





**Figure C-3:** Common Support Area, Propensity Score Estimation – Grants, Loans, FWS (Treatment 3)



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